P1089　　　　　　　　　**[3964] - 164**

B.E. (Production Engineering)
ADVANCED MATERIAL PROCESSING
(Sem. - II) (Elective - II) (2003 Course) (411090)

Time : 3 Hours]　　　　　　　　　　　　　*[Max. Marks : 100*

Instructions to the candidates:

　　1)　Answer three questions from Section - I and Section - II.

　　2)　Answer to the sections should be written in separate books.

　　3)　Neat diagrams must be drawn wherever necessary.

SECTION - I
UNIT - I

Q1) a)　Explain with neat sketch oscillating turning process and compare it with conventional turning process.　**[8]**

　　b)　Explain Cryogrinding process. State its advantages.　**[8]**

OR

Q2) a)　Explain the chip formation mechanism in High speed machining. State advantages of High speed machining.　**[8]**

　　b)　Explain the development of tool material used in advanced machining process.　**[8]**

UNIT - II

Q3) a)　State the requirement of tool material used in EDM? Explain the taper and overcut in EDM.　**[8]**

　　b)　Explain with neat sketch STEM process.　**[8]**

OR

Q4) a)　For a Rc Ckt adjusted for maximum power supply, following details available, Resistance R = 300 Ohm, Capacitance C = 50 microfarad, Supply voltage = 80 V. Calculate charging current, at the Instant when the CKT is switch on, frequency of discharge.　**[8]**

　　b)　Explain with neat sketches the defects seen in product if it machined by chemical machining.　**[8]**

P.T.O.

UNIT - III

Q5) a) Compare Hot forging, cold forging, and warm forging. **[9]**

b) Explain with diagram a precision forging process and write its advantages.**[9]**

OR

Q6) a) Explain the procedure for preparation of a blank for three roll forming process. **[9]**

b) Explain with diagram magneto forming process and write its advantages.**[9]**

SECTION - II

UNIT - IV

Q7) a) Explain with suitable example how brass components are casted. **[8]**

b) Explain with neat sketch a continuous casting process. **[8]**

OR

Q8) a) Explain suitable process for casting of Al and Al alloys. **[8]**

b) State and explain controlling parameters in injection casting process? **[8]**

UNIT - V

Q9) a) Suggest suitable process and explain for casting of ceramic parts. **[8]**

b) What is meant by mushy materials? Explain the processing of such materials. **[8]**

OR

Q10) a) Explain with neat sketch rotational moulding process and state its application, advantages. **[8]**

b) Suggest and explain a suitable process for following : **[8]**
   i) Packaging film
   ii) Bucket

UNIT - VI

Q11) a) Explain PVD process. Compare it with CVD process. **[9]**

b) Explain steps in MEMS. **[9]**

OR

Q12) Write notes on following : **[18]**
   i) LIGA process.
   ii) Types of Paints
   iii) Surface cleaning methods.

■ ■ ■

P1094   **[3964] - 178**

B.E. (Production S/W)
SUPPLY CHAIN MANAGEMENT
(2003 Course) (411125) (Elective - II) (Sem. - I)

Time : 3 Hours]   [*Max. Marks : 100*

Instructions to the candidates:

 1)   *Answer any Three questions from each Section.*
 2)   *Your answers will be valued as a whole.*
 3)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Consider the supply chain involved when a customer purchases a toothpaste pack from a retail-store or a pan-shop. Identify the cycles in this supply chain and the location of the push-pull boundary. **[10]**

  b) Discuss primary and secondary objectives of supply chain Management.**[8]**

Q2) a) "Product Packaging is the main selling driver in the FMCG industry". Explain this statement with focus on the logistics. **[8]**

  b) What is Discounted cash flow Analysis? Why is it used in supply chain management? How the flexibility is evaluated in supply chain? **[8]**

Q3) a) What actions a manager can take to over come the obstacles and achieve co-ordination in supply chain? **[8]**

  b) What is bullwhip effect? Discuss its characteristics and managerial strategies to reduce its impact. Give examples. **[8]**

Q4) a) Explain inventory as a driver of supply chain performance. Give two examples. **[8]**

  b) Discuss various forecasting techniques used in SCM. **[8]**

SECTION - II

Q5) a) Why is IT the key component of SCM system? "Successful IT implementation is the outgrowth of the participation of knowledge workers". Comment with examples. **[8]**

b) Explain various modes of transportation. On what basis one should decide the best mode of transport? "Warehousing (TPW) is becoming an essential service for the industries". Comment. **[8]**

Q6) a) Explain the basic purchasing cycle and the role of purchasing manager in detail. **[8]**

b) How can a company use pricing to change demand patterns? Give examples. **[8]**

Q7) a) Discuss the various parameters and systems used to evaluate SCM performance. **[8]**

b) Explain with examples why outsourcing is imperative today. How an organisation can control the activities which are outsourced? **[8]**

Q8) Write short notes on <u>any three</u> of the following : **[18]**

a) Cycle stock in SCM.

b) Economics of scale.

c) Facility location decisions in supply chain.

d) Impact of financial factors on supply chain decisions.

e) Aggregate planning in SCM.

■ ■ ■

P1095   **[3964] - 179**

B.E. (Production S/W)
INDUSTRIAL AND COMMERCIAL LAW
(2003 Course) (411125) (Elective - II) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) Question No. 1 & Question No. 6 are compulsory.
2) Attempt any three questions from the remaining from each section.
3) Your answers to the problems must be supported by a correct legal & logical reasoning.
4) Figures to the right indicate full marks.

SECTION - I

Q1) a)   Nine clerks, working in the office of a government owned pharmaceutical factory employing 294 workmen, were terminated from his services on account of closure of a section in the office. They have challenged this action under the industrial Dispute Act 1947. Under which conditions can the aggrieved clerks succeed? Give your opinion, with reasons. **[5]**

b)   A Union has made certain demands from the Management of a factory establishment, for wage rise and other facilities. The management has not conceded (accepted) these demands and is not ready to accept any. Advice the Union with the reasons, the courses of action open to them under the Industrial Disputes Act, 1947, to get their demands sanctioned. **[5]**

c)   A computer vendor sold a computer to a customer. Immediately there after, the customer made a complaint that it can not perform the minimum functions as told and shown to him by the seller, at the time of sale. The customer has demanded the money back, on the grounds that he had been cheated. The seller is showing a printed line on the invoice that 'goods once sold will not be returned under any circumstances'. State the legality of the respective claims of the parties. **[5]**

d)   12 workers working in one automobile spare parts factory run on electricity have been asked to work for 9 hours a day with five days a week. Are these working hours legal? **[5]**

P.T.O.

Q2) State the meaning, legal status and importance of 'Standing Orders' and Model Standing orders. **[10]**

Q3) Define and explain the term Factory and Workman as per the Factories Act 1948. **[10]**

Q4) Define the terms 'Industry' and 'Retrenchment' as per Industrial Disputes Act 1947 and explain its essentials. **[10]**

Q5) a) State the purpose and reasons of legislating the Competition Act, 2002. **[5]**

b) Explain the meaning of 'relevant market' as per the Competition Act, 2002. **[5]**

SECTION - II

Q6) a) State with reasons whether the following personnel shall attract the definition of a workman' as per Industrial Disputes Act, 1947. **[5]**

i) A teacher,

ii) A nurse in a trust owned hospital,

iii) A peon in District Collector's office,

iv) A CNC operator drawing monthly salary higher than the manager of his factory.

b) A Hospital has employed 26 nurses and 30 ward boys. It claims that it is not covered by the Industrial Employment and Standing Orders Act, 1946. Is this position legally tenable? **[5]**

c) A workman working in a shop employing 76 workers is being terminated from his services on the grounds of surplus staff. State the provisions the employer is required to follow in the circumstances. **[5]**

d) A seller has sold 5 ordinary plastic chairs to a customer. No price was determined at the time of making the sale. However, the seller demanded a total price of Rs. 25,000/- after the completion of the sale and delivery. The customer refused to pay on the grounds of inordinately exorbitant price and therefore wants to cancel the sale. The seller is insisting on the same price. State the legality of their respective claims against each other along with the correct legal position. **[5]**

Q7) a) Can workmen in a Public Utility Service go on strike as per the provisions of Industrial Disputes Act, 1947? If yes, what are the conditions they have to comply with? If not, state the reasons of your answer. **[5]**

b) State the provisions of the factories Act, 1948, regarding the leaves and holidays of the workers. **[5]**

Q8) a) Explain the terms Condition and Warranty, marking out the distinction between them as per the provisions of the Sale of Goods Act. 1930.**[5]**

b) Explain the term Dominant Position as per the competition Act,2002.**[5]**

Q9) State the meaning of Certified Standing orders and explain the procedure of having Certified Standing Orders in any establishment as per the Industrial Employment (Standing Orders) Act, 1946. **[10]**

*Q10)*Write notes on (any two) : **[10]**

a) Distinction between Sale and Agreement to sell,

b) Manufacturing Process as per the Factories Act, 1948,

c) Distinction between closure and lockout as per the Industrial Disputes Act, 1947.

■ ■ ■

P1096   **[3964] - 180**

B.E. (Production S/W)
PROJECT MANAGEMENT
(Sem. - I) (2003 Course) (Elective - II) (411125)

Time : 3 Hours]   [*Max. Marks : 100*

Instructions to the candidates:

1) *All questions are Compulsory.*

2) *Answers to the two sections should be written in separate books.*

3) *Neat diagrams must be drawn wherever necessary.*

4) *Figures to the right indicate full marks.*

5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

6) *Assume suitable data, if necessary.*

SECTION - I

Q1) Explain in detail methods to identify project.   **[16]**

OR

Q2) Enumerate difference of project under private, public and joint sector.   **[16]**

Q3) Explain following :   **[16]**

    a)   Type of project under BMRED Balancing.

    b)   Modernization, Replacement.

OR

Q4) Explain :   **[16]**

    a)   Expansion of project.

    b)   Diversification of project.

Q5) Explain project formulation in consideration with preparation of feasibility report and specifications.   **[18]**

OR

Q6) What are the incentives from state and central govt. Explain advantages and applications of import substitution projects.   **[18]**

P.T.O.

SECTION - II

Q7) Explain different sources of finance for project. Address the issues of raising local and foreign investments. **[16]**

OR

Q8) Write note on following for project appraisal : **[16]**

    a)   Techno - commercial.

    b)   Financial discounted cash flow.

    c)   Non financial benefit.

    d)   Socio- economic cost benefit analysis.

Q9) Enumerate different aspects of project costing, contracting for labour and equipment costs. **[16]**

OR

*Q10)*a)   What are the different aspects for development and codification of cost data. **[8]**

    b)   Explain the advantages of using Activity-Based costing in detail. **[8]**

*Q11)*Explain following for project Administration : **[18]**

    a)   Cash flow planning.

    b)   Project scheduling.

OR

*Q12)*Write short notes on following (any three) : **[18]**

    a)   PERT.

    b)   CPM.

    c)   GANTT Charts.

    d)   Overruns costs.

■ ■ ■

P1352   **[3964] - 210**

B.E. Elec.(Sem. - IV)

ENERGY MANAGEMENT

(2003 Course)

Time : 3 Hours]   [*Max. Marks : 70*

Instructions to the candidates:

1) *Answer Three questions from Section - I and Three questions from Section - II.*

2) *Answer to the two sections should be written in separate books.*

3) *Neat diagrams must be drawn wherever necessary.*

4) *Black figures to the right indicate full marks.*

5) *Use of logarithmic tables slide rule. Mollier charts, electronic pocket calculator and steam tables is allowed.*

6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   What are the primary energy sources? How seconds energy sources help the business and economy.   **[6]**

b)   What are the renewable and non-renewable sources of energy.   **[4]**

c)   What is energy security. Why it is important.   **[6]**

OR

Q2) a)   What is an EC - Act. Describe the salient points of the EC - Act 2003.**[8]**

b)   What are the salient features of EC Bill 2001.   **[8]**

Q3) a)   Define energy policy of the government explain the concept of energy management.   **[8]**

b)   What is meant by Designated companies and who has designated them. Give names of all the companies.   **[8]**

OR

Q4) a) How demand side management and supply side management are complementary to each other. Discuss in detail. **[8]**

b) Explain the role of energy manager in energy intensive industry. **[8]**

Q5) a) What are the needs and types of energy audit. What are their outputs. **[8]**

b) Give the list if instruments and where are they used in energy audit. **[10]**

OR

Q6) a) How many phases are in the step by step energy audit. Write only the names that are done in phase -I **[5]**

b) Write in detail what is done in phase -II if energy audit. **[5]**

c) What is sankey diagram. How it is useful in energy auditing. **[5]**

SECTION - II

Q7) a) What are fixed and variable components in tariff. How does the tariff structure encourage energy conservation? **[8]**

b) Evaluate the financial merit of a proposed project shown in table below. Consider annual discount rate of 8% for each project. Use Net present analysis technique.

	Project - I	Project - II
Capital cost (Rs.)	30,000/-	30,000/-
Year	Net annual saving (Rs.)	Net annual saving (Rs.)
1	+ 6000/-	+ 6600/-
2	+ 6000/-	+ 6600/-
3	+ 6000/-	+ 6300/-
4	+ 6000/-	+ 6300/-
5	+ 6000/-	+ 6000/-
6	+ 6000/-	+ 6000/-
7	+ 6000/-	+ 5700/-
8	+ 6000/-	+ 5700/-
9	+ 6000/-	+ 5400/-
10	+ 6000/-	+ 5400/-

OR

Q8) a) Explain TUD and ABT tariff and impact of tariff on energy managemen.**[8]**

b) Evaluate the financial merit of proposed project shown in the table below. Consider annual discount rate of 7.5% for each project. Use Net present analysis technique. **[8]**

	Project - I	Project - II
Capital cost (Rs.)	Rs. 1,00,000/-	Rs. 1,00,000/-
Year	Net annual saving (Rs.)	Net annual saving (Rs.)
1	+ 9,500/-	+ 10,000/-
2	+ 9,500/-	+ 8,500/-
3	+ 9,500/-	+ 8,500/-
4	+ 9,500/-	+ 8,200/-
5	+ 9,500/-	+ 8,000/-
6	+ 9,500/-	+ 7,500/-
7	+ 9,500/-	+ 7,000/-

Q9) a) Explain the waste neat recovery system and vary applications of recovered heat? **[8]**

b) List down energy conservation opportunities in water pumping system and fan. **[8]**

OR

Q10) a) What are the various energy conservation imear as applied to air conditioners and refrigerators? **[8]**

b) List the energy conservation apporturities for illumination system. **[8]**

Q11) Explain the energy audit case studies for the: **[18]**

   (i)   Textile mill.
   (ii) Municiple corporation.

OR

Q12) Explain the energy audit case studies for the: **[18]**

   (i)   I.T. industry.
   (ii) Chemical industry.

◻◻◻

P1103   **[3964] - 215**

B.E. (Electrical)

DIGITAL SIGNAL PROCESSING

(2003 Course) (Elective - II) (403150) (Sem. - II)

Time : 3 Hours]   [*Max. Marks : 100*

Instructions to the candidates:

   1)   Answer three questions from Section - I and three questions from Section - II.

   2)   Answers to the two sections should be written in separate books.

   3)   Neat diagrams must be drawn wherever necessary.

   4)   Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

   5)   Assume suitable data, if necessary.

SECTION - I

Q1) a)   State and explain sampling theorem and nyquist rate.   **[4]**

   b)   Compute linear convolution by tabulation method :   **[8]**

   i) $X(n) = n + 1$ for $0 \leq n \leq 1$

            $= 5 - n$ for $2 \leq n \leq 4$

            $= 0$ elsewhere

         $H(n) = -n/2$ for $2 \leq n \leq 4$

            $= 0$ elsewhere

   ii) $X(n) = \{2, 2, 2\}$

         $h(n) = \{1, 2, 3, 2, 1\}$
                       $\uparrow$

   c)   State advantages of digital signal processing over analog signal processing.
                                                                              [6]

OR

Q2) a)   Explain properties of linear convolution.   **[6]**

   b)   Obtain the cross correlation for the DT sequence given below and sketch result $X(n) = \{2, -1, 3, 7, 1, 2, -3\}$ $Y(n) = \{1, -1, 2, -2, 4, 1, -2, 5\}$**[8]**
                       $\uparrow$ $\uparrow$

   c)   Determine whether the given systems are static/dynamic, linear/ nonlinear

   i) $Y(n) = e^{x(n)}$ ii) $Y(n) = x(n) + n\, x(n-2)$ **[4]**

                                                                              P.T.O.

Q3) a) How causality and stability is determined in terms of Z transform. **[6]**

b) Determine z transform and ROC of following : **[10]**

   i) $x(n) = 2^{n+2} u(n-1)$

   ii) $x(n) = n^2 u(n)$

OR

Q4) a) Obtain inverse z transform using residue method. **[8]**

$$X(z) = \frac{z(z^2 - 4z + 5)}{(z-3)(z-1)(z-2)}$$

b) State and prove initial and final value theorem and obtain the final value

of $x(z) = \frac{2.4\,z}{(z-0.5)(z+0.2)(z-1)}$ **[8]**

Q5) a) State and prove any four properties of DFT. **[8]**

b) Calculate DFT of $x(n) = \{1, 1, 0, 0\}$ check answer by calculating IDFT.**[8]**

OR

Q6) a) Explain radix-2 DIF FFT algorithm for computation of DFT when N = 8.**[8]**

b) Find linear convolution of following sequence and obtain same result using circular convolution. **[8]**

   $X1(n) = \{1, 2, 3, 4\}$ $X2(n) = \{1, 1, 1\}$

SECTION - II

Q7) a) For the given difference equation develop cascade form and parallel form realization. **[10]**

   $y(n) - (5/8)\,y(n-1) + (1/16)\,y(n-2) = x(n) + (3/4)\,x(n-1) + (1/8)\,x(n-2)$

b) Explain design of rectangular window method. **[6]**

OR

Q8) a) State advantages and disadvantages of digital filter over analog filter.**[6]**

b) The transfer function of analog notch filter is given below, design the digital IIR notch filter using BLT with notch frequency 60 Hz and sampling frequency 960 sps. **[10]**

$$H(s) = \frac{s^2 + 1}{s^2 + s + 1}$$

Q9) a) Explain Harward and modified Harward architecture of DSP and compare. **[8]**

b) Explain ADSP 2100 series architecture of DSP with the help of major blocks and function of respective blocks. **[8]**

OR

*Q10)*a) Compare DSP processor over microprocessor. **[8]**

b) For TMS 3200 c5x explain with neat block diagram its architecture. **[8]**

*Q11)*Write short note on : **[18]**

a) Induction motor control using DSP.

b) Harmonic analysis using DSP.

OR

*Q12)*Write short note on : **[18]**

a) Power factor correction using DSP.

b) Vibration Analysis using DSP.

■ ■ ■

P1577

[3964]-231

B.E. (Electronics)
MANAGEMENT INFORMATION SYSTEMS
(404210) (2003 Course) (Sem. - II) (Elective - I)

Time : 3 Hours]
[Max. Marks : 100

Instructions to the candidates :
  1) *Answer 3 questions from each section.*
  2) *Neat diagrams must be drawn wherever necessary.*
  3) *Figures to the right indicate full marks.*
  4) *All questions carry equal marks.*

SECTION - I

Q1) a) Define MIS as it is generally understood. What are its components? Why is it a pyramid structure made up of decreasing complexity information processing layers? **[8]**

 b) Consider following example.

"Preindustrial agriculture - open loop system that it represents - is nothing to be yearned for, and the greater inherent efficiencies of small farms are largely forced; lacking synthetic fertilizers, tractors, or chemical pesticides, farmers have no choice but to operate their farm as closed systems - keeping animals for traction and manure, spreading that "fertility" manually, and weeding and harvesting by hand - all of which are tremendously labor intensive and not terribly productive. However some of the ideas implicit in these past practices are highly relevant today, too, and, with the aid of modern, relevant education, research and prudent use of technology can and should be brought back into usage.

For example, the ancient practice of cover crops though partly sidelined by synthetic fertilizers, is by no means obsolete: alternating a cash crop with a crop such as alfalfa, whose roots work symbiotically with soil bacteria to pull nitrogen from the air and fix it in the dirt, can be just as replenishing as an application of synthetic urea. (Even ultra-industrial corn farmers use alternating crops of soybeans, a nitrogen-fixing legume.) As a side effect, by rotating a field through three or four different crops over successive years, farmers actually slow weeds and insects from establishing themselves, as they invariably do when farmers grow the same crop in the same field year after year, and rely instead on pesticides.

P.T.O.

The point of this <u>closed loop system,</u> which is "natural systems agriculture" - an <u>open system</u> that it represents - isn't simply to replace nasty synthetic inputs with kinder, gentler variants. Rather, the goal is to replace the underlying system that required the synthetic inputs with a system that does not - an open system modeled on nature's own methods for circulating energy and nutrients, interrupting the pest populations, and maintaining internal balance.

Under such model, livestock and crops are reintegrated: animals generate manure to fertilize crops to feed to livestock. Farmers choose crops not only for maximal yields but also for their capacity to encourage the complex but crucial nutrient cycle among plants, soil, and soil microorganisms.

In short, where agribusiness in traditional industrial plant model seeks to mimic the methods and structures of the factory, the environmentally responsive effective model mimics the patterns and relationships found in environment."

By critically analyzing above example, explain open and closed systems? Also explain open-loop system and closed-loop system? How do they differ? **[8]**

OR

Q2) a) Consider the following market development decision challenge that mobile business faces due to rise of convergence technology.
"BUYING a mobile phone was the wisest Rs. 940/- ($20) Ranvir Singh ever spent. Mr. Singh, a farmer in the north Indian state of Uttar Pradesh, used to make appointments in person, in advance, to deliver fresh buffalo milk to his 40-odd neighbors. Now his customers just call when they want some. Mr. Singh's income has risen by 25%, to Rs. 7,000/- ($149) a month. And he hears rumors of an even more bountiful technology. He has heard that "something on mobile phones" can tell him the current market price of his wheat. Mr. Singh does not know that that "something" is the internet, because, like most Indians, he has never seen or used it. But the phone in his calloused hand hints at how hundreds of millions of people in emerging markets-perhaps even billions-will one day log on.

Only 81m Indians (7% of the population) regularly use the internet. But brutal price wars mean that 507m own mobile phones. Calls cost as little as Rs. 0.30/- ($0.006) per minute. Indian operators such as Bharti Airtel and Reliance Communications sign up 20m new subscribers a

month. In a report called "The Internet's New Billion", Boston Consulting Group (BCG) predicts that by 2015 there will be such 1.2 billion internet users in BRICI countries-dwarfing the total in America and Japan.

These new internet users will mostly log on via their mobile phones. This tends to be cheaper and easier than any other option. In Brazil, fixed-line broadband is often prohibitively expensive; in Russia, where it can be much cheaper, it is often unavailable. In India, where infrastructure is always a headache, it is hard to get a good basic landline, let alone broadband. Further hordes of Indians will start using their mobiles to access the internet soon as third-generation (3G) services, which allow subscribers to access the web, arrive.

The stakes are high. In developing countries, every 10 percentage-point increase in mobile-phone penetration yields an extra 0.81 percentage points of annual economic growth, according to a 2009 World Bank study. The mobile internet could be even more powerful. The unemployed will search for jobs online. Farmers in remote areas will find customized advice on crop planting.

The drawback of the internet is that you have to be literate to use it. That is a huge problem in India, where the literacy rate is only 60% (in China and Russia, it is over 90%). Mr. Singh, the farmer, cannot read, so he cannot send text messages. He says he often needs help dialing numbers correctly, too. Other side of the coin is that this presents opportunities for new service businesses and with it for technology development."

With the help of Figure (1), critically analyze mobile business transformation due to rise of convergence technology. What does it mean for business information system design? **[8]**

b) What do you understand by the terms "business competitive advantage" and "Continuity Planning"? Analyze implications of convergence technology and emerging business model for information system design for business competitive advantage. **[8]**
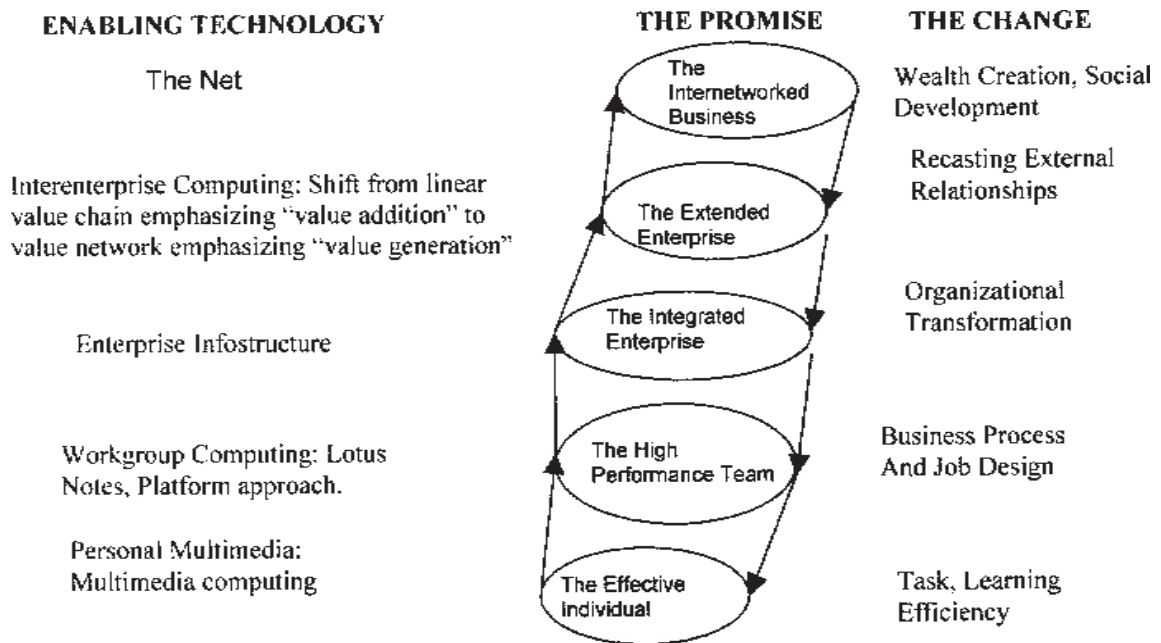
Fig. (1): Business Transformation through Convergence Technology

Q3) a) With the help of Figure (2), describe a generic business process as integral to a closed loop closed loop information and control system constituting a Business process IS view. **[8]**

b) Consider a following situation of teddy bear toys manufacturing company "Vermont Teddy Bear" missing out on a business opportunity to transform itself into a global bear ecosystem and capturing global market.

"A quaint little company in Vermont makes teddy bears. Its amusing chief executive, John Sortino, first sold his bears from a cart in the street. He admonished his employees, "Be a teddy bear person and don't let anyone who isn't." Nothing could be further from the high tech world. It seemed most unlikely that Sortino could make a dent in the giant toy companies.

Bur Sortino invented "Bear-Games." The public could dial an 800 number and on Mother's Day, or any other day, and send a greetings message that had a teddy bear packaged with it. Sales shot up thirtyfold and kept growing. A computerized information system was set up to market directly to the million or so people who have sent bear-grams, most of whom have never seen the bears. Analyzing the responses, the computer indicated that the mailed brochure should emphasize the Pregnancy Bear and the Bride and Groom Bears. The bears company people thought people would buy were quite different from what the computer showed customers wanted. Design and manufacturing changed

fundamentally because of the computerized analysis of bear-gram responses. The company went public and had a frenzied first day of trading. Now it is planning world-wide bear-grams.

The bear company went on to use the Internet. Many people as they explore the Net find a subject ''teddy bears,'' and many click on it. They find the opening Web page of the Vermont Teddy bear Company and text that tells them why big folks need teddy bears. Bear-grams, computerized follow-up, marketing on the Net, and electronic feedback about customer needs are all CT -enabled business thinking. They enabled the bear company to grow at breathtaking speed, astonishing to its founder John Sortino.

But the bear company also contained some anti CT -enabled business thinking. Sortino insisted that the company must manufacture bears in Vermont and production should not be diverted (outsourced) to developing countries. However bears can be manufactured in developing countries at a fraction of cost, with tight quality control. The design could be done with Sortino's sense of what bears ought to be, but the manufacturing done at lower cost elsewhere. Sortino's expenses in Vermont became too high to support revenue, and Sortino was removed by the board.

If the bear company had taken CT -enabled business thinking to its competitive advantage it would have had *worldwide* bear-grams adapted to *local* markets, computerized follow-up and marketing constantly adjusting to *local* customer demand, local design reflecting local stuffed-animal tastes, minimum cost manufacturing in cheap-labor countries with rigorous integrity control, and global computerized logistics of bear shipping and warehousing. The company might have evolved into a global bear ecosystem.''

i)   Explain how CT -enabled complex information system delivers competitive advantage for business? What is the information processing flaw here?

ii) Is there a loss of decision integrity in this case? Where and how?

iii) Is there loss of goal integrity? Explain.

iv) For competitiveness what was needed?   **[8]**

OR

Q4) a) i) With the help of Figure (3), describe a business process model, with a controls interpretation, as integral to a closed loop information and control system.

ii) Compare the business process model in Figure (3) with the systems view of business process in Figure (2). **[8]**

b) "Systems theorists and economists argue that the complexity of an organization is ultimately limited by the amount of information it (i.e., organization) can (economically) process and transfer. This holds for the open system as a whole, for part systems, and for components. The degree to which higher efficiency through increased specialization is feasible is governed by the means that are available to control the ensuing complexity, that is by the cost and efficiency of the available information flow systems."

Within above framework briefly discuss what are open and closed systems? How do they differ? What is it that open systems must control and to what purpose? To answer you may refer to Figures (2) and (3).**[8]**
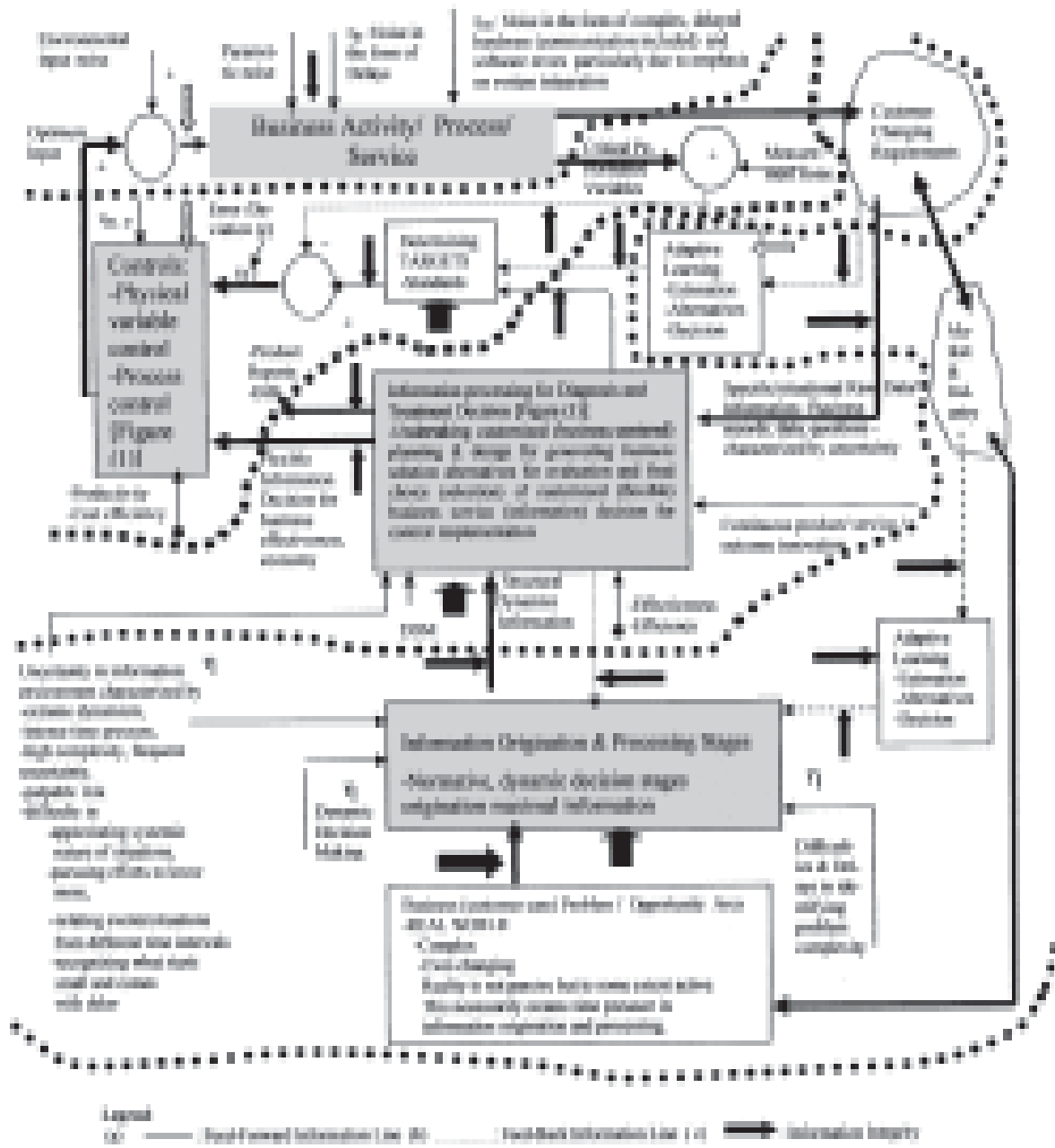
Figure (2) : A system view of a business process represented as a generic business process IS view and as integral part of a closed loop information and control system characterized by continuous information origination and processing in the presence of uncertainty and the emergent all encompassing view of Information Integrity for business competitive advantage.

Figure (1): Modelling a behaviour process, with a complete transportation of delegation chain, mapping interoperability and resource pooling

Q5) a) i) "The focus of a System Dynamics study is not a system, whatever it is, but a problem."

What is the significance of "System Dynamics" methodology in studying the complex system failures? Explain with the help of an example.

ii) Fill in the blanks by putting in appropriate word from the set of words given at the appropriate blank indicated by number.

A heating system produces heat to warm a room. A thermostat in the room, connected to the heating system, returns --------(1)------- about the room's temperature -----(2)------------ to the heating system, turning it on or off and thereby-----(3)----------- the room's temperature. A thermostat is a -------(4)--------- device. Together with the furnace, pumps, and radiators or vents, it forms a ------(5)--------.

Set of words to choose appropriate word to fill in the blank: {feedback; controlling; feedback system; back; information}   **[9]**

b) List and briefly describe seven stages - <u>from</u> problem identification and definition <u>to</u> model use for implementation - in approaching a problem in a system from the System Dynamics perspective.   **[9]**

OR

Q6) a) i) "In engineering design and control, there is a subject area of "systems engineering", which is concerned with planning and design of (large) systems to achieve proper balance, performance, and economy".

What is the difference in studying a system from the "systems engineering" angle and from "System Dynamics" angle? Explain with the help of an example of your choice.

ii) Define following System Dynamics variables:

a) Level variable,

b) Rate variable,

c) Parameters and input variable,

d) Supplementary variable,

e) Auxiliary variable.   **[9]**

b) System Dynamics models a system with the help of causal loop diagram. For a project . activity, Figure (4) represents a causal loop representation of the project progress measurement system conceptualization.
  i) Describe in your own words the project progress measurement system conceptualized in Figure (4).
  ii) Are there feedback loops in the system conceptualized in Figure (3)? Indicate the feedback loops. **[9]**
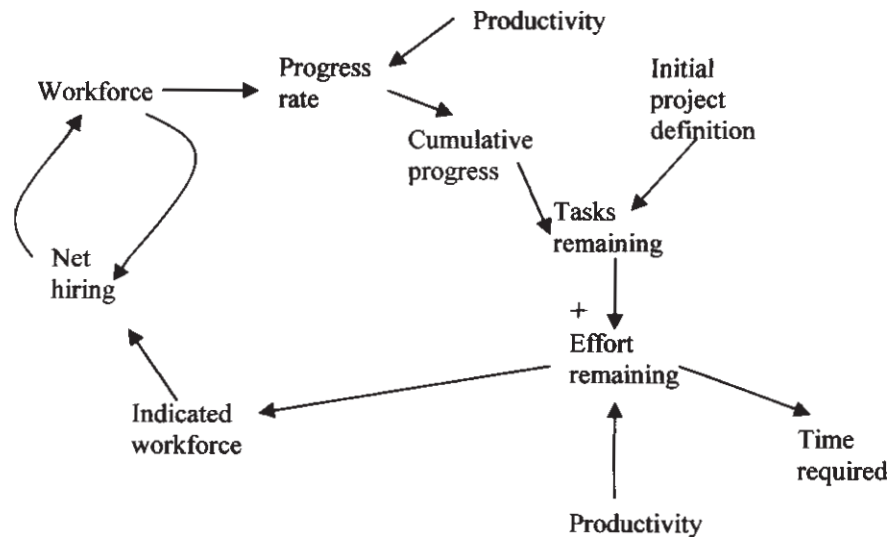
Figure (4): Conceptualization of a Progress Measurement system

Q7) a) "System Dynamics modeling uses causal-loop diagrams. The diagrams are referred as influence diagrams, or, more mathematically, as directed graphs. This is because the individual links (giving variable influence or graph direction) in such diagrams are labeled to show whether the nature of the causal-link is "positive" (+) or "negative" (–)".
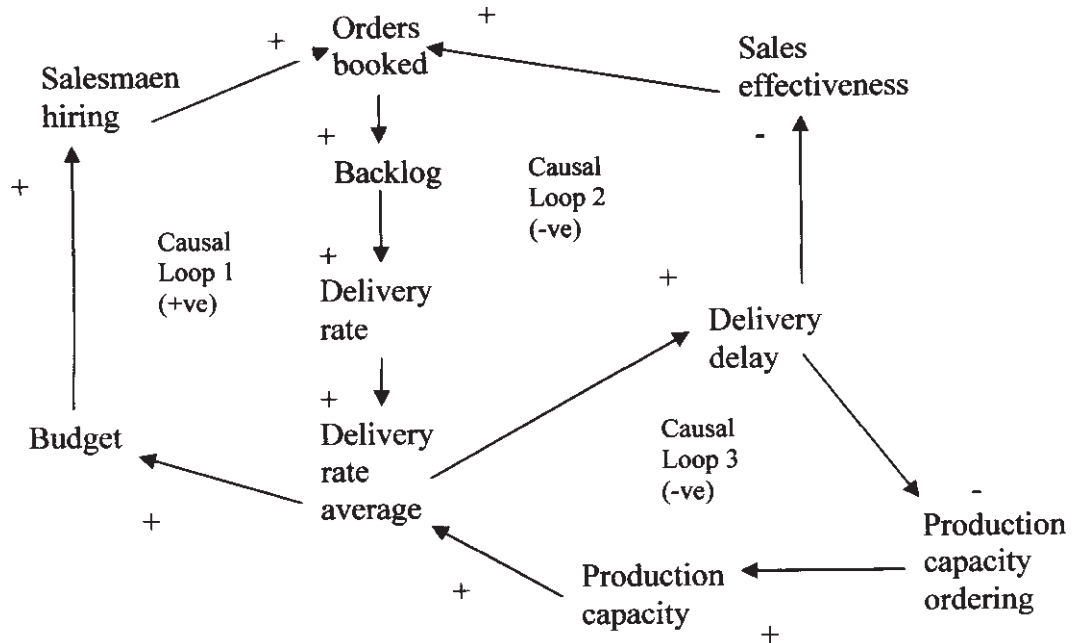
Figure (5): System Dynamics Modeling of a Business giving Causal Loop Structure for Sales Growth, Delivery Delay and Capacity Expansion

Describe in your own words the business Model in Figure (5). **[8]**

b) Analyze the business model in 7(A) at Figure (5) to show that the said business is experiencing stagnation in sales growth even when the market is unlimited. **[8]**

OR

Q8) A basic production sector can be seen as comprising four sub-sectors, namely, Sales sub-sector, Inventory sub-sector, Production sub-sector and Employment sub-sector.

Figures (6)-(9) represent causal-loop diagrams for the sub-sectors of a basic production sector.
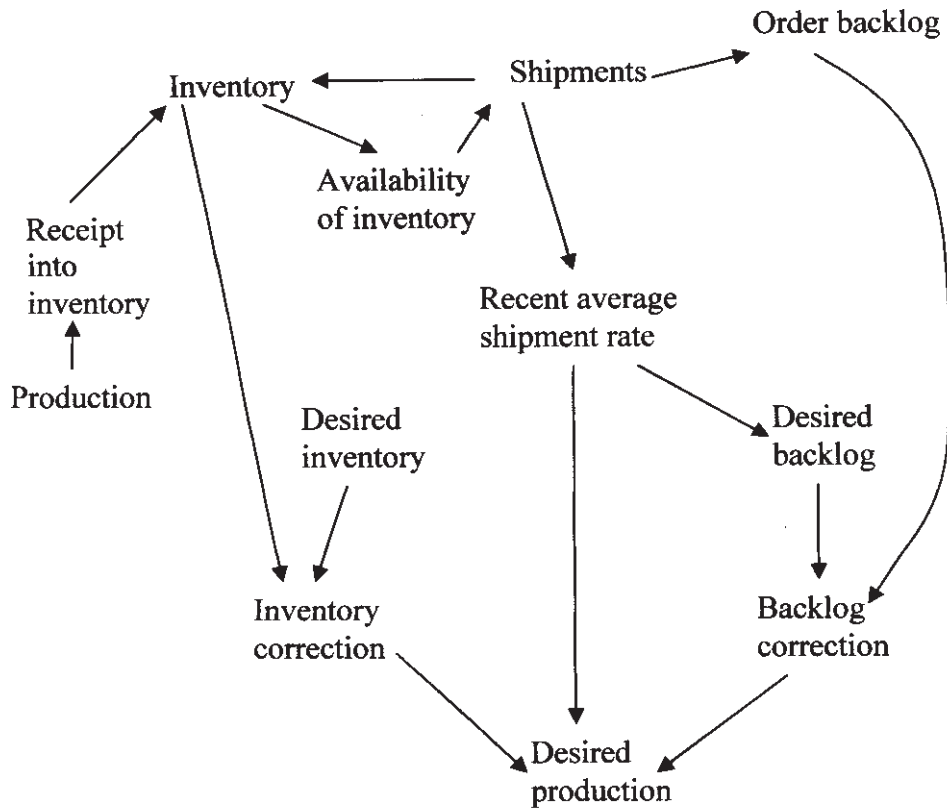
Figure (6): A Causal loop diagram of a sub-sector of a basic production sector

Receipt
into
inventory

↑

Production

Desired
production

Desired workforce

↓

Workforce → Hire/fire rate
(production capacity) (capacity order rate)

Workforce
(capacity on order)
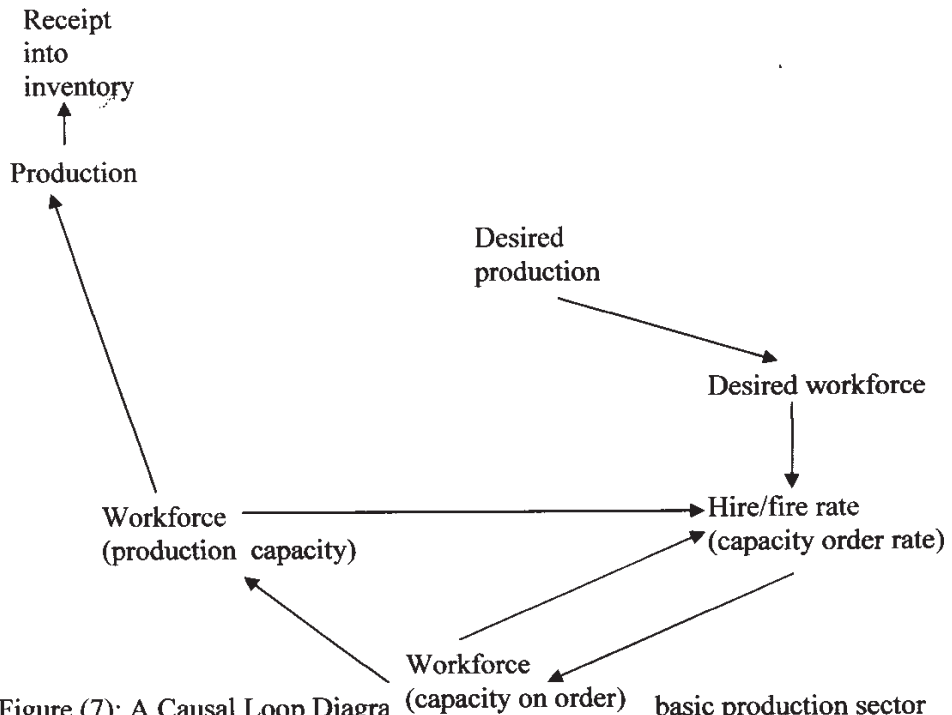
Figure (7): A Causal Loop Diagra (capacity on order) basic production sector

Production

Production

Desired
production

Overtime-
Undertime

Workforce
(production
capacity)
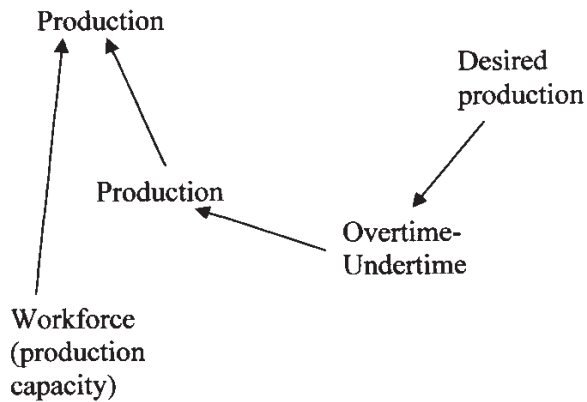
Figure (8): A Causal Loop Diagram of a Sub-sector of a basic Production sector

Delivery delay
perceived by market

Average
shipment rate

Market share

Inventory ← Shipments → Order backlog ← Orders

Desired
shipments

Market
demand

Figure (9): A Causal loop diagram of a sub-sector of a basic production sector

a)   Answer following:
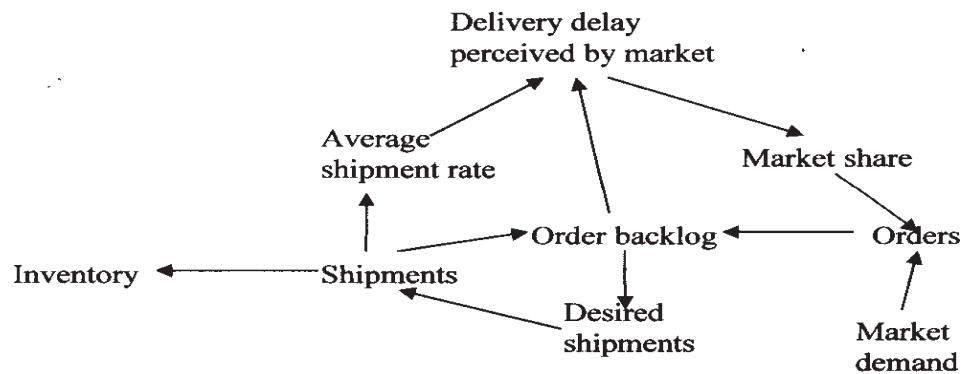
i)   Identify sub-sectors of a basic production sector for which Figure (6), Figure (7), Figure (8) and Figure (9) represent causal loop diagrams, respectively.

ii)   Develop an integrated causal-loop diagram model showing an overview of a basic production sector. **[8]**

b)   Identify feedback loops in the basic production sector and explain their nature. Do these feedback loops control the system problems? Explain.**[8]**

Q9) a)   For information envelope briefly describe following information origination processes and indicate uncertainties therein and their integrity implications:

i)   From long term design goal set to multiple criterion and many factors,

ii)   From multiple criterion and many factors to operable goal,

iii) From operable goal set to defining design opportunity and constraining spaces,

iv)   From design information structure to environmental information variables, **[8]**

b)   For information envelope briefly describe following information origination processes and indicate uncertainties therein and their integrity implications:

i)   From environmental information variables to their relationships leading to problem information structure model,

ii)   From Problem Information Structure Model to Problem Information Structure Model,

iii) From Problem Information Structure Dynamics Model to Flexible Information Decision,

iv)   From Flexible Design Information Decision to Product/System/ Service Delivery,

v)   From Product delivery to feedback and performance evaluation.**[8]**

OR

Q10) a) Briefly describe existing integrity mechanisms. What is there main limitation? **[8]**

b) "Existing practice is to verify data for its integrity. However, given the reality of ever changing environment, requirement for the improved decision-making is to view information as a composite good of interrelated attributes, namely, usefulness, usability and integrity."

What is "Usefulness-Usability-Integrity paradigm"? What is its main implication? **[8]**

Q11) a) i) Define attributes of Information Integrity.

ii) Equation (4.1) gives Cost benefit Analysis Equation of Information Integrity.

$$\Delta IU(I)\big|_{Si} = [\{[\,\alpha\,(I) \times \beta(I) \times IUUB(I)]\big|_{S_i}\} \times \{A(I)\big|_{S_i}\}] - [COST_{OI}(I)\big|_{Si} + COST_{ANALY}\{A(I)\}\big|_{Si} + COST_{OPPORT}\{A(I)\}\big|_{Si}]$$

.. ... Equation (1)

What is the significance of Equation (1) from a business to achieve competitive advantage? Discuss analytically. Give example. **[9]**

b) Figure (10) gives a systems view of a design basis for the "Information Integrity Technology Development System".

Answer any one of the following:

i) Briefly define any 15 terms from the Systems View in Figure (10).

ii) Explain the systems view in your own words. Give an illustration. **[9]**

OR
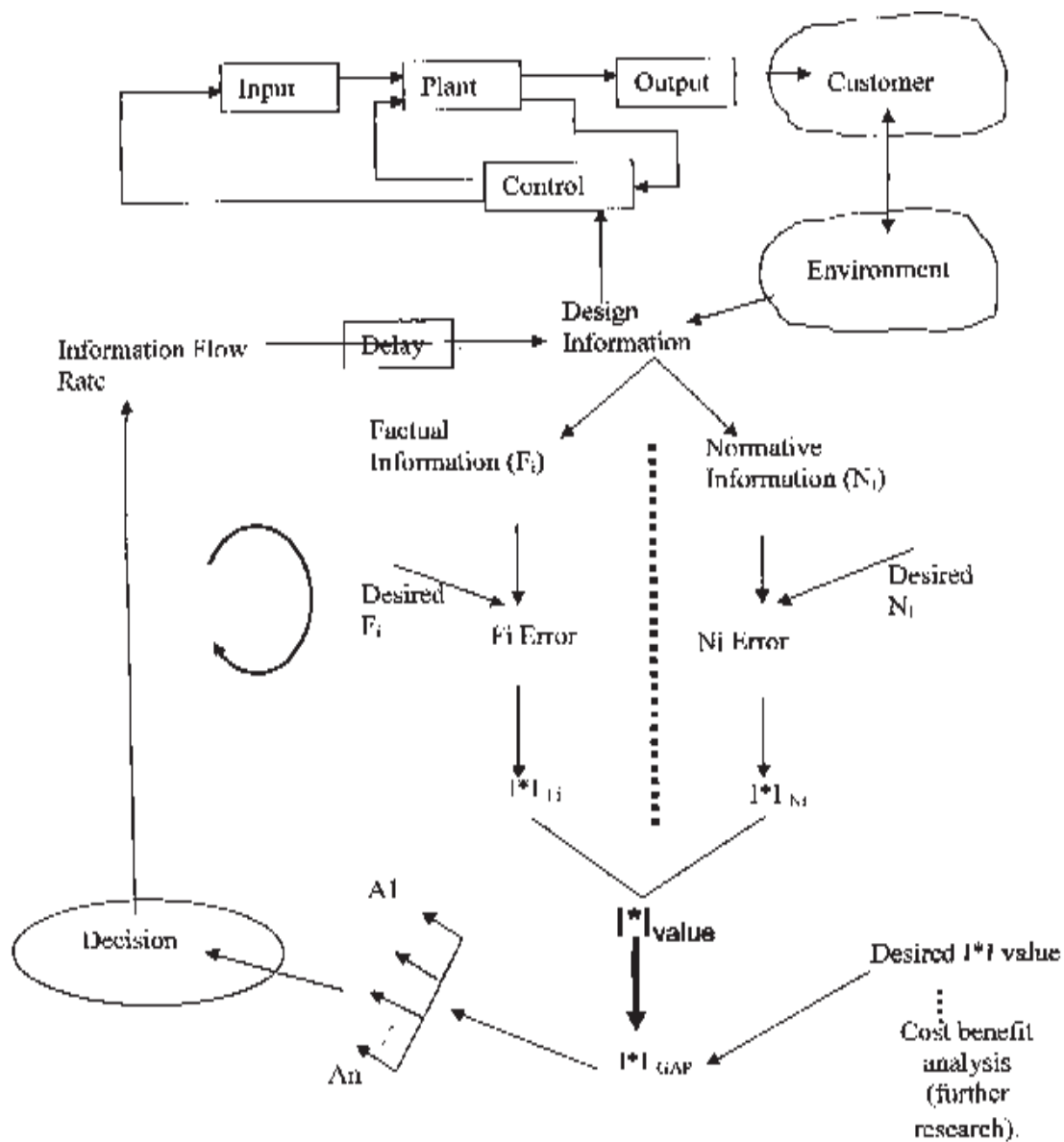
Figure (10): Systems view of a design basis for the "Information Integrity Technology Development System".

Q12) a) Write short notes on following:

      i) Acquisition Cycle under the I * I Technology Development System,

      ii) Utilization Cycle under the Information Integrity Development System,

      iii) Information Integrity Control through Information Integrity Technology. **[9]**

   b) Compare Traditional IS, Quality IS and Integrity IS with respect to any three of the following parameters:

      i) Parameter: Paradigm - *System Complexity* factor,

      ii) Parameter: Paradigm - *Economic* factor,

      iii) Parameter: Process factor of Design,

      iv) Parameter: Process factor of Manufacturing,

      v) Parameter: Techniques factor. **[9]**

❂✩❂✩

P1142   **[3964] - 272**

B.E. (Instrumentation And Control)
ADVANCED BIOMEDICAL INSTRUMENTATION
(Sem. - II) (406270) (1997 & 2003 Course) (Elective - II)

Time : 3 Hours]   [*Max. Marks : 100*

Instructions to the candidates:
  1)   *Answer three questions from Section - I and three questions from Secetion - II.*
  2)   *Answers to the two sections should be written in separate books.*
  3)   *Neat diagrams must be drawn wherever necessary.*
  4)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   With the help of neat diagram, explain the working of programmable pacemaker.   **[8]**

 b)   Mention the advantages and disadvantages of the same.   **[4]**

 c)   Write down the specifications of a typical pacemaker.   **[4]**

OR

Q2) a)   It is required to set up an ICU for 8 beds. Elaborate the implementation plans.   **[10]**

 b)   Discuss different types of defibrillators and explain any one of them with the help of neat diagram.   **[6]**

Q3) a)   Explain the need and working of an 'Autoanalyser'.   **[8]**

 b)   With the help of graph, explain the basic working principle of a pulse oximeter.   **[4]**

 c)   Explain the working of an In-Vivo type of oximeter with the help of a suitable diagram.   **[6]**

OR

Q4) a)   Describe with the help of neat waveform various modulation techniques for a typical Telemedicine System.   **[8]**

 b)   Explain the conductivity type blood cell counter for RBC and WBC measurement.   **[10]**

P.T.O.

Q5) a) Explain the principle of CT-scanning. How it overcomes the drawback of X-Ray imaging? **[8]**

b) What is the role of 'Hounsfield number' in image reconstruction? **[8]**

OR

Q6) a) Discuss X-ray properties and X-ray film used for imaging. **[8]**

b) List specifications of X-ray machine and explain their importance. **[8]**

SECTION - II

Q7) a) With the help of a suitable block diagram, explain the working of Gamma camera. **[8]**

b) Explain A scan, B scan and M-scan in ultrasound imaging. **[8]**

OR

Q8) a) Draw a diagram, explaining what is meant by spin-spin relaxation time and spin lattice relaxation time. What is the importance of it? **[8]**

b) Write a note on Positron Emission Tomography. **[8]**

Q9) a) What is nuclear medicine? Describe various types of detectors that are used to detect β and γ rays. **[8]**

b) What is an Endoscope? Explain its construction with the help of neat diagram. **[8]**

OR

Q10) a) Explain laser application in diabetic retinopathy and glaucoma. **[8]**

b) Explain in brief various types of dialysers used for Hemodialysis. **[8]**

Q11) a) Describe various Orthotic and Prosthetic devices. **[8]**

b) Explain different types of wheelchair and joysticks. Specify their materials and properties. **[10]**

OR

Q12) a) What is kidney stone? Explain lithotripsy based on acoustic shock wave with plasma explosion. **[8]**

b) Explain Instrumentation in Hemodialysis. **[10]**

■ ■ ■

P1143   **[3964] - 273**

B.E. (Instrumentation & Control)
POWER PLANT INSTRUMENTATION
(2003 Course) (406270) (Elective - II) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

  1) *Answer three questions from Section - I and three questions from Secetion - II.*

  2) *Answers to the two sections should be written in separate books.*

  3) *Neat diagrams must be drawn wherever necessary.*

  4) *Figures to the right indicate full marks.*

  5) *Assume suitable data, if necessary.*

SECTION - I

Q1) What are various ways of generation of Electricity? Explain in brief.   **[16]**

OR

What is a grid? Explain the concept of Regional & National grid in detail.**[16]**

Q2) a) A steam power station of 100 MW capacity uses coal of calorific value of 6400 kcal/kg. The thermal efficiency of the station is 30% and electrical generation efficiency is 92%. Determine the coal required per hour when plant is running at full load.   **[8]**

  b) What are different types of systems & components which are used in thermal power plant?   **[8]**

OR

  a) What is coal preparation? What are the advantages of coal preparation.**[8]**

  b) Explain open cycle gas turbine power plant neat sketch. Also state its advantages & disadvantages.   **[8]**

Q3) a) What is differential expansion in turbine blades? How it controlled? Explain with neat schematic.   **[9]**

  b) Explain coal handling process with neat Instrumentation?   **[9]**

OR

Draw & explain condenser and feed tank level control system in a power plant.   **[18]**

SECTION - II

Q4) a) What are the different advantages and disadvantages of hydroelectric power plants? **[8]**

b) Draw and explain different types of surge tanks with necessary instrumentation. For level measurement. What are the functions of surge tanks? **[10]**

OR

a) How energy can be released from Nuclear Power Plant? What are various types of Nuclear reactions? Explain. **[10]**

b) Explain following w.r.t. Nuclear Power Plant : **[8]**

   i) Moderator.   ii) Reflector.

   iii) Coolants.   iv) Control Rods.

Q5) a) How efficiency of a Power Plant can be measured? What are various methods to improve the efficiency of the power plant? **[6]**

b) Why it is essential to measure the dissolved oxygen in feed water of a Power plant? Explain the same with neat schematic. **[10]**

OR

Write Notes on (Any Two) : **[16]**

a) Energy Audit.

b) Automation of Conservation.

c) Boiler Regulations.

Q6) a) What is Geothermal energy? What are various forms for geothermal energy? Explain in brief the classification of the same. **[10]**

b) What is a Tidal Power? What are factors affecting the suitability of tidal power plant. **[6]**

OR

a) Write advantages & disadvantages of wind power plant. **[8]**

b) Explain Power generation with Hydrogen cell. **[8]**

■ ■ ■

P1144   **[3964] - 274**

B.E. (Instrumentation & Control)
FIBER OPTIC INSTRUMENTATION
(Sem. - II) (2003 Course) (Elective - II) (406270)

Time : 3 Hours]   [*Max. Marks : 100*

Instructions to the candidates:

 1) *Answer Three questions from Section - I and Section - II.*
 2) *Answers to the two sections should be written in separate books.*
 3) *Neat diagrams must be drawn wherever necessary.*
 4) *Figures to the right indicate full marks.*
 5) *Use of electronic pocket calculator is allowed.*
 6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Discuss the advantages of optical fiber system.   **[8]**

     b) Compare Multimode step index fiber and Single-mode step index fiber. **[9]**

                              OR

Q2) a) A silica optical fiber with a core diameter enough to be considered by
         ray theory analysis has a core refractive index of 1.50 and a cladding
         refractive index 1.47. Determine the critical angle at the corecladding
         interface, numerical aperture for the fiber and the acceptance angle in air
         for the fiber.   **[9]**

     b) Describe with the aid of suitable diagrams, the concepts of Evanescent
         field in optical fiber transmission.   **[8]**

Q3) a) Describe various attenuation mechanisms in optical fiber transmission in
         detail.   **[8]**

     b) Explain what is meant by fiber bend loss.   **[9]**

                              OR

Q4) Write short notes on :

     a) Pulse broadening in optical fiber.   **[8]**

     b) OTDR in distributed optical fiber sensing.   **[9]**

Q5) a) Explain the various types of fiber misalignments, which may contribute to insertion loss at an optical fiber joint? **[8]**

b) Describe the principles of operation of the injection laser. **[8]**

<div align="center">OR</div>

Q6) a) Compare p-n photodiode with the p-i-n photodiode. **[8]**

b) What are the advantages and drawbacks of the LED in comparison with the injection laser for use as a source in optical fiber sensing. **[8]**

<div align="center">

SECTION - II
</div>

Q7) a) Write a short note on 'Encoding-based Position Sensors'. **[8]**

b) Describe the characteristics, advantages and drawbacks of Optical Fiber Sensors. **[8]**

<div align="center">OR</div>

Q8) a) Describe one technique of sensing which is based on intensity modulation. Also enlist various parameters, which can be sensed by using this technique. **[8]**

b) Write short note on intrinsic and extrinsic Optical Fiber Sensors. **[8]**

Q9) a) Discuss 'Manufacturing of Fiber Grating'. **[9]**

b) Explain any one application of Fiber Bragg Grating as optical fiber sensor.**[9]**

<div align="center">OR</div>

Q10) a) List the advantages and disadvantages of Distributed Optical Fiber Sensing? Explain Distributed Optical Fiber temperature Sensing. **[10]**

b) What are the performance parameters which characterize any Distributed Optical Fiber Sensing? **[8]**

Q11) a) Give major reasons which have led to the development of optical amplifiers, outlining the attributes and application areas for these devices. **[8]**

b) Explain with the aid of suitable diagrams, Beam splitter and Directional coupler. **[8]**

<div align="center">OR</div>

Q12) Write short notes on :

a) Optical fiber amplifier. **[8]**

b) Integrated Optics. **[8]**

<div align="center">■ ■ ■</div>

P1145   **[3964] - 275**

B.E. (Instrumentation & Control)

PROCESS MODELING & OPTIMIZATION

(1997 and 2003 Course) (406270) (Elective - II) (Sem.- II)

Time : 3 Hours]   [*Max. Marks : 100*

Instructions to the candidates:

   1) *Answer Three questions from Section - I and Three questions from Section - II.*

   2) *Neat diagrams must be drawn wherever necessary.*

   3) *Figures to the right indicate full marks.*

   4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

   5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain in detail the role of mathematical modeling in process industries.

   b) What are the principals of the formulation in modeling? Explain each in short.

                                                                            [18]
                                        OR

Obtain differential model of the CSTH system shown in Fig. 1. Also obtain the linearized state model.

Fig 1
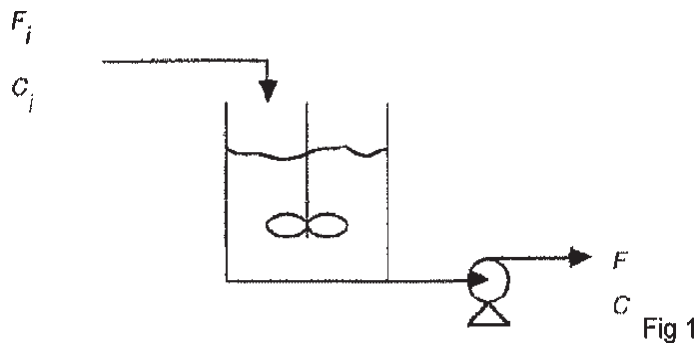
Q2) Obtain the steps involved in modeling of ideal binary distillation column and obtain the model of ideal binary distillation column. **[16]**

OR

Explain various methods of system identification.

Q3) Obtain the model of non isothermal C. S. T. R. **[16]**

OR

Write short note on :

a) Newton-Rapson method.

b) Runga-Kutta method.

SECTION - II

Q4) Explain Niederlinski index for analysis of stability. **[18]**
Consider a system

$$G(s) = \begin{pmatrix} \dfrac{22.89}{4.572s+1} e^{-0.2s} & \dfrac{-11.64}{1.807s+1} e^{-0.4s} \\ \dfrac{4.689}{2.174s+1} e^{-0.2s} & \dfrac{5.8}{1.801s+1} e^{-0.4s} \end{pmatrix}$$

Find RGA and NI.

OR

Write short notes on :

a) Decoupling and Interaction.

b) Process modeling and its use for control system design.

Q5) Explain the following : **[16]**

a) Concave, convex functions and continuity of a function.

b) Gradient of a function and Hessian matrix.

OR

Explain in details the steps used to solve a minimization problem (with reference to any suitable method of minimization), and

Find the minimum value of

$$W = 3x_1 + 2x_2$$

subject to the constraints

$$\left.\begin{array}{r}2x_1 + x_2 \geq 6 \\ x_1 + x_2 \geq 4\end{array}\right\}$$

where $x_1 \geq 0$ and $x_2 \geq 0$.

Q6) Explain Newton, Quasi-Newton and secant methods for single variable optimization. **[16]**

<div align="center">OR</div>

Write short note on :

a) Scanning and bracketing for optimization.

b) Newtons method for optimization of multivariable functions.

<div align="center">□□□</div>

P1146   **[3964] - 276**

B.E. (Instrumentation and Control)
BUILDING AUTOMATION - II
(Sem. - II) (2003 Course) (Elective - II) (406270)

Time : 3 Hours]   [*Max. Marks : 100*

Instructions to the candidates:

1) *Answers to the two sections should be written in separate books.*

2) *Neat diagrams must be drawn wherever necessary.*

3) *Figures to the right indicate full marks.*

4) *Assume suitable data, if necessary.*

5) *All questions are Compulsory.*

SECTION - I

Q1) a)   Explain Psychrometric chart with neat sketch show all the specification.**[8]**

b)   Explain followings terms :   **[8]**

   i)   Sensible Heating.

   ii)   Sensible Cooling.

   iii)   Specific Heat.

   iv)   Latent heat.

OR

Q2) a)   Explain Human comfort zone. List different factors affecting to Human comfort, Explain any four factors in details.   **[12]**

b)   Explain Absolute humidity & Relative Humidity.   **[4]**

Q3) a)   Explain Vapor Compression Cycle with respect to each device involved in it.   **[10]**

b)   Explain Air Handler Unit with their types, Components, Filters used.**[8]**

OR

P.T.O.

Q4) a) Explain Steam System with following points : **[10]**

      i) Steam Pressure.

      ii) System Piping.

      iii) Steam Traps.

   b) What are the sections of Central FAN System? Sketch the symbols used in air conditioning system. **[8]**

Q5) a) Explain terms : **[10]**

      i) Optimum start

      ii) Night Cycle

      iii) Night purge

      iv) Load reset

      v) Power demand.

   b) List out different input & output field components. Compare different temperature sensors used in DDC system with their advantage and disadvantage. **[6]**

<div align="center">OR</div>

Q6) a) What are building management functions in DDC, Explain the steps in DDC control design process. **[10]**

   b) Explain two position control and Floating control. **[6]**

<div align="center">

SECTION - II

</div>

Q7) a) What is purpose of MCC. Explain momentary start-stop circuit of MCC.**[8]**

   b) Explain LON Bus protocol. **[10]**

<div align="center">OR</div>

Q8) a) Explain BAC net Protocol with following points : **[12]**

      i) Objective

      ii) Elements

      iii) System operation

      iv) Safety and security

      v) Services

      vi) Networking

   b) Explain Modbus protocol. **[6]**

Q9) a) Draw : **[8]**

   i) Regulatory control Symbols.

   ii) Analog and Digital Input/Output Symbols.

   b) What do you mean Green Building; explain the goals of Green Building.
   [8]

<p style="text-align:center">OR</p>

*Q10)*a) Explain IBMS system with following points : **[10]**

   i) Objective

   ii) Heart of system

   iii) Features.

   b) What do you mean energy management? Explain types of Energy Measurement Devices. **[6]**

*Q11)*a) Explain different features of IBMS & List benefits of IBMS. **[8]**

   b) Explain BMS Verticals. **[8]**

<p style="text-align:center">OR</p>

*Q12)*a) Describe the IBMS architecture. **[10]**

   b) Explain the role of Energy management in security & HVAC Systems.**[6]**

<p style="text-align:center">■ ■ ■</p>

P1332 **[3964] - 313**

B.E. Chemical

CHEMICAL PLANT ENGINEERING

(2003 Course)

Time : 3 Hours] [*Max. Marks : 100*

Instructions to the candidates:

1) Answer Three questions from Section - I and Three questions from Section - II.

2) Answer to the two sections should be written in separate books.

3) Neat diagrams must be drawn wherever necessary.

4) Black figures to the right indicate full marks.

5) Use of logarithmic tables slide rule. Mollier charts, electronic pocket calculator and steam tables is allowed.

6) Assume suitable data, if necessary.

SECTION - I

Q1) a) Discuss in details various design considerations in plant design with process design aspects. **[12]**

b) Explain scale-up in design of a plant. **[4]**

c) What is energy security. Why it is important. **[6]**

OR

Q2) a) With neat sketch, explain P&ID of a distillation column with a condenser, a reboiler, and a side stripper. **[10]**

b) Describe the role of pilot plant data in process design. **[6]**

Q3) a) Prepare a plant layout for a process which involves process equipment such as a stream mixer, a reactor, a cooler, an absorber, a crystalizer, a filter and three pumps. What are the factors to be considered for layout prepaation of this process? Suggest proper site. **[12]**

b) Explain the role of a plant designer in deciding aspects of Health, safety and Environment. **[6]**

OR

Q4) a) Design a detailed specification sheet for a bubble cap distillation column. **[8]**

b) Write in details on basic engineering of a process with reference to thermodynamic and kinetic feasibility. **[8]**

Q5) a) Describe the purpose of primary, secondary, and tertiary methods of waste water treatment. **[10]**

b) Draw a neat diagram for compressed air system with explanation. **[6]**

OR

Q6) a) Explain with neat skethf a bioological waste water treatment plant **[10]**

b) Write the capacity estimation and economic factors for chilling system.**[6]**

SECTION - II

Q7) a) Explain the colour codes with colour bands in pipelines. **[8]**

b) With neat sketch, discuss the piping system design network for cooling water distribution. **[8]**

OR

Q8) a) Carbon dioxide is to be conveyed from the top of the stripper of ammonia plant to urea plant. Calculate the pipe size required based on following given things : **[12]**

Flow rate of CO_2 = 1000 t/day

Total length of pipe = 800 m

Available pressure at inlet of pipe = 24 kPag

Discharge pressure of CO_2 from pipe required = atmospheric

No. of 90° elbows in pipeline = 8   K for elbow = 0.75

No. of butterfly volve = 1   K for butterfly valve = 0.24

`   Temperature of gas = 60°C

Viscosity of CO_2 gas = 0.016 cP.

Q9) a) Toluene at 37.8°C is pumped through a system at a rate of 9.09 m³/h. The tank is at atmopheric pressure. Pressure at the end of the discharge line is 345 kPag. The dicharge head is 3.05m and the suction lift is 1.22m above the level of liquid in the tank. The friction loss in suction line is 3.45 kPa and that in the dischageg line is 37.9 kPa. The mechanical efficiency of the pump is 0.63. The density of toluene is 866 kg/m³ and its vapor pressure at 37.8°C is 25 kPa. Calculate:

i) $NPSH_A$ and

ii) Power required by the centrifugal pump. **[12]**

b) What is NPSH? Write formulae for two types of NPSH. **[4]**

OR

Q10) a) Explain different types of pumps with their advantages and limitations. **[8]**

b) A centrifugal pump draws benzene from an overbead tank. Operating pressure in the tank is 700 torr vacuum. Vertical distance between the free surface of liquid in the tank and the centreline of the pump is 12m. Maximum operating temperature is 50°C. Vapor pressure of benzene at 50°C is 280 torr. Density of benzene at 50°C is 870 kg/m³. Frictional 1035 in suction line of the pump is 1m of benzene column. Calculate $NPSH_A$ of the centrifugal pump. **[8]**

Q11) a) Determine the critical path for the network shown below. **[10]**
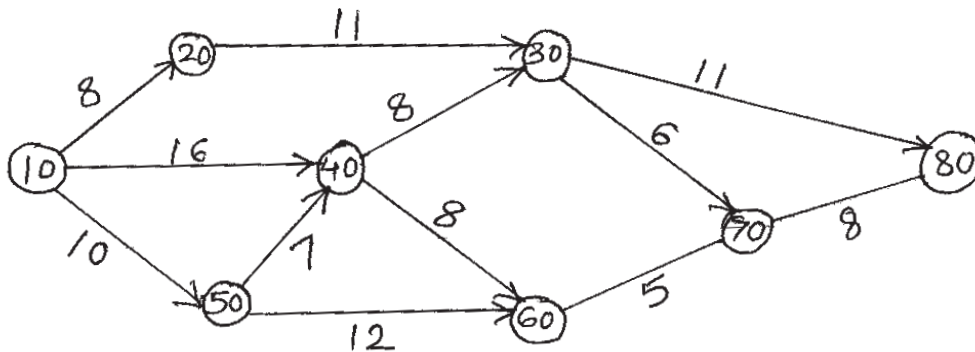
b) Distinguish between CPM and PERT. **[8]**

OR

Q12) a) Explain the procedure for calculating the standard time and expected time for activitees using PERT along with terminologies. **[10]**

b) Write in details on importance of HAZOP study in project scheduling process, focusing on industrial safety. **[8]**

□□□

B.E. (Petroleum)

OIL WELL DRILLING

(2003 Course) (412390) (Sem. - II)

Time : 3 Hours]   [*Max. Marks : 100*

Instructions to the candidates:

1) *Question Nos. 4 and 8 are compulsory. Out of the remaining attempt 2 questions from Section - I and 2 questions from Section - II.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of logarithmic tables slide rule. Mollier charts, electronic pocket calculator and steam tables is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What is well planning? Discuss importance and different parameters considered while making GTO (Geo Technical Order). **[8]**

b) Find out minimum drilling cost for the following case study. **[8]**

Data : Rig cost = $ 50,000/ day

Bit cost = $ 40,000/-

Trip time = 6.5 hr.

CASE STUDY	Bit weight lb	Rotory speed (rpm)	Drilled footage (ft)	Rotating (hrs)
Case I	75000	127	149	5.06
Case II	65000	92	192	8.65
Case III	65000	65	218	12.28

Q2) a) Make (pendulum assembly) BHA design using following data. 26" Bit (IADC 1–1–5)

 1 × 26" Integral blade type stabilizer 3 × 9 – ½ Drill-collar, 9 – ½" Bit sub, 2 × cross over 5 × 8" drill - collar, 1 × 7 – ¾" OD drilling Jar, 18 × 5"OD HWDP

Discuss the use of pendulum assembly and bit side force in brief.   **[8]**

P.T.O.

b) A drill string consist of 600 ft, 8" drill-collar & rest is 5" drill pipe 19.5 PPF. If required Mop is 100,000 lbs and Mud weight is 10 ppg calculate maximum depth of well that can be drilled using new drill pipe p_t =501,090 lb, steel density 489.5 pcF. B.F. = 0.847. **[8]**

Q3) a) Explain geometrical planning of type I directional well and find measure depth of a well. **[10]**

slot co - ordinate 15.32 ft N, 5.06 ft E

Target co-ordinate   1650 ft N, 4510 ft E

TVD target = 9800 ft

TVD rop = 1400 ft

Build uprate =1.5 deg. per 100 ft.

b) Discuss any survey method in detail to calculate true vertical depth, north increment and east increment. **[6]**

Q4) a) What is hydraulics? Discuss different pressure losses and hedstrom number? Effect of ECD on bottom hole pressure. **[6]**

b) Write short note on : **[12]**
   (i) Ton mile calculations.
   (ii) MWD Tool.
   (iii) Multilateral wells.

SECTION - II

Q5) a) Calculate number of Cement sacks required for Lead slurry and tail slurry. Using following data for 13-3/8" Casing cementation well depth = 915 M, shoe depth = 910 M, float collar depth = 886 m, cement top = 77m, previous casing (20" inch) shoe depth = 309 m,

Hole diameter 19.124" from 0 to 309 m

Hole diameter 17.5" from 309m to 915m.

Casing O.D = 13 – 3/8" and ID = 12.515 consider 50% excess on lead slurry and 30% excess on tail slurry. Lead slurry cement yield = 2.0630 ft^3 / sack slurry density = 12.7 ppg, Tail slurry density = 15.8 ppg, Cement yield = 1.1670 ft^3/ sack. **[10]**

b) Discuss use of the following : **[6]**
   (i) Top plug.
   (ii) Float collar.

Q6) a)   Well containing 13-3/8" casing shoe at 2480M, Mud weight 1.28 gm/cc, collapse pressure at 2480M = 317 kg/cm², Burst pressure at surface = 374 kg /cm². Use following casing grade P 110, 72 PPF **[10]**

Collapse resistance = 357 kg /cm²

Internal yield pressure = 520 kg /cm²

Pipe body yield strength = 989 Dan check casing grade with respect to collapse burst & tension.

   b)   Write casing seat / shoe depth selection procedure in detail.   **[6]**

Q7) a)   Discuss different types of jack up ratio. Offshore rigs and drilling operations in brief.   **[6]**

   b)   In a 3000 psi Bop control unit how many ten gallons capacity accumulator bottles with 1000 psi precharge pressure are required when 96.6 gallons of operating fluid is needed including safety factor for all the functions of Bop stack which has 10,000 psi rated working pressure ram preventor with a closing ratio of 7:1.   **[5]**

   c)   Discuss Blow out preventor accumulator system in detail.   **[5]**

Q8) a)   Explain wait & weight method of well control in detail.

   b)   Prepare a kill sheet using following data.

Hole size = 12.25 inches Measured depth = 8762 ft.

True vertical depth = 8462 feet, Mud weight = 11.6 ppg

Drill string volume = 150.81 bbls casing shoe data.

Casing size = $13 - \frac{3}{8}$ inch measured depth = 4734 ft True vertical depth = 4424 ft.

Annulus drill string × Open hole volume   = 469.37 bbls

Annulus drill string × casing volume = 605.47 bbls

Mud pump displacement = 0.119 bbl/ strokes slow circulating rate = 360 psi at 30 SPM, The well has been shut in after a kick kick data.

SIDP = 590 psi SICP = 660 psi p.i gain = 12 bbl.

The well will be killed using the wait and weight method at 30 spm.

Answer the following :

   i)   What is the kill mud weight required to balance the formation?

   ii)   How many strokes are required to pump kill mud from surface to bit?

iii) How many strokes are required to pump from bit to casing shoe?

iv) What is total annular volume?

v) What is initial circulating pressure?

vi) What is final circulating pressure?

vii) What is the drill pipe pressure reduction per 100 strokes as kill mud is being pumped to the bit?

viii) How long will it take to circulate kill mud around the well at 30 SPM?

ix) Which pressure kept constant to bring the pump to slow circulation rate? Give the value. **[18]**

■ ■ ■

P1336   **[3964] - 350**

B.E. (Polymer Engg.)
POLYMER PROCESSING OPERATIONS - II
(409369) (2003 Course) (Sem. - II)

Time : 3 Hours]   [*Max. Marks : 100*

Instructions to the candidates:

1) *Attempt Q.No. 1 or 2, Q. No. 3 or 4 and Q. No. 5 or 6 from Section - I.*
   Attempt Q. No. 7 or 8, Q. No. 9 or 10 and Q. No. 11 or 12 from Section - II.
2) *Figures to the right indicate full marks.*
3) *Use of pocket calculator, log paper, log-log graph paper is allowed.*
4) *Answers to the two sections should be written in separate answer books.*
5) *Assume suitable design data, if required.*

SECTION - I

Q1) a) Explain in short the features of 'Rock and Roll type rotational moulding machines'.   **[4]**

   b) Explain with neat sketch 'Moulded in inserts' with reference to rotational moulding.   **[4]**

   c) Explain in short effect of particle size and particle shape on processing of products by rotational moulding.   **[4]**

   d) Discuss the effect of following processing parameters on rotational moulding of liquid polymers.   **[4]**
       (i)   Rotation speed.
       (ii) Shot size.

   e) Give any two advantages of rotational moulding of liquid polymers. **[2]**

Q2) a) Explain solid, hollow and kiss off or tack off type stiffening ribs used in rotational moulding. With neat sketch suggest recommended proportions for any one type.   **[5]**

   b) Give merits, features and cycle time chart for Independent arm type rotational moulding machine.   **[5]**

                                                                    P.T.O.

c) Draw a typical internal mould air temperature profile during rotational moulding and show clearly the point at which plastic sticks to mould and the point at which plastic starts to pull away from mould wall. **[5]**

d) How pressure can be used as blowing agent in rotational moulding? **[3]**

Q3) a) Write in short about types of bearing used in calendering and their effect on product quality. **[4]**

b) Explain how matt surface finish is imparted to calendered sheet. **[4]**

c) With neat sketches, show clearly movable and fixed roll positions in z- type and three roll super imposed calender. **[4]**

d) With neat sketch, explain the use of hydraulic pull backs in case of calendering. **[4]**

Q4) a) Explain at least two faults or processing difficulties in case of calendering and give remedies. **[4]**

b) Explain different factors which determine the sheet path. **[6]**

c) A calender roll diameter is 0.4 meter and produces 3 mm thick plastic sheet. The sheet velocity is 0.1 m/sec. Find maximum pressure, Pmax, for a nip gap of 2.5 mm. Find also the point of maximum pressure. Take polymer viscosity as 1.5×10^3 Nsec/m^2. **[6]**

Q5) Write short notes on (Any four) : **[16]**
  a) Rainbow effect.
  b) Polymer casting.
  c) Texturising.
  d) Embossing.
  e) Slush moulding.

Q6) a) List advantages of flexographic printing. **[4]**

b) Describe the equipment and process of hot stamping. **[6]**

c) Write in short about surface treatment prior to printing or painting on plastics. **[6]**

SECTION - II

Q7) a) With neat sketches, briefly comment on various modes of quenching (cooling) used in melt spinning operation. **[6]**

b) Explain the importance of extensional flow in thread line of fiber spinning . **[6]**

c) What are the different types of solution spinning techniques? Comment on difference in working principle for these types. **[6]**

Q8) a) Write a short note on : **[4]**

'Non-woven fibers'.

b) Discuss process variables in melt spinning technique. **[5]**

c) Enlist different types of flow instabilities in fiber spinning operation. **[3]**

d) Write a note on the technique used for spinning polypropylene fibers. **[6]**

Q9) a) Write down description of the process and material considerations for ultrasonic welding. **[8]**

b) Write in short about energy director in ultrasonic welding of plastic ports. **[4]**

c) With respect to self threading screws, explain following terms : **[4]**
(i) Pilot hole.
(ii) Screw depth utilisation.

Q10) a) Explain the role of snap joints in joining two plastic parts. **[7]**

b) Write notes on :
(i) Hot plate welding.
(ii) Drilling of plastics.
(iii) Joining of plastics. **[9]**

Q11) a) Explain in brief density, solubility and burning behaviour tests used for plastic identification required during recycling. **[8]**

b) Write a short note on sources of scrap plastics other than MSW (Muncipal Solid Wastes). **[8]**

Q12) a) Write a short note on PET recycling by wet process. **[6]**

b) Explain the alcoholysis process used for polyurathene recycling. **[6]**

c) Write in short about four 'R' s used in plastic waste management. **[4]**

■ ■ ■

P1050

[3964]-101

B.E. (Civil)

HYDROLOGY & IRRIGATION

(2003 Course) (Sem. - I) (401001)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:
1) *Answer any 3 questions from each section.*
2) *Answer to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Define precipitation. State any six forms of precipitation. Also, explain 3 types of precipitation. **[8]**

b) In a catchment area of 100 Km^2, the average annual precipitation observed at five raingauge stations was **[8]**

Station	A	B	C	D	E
Ann.Av. Ppt(mm)	750	1000	900	650	500

If permissible error is 10%, determine

i) Number of additional raingauge stations required.

ii) Raingauge density.

OR

Q2) a) State any three types of raingauges. Explain any one of them in detail with a neat sketch. **[8]**

b) The hourly precipitation data during a storm is as follows: **[8]**

Time (Hrs)	0	1	2	3	4	5	6	7	8	9	10
Precipitation (mm)	0	10	30	25	50	5	10	10	25	20	0

Plot i)   Hyetograph   ii)   Mass curve
for above data.

Q3) a) Differentiate between Evaporation and evapotranspiration. State any five factors affecting evaporation. State Dalton's equation. **[8]**

b) Define surface runoff. State any four factors affecting surface runoff.

The annual yield in Mm^3 from a catchment for last six years is 200, 350, 600, 400, 150 & 100.

Determine **[8]**

i) 50% dependable yield.

ii) % dependibility for yield of 200 Mm^3.

OR

Q4) a) Define infiltration. State factors affecting infiltration. State Horton's equation for infiltration. **[8]**

b) Explain with neat sketch, the current meter method of determining the discharge flowing through open channel. Also, state the equation of current meter. **[8]**

Q5) a) Define flood. State factors affecting flood. State any four methods of estimating floods. **[8]**

b) The unit hydrograph coordinates of a 1cm-1Hr unit hydrograph are as follows: **[10]**

Time (Hrs)	0	1	2	3	4	5	6	7	8	9	10
Q(m^3/sec)	0	6	13	22	16	11	7	4	2	1	0

Determine: i) Flood hydrograph for a storm of 2cm/hr for 1 hour.

ii) The catchment area.

OR

Q6) a) A catchment area of 80 km^2 receives maximum precipitation of 4cm/hr. Find maximum flood discharge by using **[8]**

i) Dicken's formula (Take C = 22)

ii) Inglis formula.

iii) Ali Nawaz Jung Bahadur formula (Take C = 50)

iv) Rational formula (Take C = 0.35).

b) Define unit hydrograph. Discuss limitations of unit hydrograph theory. State step by step procedure for deriving unit hydrograph. **[10]**

SECTION - II

Q7) a) Find duration (in days) between two waterings if [8]

  i)   Field capacity of soil = 30%.

  ii)   Apparent density of soil = 1.5.

  iii) Permanant wilting point = 15%.

  iv)   Effective depth of root zone = 75cm

  v)   Daily consumptive use of water for the crop = 10mm

  b) State salient features of National Water policy. [8]

OR

Q8) a) Define Duty. State any six factors affecting duty. Also, state any four methods to improve duty. [8]

  b) Determine capacity of reservoir if its culturable area is 1,00,000 ha. Following are details of crop pattern.

Crop	Base period (Days)	Duty (ha/cumec)	irrigation intensity(%)
Sugarcane	330	2500	40
Wheat	120	1500	20
Rice	120	1000	10

Assume reservoir losses as 10% and canal losses as 5%. [8]

Q9) a) State any two classifications of land drainage systems & explain design aspects of tie drains. [8]

  b) State concept of participatory irrigation Management (PIM). Explain role of water users cooperative societies in P.I.M. [8]

OR

Q10) a) Explain concept & functioning of GWP. [8]

  b) Compare lift irrigation system with canal irrigation system. [8]

Q11) Write short notes on: [18]

  a) Application of Remote Sensing in reservoir sedimentation.

  b) Use of G.I.S. in crop pattern.

  c) Warabandi.

OR

Q12) a) State Dupuit's assumptions and derive the equation for discharge from unconfined acquifer under steady state conditions. [8]

  b) What are different irrigation acts? State the main features of Maharashtra Water Resources Controlling Authority Act 2005. [10]

P1055   **[3964]-110**

B.E. (Civil)

ADVANCED ENVIRONMENTAL MANAGEMENT

(Sem. - I) (2003 Course) (Elective - I) (401005)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) Answers to the two sections should be written in separate books.

2) Neat diagrams must be drawn wherever necessary.

3) Figures to the right indicate full marks.

4) Your answers will be valued as a whole.

5) Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

6) Assume suitable data, if necessary.

SECTION - I

Q1) a)   Enlist ISO 14000 series.   **[6]**

   b)   Write short note on.   **[12]**

         i)   Continual improvement.

         ii)   Environment.

         iii)   Environmental Aspect.

         iv)   Environmental impact.

OR

Q2) a)   What events lead to development of ISO 14000 series?   **[6]**

   b)   Explain environmental management system requirements.   **[6]**

   c)   Write about links between ISO 14001 and ISO 9000 in tabular form.**[6]**

Q3) a)   Explain the provision made to regulate collection, segregation, transport and disposal of solid waste in Municipal Solid Waste (Management & Handling) Rules 2000.   **[7]**

   b)   Explain procedure for sampling under   **[9]**

         i)   The air act.

         ii)   The water act.

         iii)   The environmental protection act.

P.T.O.

Q4) a) Briefly discuss the salient features of Environment Protection Act, 1986.**[8]**

b) What is the purpose of Air (Prevention & control) Act 1981; Explain in brief how this act helped the state pollution control board to control air pollution. **[8]**

Q5) a) Write a procedure for controlling the emission of SOx by dilution using tall stacks. **[8]**

b) Enlist different control measures for NOx control and Explain any one in detail. **[8]**

OR

Q6) What are the sources of nitrogen oxides? Explain the following techniques to reduce the emission of NOx. **[16]**

a) Low excess air combustion.

b) Flue gas recirculation.

c) Two Stage Combustion.

d) Modifications in burner design.

SECTION - II

Q7) a) What are the classifications of solid waste? **[6]**

b) Write short notes on: **[12]**
   i) Landfilling.
   ii) Gasification.
   iii) Vermi composting.

OR

Q8) a) Explain treatment methods and disposal of hazardous waste. **[7]**

b) Explain the various methods of disposal of biomedical waste. **[7]**

c) Draw symbols for following: **[4]**
   i) Biohazard.　　　　　　ii) Cytotoxic hazard.

Q9) a) Enlist various methods of phosphorous removal from effluent and explain any one method. **[8]**

b) Enlist various methods of removing dissolved inorganic solids and explain with chemical equations Ion Exchange process. **[8]**

*Q10)*Write short notes on   **[16]**

    a)   Carbon adsorption.

    b)   Ion exchange.

    c)   Electrodialysis.

    d)   Reverse osmosis.

*Q11)*Write positive and negative environmental impacts of following projects.**[16]**

    a)   Thermal power plant.

    b)   Water resources project (Dam).

    c)   Express highway.

    d)   Nuclear power plant.

<div align="center">OR</div>

*Q12)*a)   Explain Category - I, Category - II and Category - III projects subject to EIA.   **[5]**

    b)   Discuss the role of general public in Environmental Clearance.   **[5]**

    c)   Explain the role of regulatory agencies and control board in Environmental Clearance of Project.   **[6]**

P1062

[3964]-120

B.E. (Civil)

TRANSPORTATION ENGINEERING - II

(2003 Course) (401009) (Sem. - II)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answer Q 1 or Q 2, Q 3 or Q 4 and Q 5 or Q 6 from Section - I and answer Q 7 or Q 8, Q9 or Q 10 and Q 11 or Q 12 from Section - II.*

2) *Answer to the two sections should be written in separate answer books.*

3) *Neat diagrams must be drawn wherever necessary.*

4) *Figures to the right indicate full makrs.*

5) *Use of logarithmic tables, electronic pocket calculator and steam tables is allowed.*

6) *Assume suitable data if necessary.*

SECTION - I

Q1) a)   State the comparison between Nagpur Road Plan and Bombay Road Plan.   **[5]**

b)   The area of certain district in India is 13,400 km² and there are 12 towns as per 1981 census. Determine the lengths of different categories of roads to be provided in this district by the year 2001.   **[8]**

c)   Explain the term traffic volume. What are the objects of carrying out traffic volume studies.   **[4]**

OR

Q2) a)   What are the various Traffic Control devices. Explain in brief various Traffic signs.   **[5]**

b)   Enlist the various planning (Fact Finding) surveys. Explain any two in brief.   **[4]**

c)   Explain in brief how the Master plan is prepared for any area or region under consideration.   **[4]**

d)   Write a note on Jaykar Committee and its recommendations.   **[4]**

Q3) a)   What are the various requirements of an ideal highway alignment. Discuss briefly.   **[4]**

b)   Find stopping sight distance for a design speed of 80 KMPH. Assume suitable data.   **[4]**

c) Explain in breif PIEV Theory. **[5]**

d) Define the following terms. **[4]**
   i) Camber.
   ii) Superelevation.
   iii) Gradient
   iv) Sight Distance.

OR

Q4) a) The speed of overtaking and overtaken vehicles are 80 and 60 KMPH respectively. If the acceleration of the overtaking vehicle is 2.5 KMPH per second, calculate the safe passing sight distance for **[6]**

   i) One way traffic regulation.   ii) Two way traffic regulation.

b) Draw the illustrative sketches of the summit curves in following cases. Also mention the deviation angle for each case (use usual notations) **[5]**

   i) Asending gradient meets descending gradient.

   ii) Descending gradient meets descending gradient.

   iii) Ascending gradients meets level road.

   iv) Ascending gradients meets ascending gradient.

c) Calculate the extra widening required for a pavement of width 7.0 m on a horizontal curve of radius 250 m, if the longest wheel base of vehicle expected on the road is 7.0 m. Design speed is 70 KMPH. **[6]**

Q5) a) Explain flexible and Rigid pavement and bringout the points of difference. **[4]**

b) Explain the term Equivalent Radius of resisting section. Compute the equivalent radius of resisting section of 20cm thick concrete slab, given that the radius of contact area (radius of wheel load distribution) wheel load is 15cm. **[4]**

c) Enlist the various tests carried out on bitumen. Highlight the importance of Flash & Fire Point Test on bitumen. **[4]**

d) Describe in brief the factors affecting pavement design. **[4]**

OR

Q6) a) Define Flakiness Index and Elongation Index. Discuss the object of carrying out above test. **[4]**

b) Draw an illustrative sketches of the following: **[4]**

   i) Penetration test on bitumen.

   ii) Ductility test on bitumen.

c) Discuss in detail how flexible pavement design is carried out by C.B.R. method of design. **[4]**

d) Write a short note on wheel load stresses in Rigid pavement. **[4]**

SECTION - II

Q7) a) State the advantages and limitations of Air Transportation. **[4]**

b) Discuss the types of surveys to be carried out for site selection for an airport. **[4]**

c) Explain with a neat sketch, how three controls are used to monitor the aircraft movements in space. **[4]**

d) How runway orientation should be done? Discuss. **[4]**

OR

Q8) a) Explain in brief basic runway length. **[4]**

b) Write a note on aircraft characteristics. **[4]**

c) Explain the terms: **[4 × 2 = 8]**

   i) Wind Rose Type I.

   ii) Cross wind component.

   iii) Minimum circling radius.

   iv) Taxiway.

Q9) a) Explain in brief the characteristics of a Ideal bridge site. **[4]**

b) State and explain various formulae to find out runoff from a catchment. **[4]**

c) A bridge constructed across a stream has a linear waterway of 400 m^2 and unobstructed water way of 500 m^2. The flood creats an afflux of 0.3 m. Calculate the flood discharge. **[5]**

d) Enlist the various loads, forces and stresses that are to be considered in designing a highway bridge. Explain any two in brief. **[4]**

OR

*Q10)*a) A Two Span plate girder bridge is to be provided across a river having the following data:

Flood discharge   100 m³/sec

Bed width   30 m

Side slope   1:1

Bed level   50.00 m

HFL   52.50 m

Maximum allowable afflux 15 cm. Calculate the span of the bridge. **[6]**

b) Explain the following Terms: **[4 × 2 = 8]**

i) Economic span.

ii) Scour Depth.

iii) Free board and its necessity.

iv) Linear Waterway and Natural Waterway.

c) What is afflux? How is it estimated. **[3]**

*Q11)*a) What is the purpose of providing bearings in bridges. Name the various types of bearings. **[5]**

b) What is cut water and Ease Water? Why it is necessary? Sketch any two shapes of cutwater and Ease water. **[6]**

c) Draw a neat sketches of the following: **[3 × 2 = 6]**

i) Transporter Bridge.

ii) Cable stayed Bridge.

iii) Hollow Girder Bridge.

OR

*Q12)*a) Explain in brief the following: **[3 × 2 = 6]**

i) Abutmentpier.

ii) Elastomeric bearing.

iii) Movable bridges.

b) What are wing walls? State various types of wing wall. Discuss the purpose for which wing walls are provided. **[6]**

c) Write a note on maintenance of bridges. **[5]**

[3964]-121

P1064

B.E. (Mechanical)

MECHANICAL SYSTEM DESIGN

(402041) (2003 Course) (Sem. - I)

Time : 4 Hours]   *[Max. Marks :100*

Instructions to the candidates:

  1)   *Answer three questions from Section I and three questions from Section II.*

  2)   *Answer to the two sections should be written in separate books.*

  3)   *Neat diagrams must be drawn wherever necessary.*

  4)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

  5)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   The piston rod of a hydraulic cylinder exerts an operating force of 10 KN. The friction due to piston and stuffing Box is 10% of the operating force. The pressure in the cylinder is 10 MPa. The cylinder is made of FG 200 and the factor of safety is 5. Determine the internal diameter & thickness of the cylinder .

  The flange thickness is 10 mm and a C.I. Cover plate of thickness 10 mm is fixed to the cylinder by means of 4, M10 bolts and a Zinc gasket of 3 mm thickness. The bolts are made of FeE400. Determine the factor of safety for bolts.

  E_{steel} = 207 GPa.

  $E_{C.I.}$ = 100 GPa.

  E_{Zinc} = 90 GPa.

  Assume a preload of 20 KN in each bolt.

  std. dia. of cylinder   - 20, 30, 40, 50, 60 mm.

  std. thickness (mm) - 2, 4, 5, 6, 7, 8, 10   **[12]**

  b)   State & explain various catagories of welded joints used in unfired pressure vessels. Draw a neat sketch.   **[6]**

<div align="center">OR</div>

Q2) a) Following data refers to a vertical pressure vessel made of plain carbon steel having ultimate tensile strength of 425 MPa and yield strength of 250 MPa.

Gauge pressure inside the vessel	- 1 MPa.
Inner diameter of shell	- 2m
Height of vessel	- 6m
Thickness of shell	- 10mm
Weight of each end cover	- 4kN
Weight of contents in the vessel	- 125 kN
Wind pressure an vessel surface	- 1.25 kPa
Torque due to offset piping	- 1.5 kNm

Find

i) Maximum resultant stress in the vessel.

ii) Factor of safety available based on yield & ultimate strength.

Assume the supports are located just above the lower head of the vessel.**[12]**

b) Derive clavarino's equation for thick cylinder subjected to internal pressure. **[6]**

Q3) A shaft is transmitting a torque of 900 Nm and is to have a rigidity of 90 Nm/degree. Assume a factor of safety of 1.5 based on yield strength. Design the shaft with minimum weight. What will be the change in design for minimum cost. Assume maximum shear stress theory of failure. Use following data for Materials.

Material	Density (Ks/m³)	Cost (Rs/N)	Yield strength (MPa)	Shear Modulus (GPa)
M_1	8500	16	130	80
M_2	3000	32	50	26.7
M_3	4800	480	90	40
M_4	2100	32	20	16

Find out diameter & length of shaft for the same. **[16]**

OR

Q4) a) A beam of rectangular cross section is subjected to a maximum bending moment M and maximum shear force V. The allowable stresses in bending and shear are σ_A and τ_A respectively. The bending stress is given by

$\sigma = \dfrac{\sigma M}{bd^2}$ and the average shear stress is given by $\tau = \dfrac{3v}{2bd}$, where b, & d are width and depth of the cross section. Design for optimisation for minimum cross sectional area using following data.

M = 40 kNm

V = 150 kN

$\sigma A = 10$ MPa

$\tau A = 2$ MPa

Determine the range of optimum dimensions for the cross section of beam. **[10]**

b) Prove that for a given helical spring, Minimum weight for given conditions occurs when the spring is so designed that the maximum load on it is equal to twice the initial load. **[6]**

Q5) a) A three cylinder single acting engine has its crank set equally at 120° and it runs at 610 rpm. The torque crank angle diagram for each cylinder can be approximated to a triangle having a maximum torque of 100 Nm at 60° from the dead centre of the corresponding crank. The torque developed on the return may be taken as zero.

Find

i) total power developed.

ii) cross sectional details of the rim & its mass.

Assume following data.

i) Coefficient of fluctuation of speed = 0.03.

ii) Rim contributes to 90% of total inertia.

iii) Width to thickness ratio is 1.0.

iv) Density = 7200 kg/m³.

v) Peripheral velocity should not exceed 8 m/s.

[12]

b) Derive the equation for the tensile stress induced due to centrifugal force in case of rimmed flywheel. **[4]**

OR

Q6) A punching machine with a capacity to punch 30 holes of 20 mm diameter per minute in a steel plate of 15 mm thickness and having ultimate shear stress of 350 MPa is powered by a flywheel through a gear reducer having a reduction ratio of 10:1. The actual punching operation last for 1/5th of the angular rotation of the punching machine crank shaft. Design a rimmed flywheel made of gray cast iron with following data.

Mechanical efficiency of punching machine = 85% .

Maximum permissible fluctuation of flywheel speed = 10% of mean speed.

Maximum permissible diameter of flywheel = 1.0m.

Contribution of rim to fly wheel effect = 90%.

Width to thickness ratio = 2.0.

Number of arms = 6.

Permissible tensile strength of flywheel = 7 MPa.

Density = 7200 kg/m³.

Also find the required power of electric motor to drive the punching machine if the mechanical efficiency of transmission is 90%. Assume the cross section of arm to be elliptical with major to minor axis ratio of 2.0. **[16]**

SECTION - II

Q7) a) The tensile strengths of a population of 700 connecting rods are normally distributed with a mean of 450 MPa and a standard deviation of 50 MPa. Find

  i)   the no.of connecting rods having strength less than 395 MPa and

  ii)   the no.of connecting rods having strength between 395 MPa and 595 MPa.

  Area from O to Z

Z	1.0	1.1	1.2	2.8	2.9	3.0
A	0.3413	0.3643	0.3849	0.4974	0.4981	0.4987 **[8]**

b) State and explain with sketches the guidelines to be followed in the design of casting. **[6]**

c) State the factors that govern the type & size of control device. **[4]**

OR

Q8) Straight tensile bars of diameter 10 ± 0.1 mm are made of plain carbon steel having tensile yield strength of 330 ± 30 Mpa. The load on the bars is 23.5 ± 5 kN. If the diameters, strengths and loads are normally distributed, estimate the reliability of the bars for withstanding the load. **[18]**

Z	1.3	1.4	1.5	1.6
A	0.4032	0.4192	0.4332	0.4452

Q9) a) A multispeed gear box is to be designed for a machine tool having speeds varying from 100 rpm to 1000 rpm. The recommended series of speeds is R5 using the standard spindle speeds. The gear box is connected to a motor driven by a pair of pulleys. Assuming the motor speed to be 1440 rpm, determine the ratio of pulley diameters required. Draw a suitable structure and speed diagram & find the number of teeth on each gear.**[12]**

   b) Explain the significance of geometric progression in case of design of machine tool gear box. **[4]**

OR

*Q10)*a) Draw the structure diagrams for the following equations of a six speed gear box.

   i) $Z = 2(1)\ 3(2)$

   ii) $Z = 2(3)\ 3(1)$

   iii) $Z = 3(1)\ 2(3)$

   iv) $Z = 3(2)\ 2(1)$

   Draw the schematic arrangement for the gears box. **[6]**

   b) A nine speed gear box is connected to a motor running at 720 rpm through belt drive. The gear Box is to have a minimum speed of 31.5 rpm and a maximum speed of 500 rpm. Using standard spindle speeds.

   i)   Select optimum structure & ray diagram.

   ii) Draw the gear box layout. **[10]**

Q11)
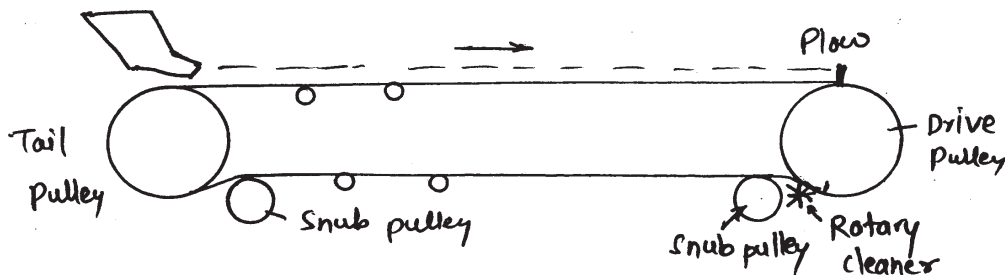
A horizontal conveyor is used in transporting a mineral Ore. The details of the conveyor are as shown in figure. Distance between the centres of drive and tail pulley is 300 m. The distance between the centres of the snup pulleys is 299m. Capacity of the conveyor is 225 tph at a belt speed of 2m/s. The ore has a density of 800 kg/m³. A three ply belt is used for the conveyor and the surcharge factor for the belt is 0.8. The mass of each idler can be taken as 20 kg.

Assume following data for the conveyor.

Friction factor for idlers = 0.025.

Snub factor for snub pulley = 0.02.

Snub Factor for drive and tail pulley = 0.06

Material velocity along the path of belt = 1m/s.

Cleaning force = K clean gB

Where k clean = 10.

Unloading resistance = 3.5 mm gB

Where B is belt width in M and mm is the mass of material per unit length & g is gravitational acceleration.

Angle of lap on drive pulley = 210º.

Coefficient of friction between belt and drive pulley = 0.4

Ultimate tensile strength per unit width of ply = 60 N/mm.

Drive efficiency = 93%.

Motor speed = 1440 rpm.

Carrying idler pitch, Pc = 1.5m

Approximate return idler pitch = 2xPc

Assume pulley diameter as 125 times no of ply.

Std pulley diameters   315, 400, 500, 630, 800 mm

Std motor rating: 5, 5.5, 7.5, 10, 11, 12.5, 15, 20kw

Std belt width.

B(mm)	400	500	650	800	1000
mb(kg/m)	5	6.5	9	12	16

Determine

1. Std belt width.
2. Std dia of pulley.
3. Width of pulley is side margin is 75 mm
4. Number of carrying & return side idler pulleys.
5. Exact return side idler pitch.
6. Std electric motor to run the conveyor.
7. Factor of safety available.
8. Reduction ratio of drive.   **[16]**

OR

*Q12)*a) Draw and explain vertical gravity take up in case of belt conveyors. **[6]**

b) Determine the resistance offered by a single carrying & return idler for the conveyor having following data. **[10]**

Capacity of conveyor = 400 tph.

Belt speed = 2m/s.

Mass of belt = 16 kg/m.

Mass of each idler = 25.1 kg.

Carrying side pitch = 1m.

Return side pitch = 2m.

Coefficient of friction between idler & belt = 0.02.

Coefficient of friction between roller pin & idler = 0.04.

Ratio of roller pin diameter to idler diameter = 0.5.

Belt inclination = 15°.

☞ ☞ ☞

P1068

[3964]-125

B.E. (Mechanical)

PRODUCT DESIGN & DEVELOPMENT

(Sem. - I) (2003 Course) (Elective - I) (402045)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answer any 3 questions from each section.*
2) *Answers to the two sections should be written in separate books.*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data, if necessary.*

SECTION - I

UNIT - I

Q1) Explain different types of customer needs. Discuss various need gathering methods. **[16]**

OR

Q2) a) Explain the importance of s - curve in the context of Technology Forecasting. **[8]**

b) Discuss in detail product development team. **[8]**

UNIT - II

Q3) a) Discuss in detail product modularity. **[9]**

b) Explain functional requirements versus constraints. **[8]**

OR

Q4) Explain product teardown process in detail with a suitable example. **[17]**

UNIT - III

Q5) a) Explain the importance of Failure modes & Effects analysis in concept embodiment. **[9]**

b) Explain in detail morphological analysis. **[8]**

OR

Q6) a) Discuss in detail brainstorming & memory maps. **[9]**

b) Explain pughs concept selection charts with suitable example. **[8]**

P.T.O.

SECTION - II

UNIT - IV

Q7) a) Explain design for manufacture guidelines for sheet metal working. **[8]**

b) Explain design for environment guidelines. **[8]**

OR

Q8) a) Explain design for recyclability & remanufacturing. **[8]**

b) Discuss in detail manufacturing cost Analysis. **[8]**

UNIT - V

Q9) a) Define optimization. Explain in detail Fundamental concepts & importance.
[9]

b) Discuss in detail linear programming with its advantages. **[8]**

OR

Q10) Explain briefly.

a) Pareto optimality. **[5]**

b) Steepest decent method. **[4]**

c) Sensitivity analysis. **[4]**

d) Stopping criteria. **[4]**

UNIT - VI

Q11) a) Explain in detail Design of Experiments. **[9]**

b) Discuss in detail Quality design theory. **[8]**

OR

Q12) a) Explain noise variable matrix & design variable matrix in detail. **[9]**

b) Explain the types & uses of prototypes. **[8]**

☛ ☛ ☛

P1069   **[3964]-129**

B.E. (Mech.)

OPERATIONS RESEARCH

(Sem. - I) (2003 Course) (Elective - I) (402045)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1)   Answers to the two sections should be written in separate books.

2)   Neat diagrams must be drawn wherever necessary.

3)   Figures to the right indicate full marks.

4)   Assume suitable data, if necessary & state if clearly.

5)   All questions are compulsory.

6)   Use of logarithmic tables, slide rule mollier charts electronic pocket calculator and steam tables state table is allowed.

SECTION - I

Q1) a)   Solve the following LPP by Simplex method.   **[12]**
Max. $z = 3X_1 + 5X_2$,
Subject to $X_1 \leq 14$,
$2X_2 \leq 12$,
$3X_1 + 2X_2 \leq 18$,
$X_1, X_2 \geq 0$

b)   Form the dual of the above & write the values of dual decision variables from the final simplex table.   **[4]**

c)   Do the RHS ringing for 3rd constraint in the above primal problem.   **[2]**

OR

a)   Explain Big - M method to solve L.P.P.   **[6]**

b)   Sketch graphically special cases in L.P.P.   **[6]**

c)   Discuss the phases or methodology of OR.   **[6]**

Q2) a)   Obtain IBFS for 3 origion, 3 destination unbalanced transportation problem by Matrix Minima Method. Check only, whether this IBFS is optimal or not by MODI method. Show the close path for most desirable empty cell & decide number of units to be shifted to this cell. Assume any suitable data for availabilities & requirements with total requirement is more than total availability. Assume any suitable transportation costs along various routes.   **[12]**

P.T.O.

b) Write the transportation form for. Assignment problem & LP form for transportation. **[4]**

OR

a) The captain of cricket team has to allot five middle batting positions to the different batsmans. The average runs scored by each batsman at these positions are as follows.

Batsman	Batting Positions				
	III	IV	V	VI	VII
A	40	40	35	25	50
B	42	30	16	25	27
C	50	48	40	60	50
D	20	19	20	18	25
E	58	60	59	55	53

i) Find the assignment of batsmans to positions which would give the maximum number of runs. **[5]**

ii) If E batsman is fixed for III position, how the decision is to be attened? **[5]**

b) Discuss the fronshipment problem. **[6]**

Q3) Write short notes on (Any three): **[16]**

a) EOQ with finite rate of replenishment

b) ABC analysis.

c) Dynamic programming.

d) Non linear programming.

e) EOQ with price - breaks.

f) Integer programming.

SECTION - II

Q4) a) Describe two - person, zero - sum game. **[4]**

b) North & South Korea armies are at war. N.Korea army has 2 air bases, one of which is thrice important than other. S.Korea can destroy an undepended air base, but it can destroy only one of them. Army of N.Korea can also depend only one of them. Find best strategy for N.Korea to minimises it's losses. **[6]**

c) Write LPP form for following game from B's point of view. **[6]**

B

A

4	1	−3
3	1	6
-3	4	−2

OR

a) Find the cost per period of individual replacement policy of an installation of 300 light bulbs, given the following.

i) Cost of replacing an individual bulb is Rs. 2

ii) Conditional probability of failure is given as

Week no.	0	1	2	3	4
Conditional p of failure	0	0.1	0.3	0.7	1.0

Also calculate the number of light bulbs that would fails during each of the fourweels. **[9]**

b) Discuss the policy of items that deteriorates gradually w.r.t. time for no time value of money & with time value of money. **[7]**

Q5) a) Derive the expression for MCSR in quaring model. **[6]**

b) The cakeshop manufactures 30 cakes/day. the sale of these cakes depends upon demand which has following distribution.

Sales (no.of cakes)	27	28	29	30	31	32
Probability	0.10	0.15	0.20	0.35	0.15	0.05

Simulate the demand for next 10 days & find average demand. Use the Random nos. as - 10, 99, 65, 99, 95, 01, 79, 11, 16, 20. **[10]**

OR

a) Find the sequence that minimises the total time required for performing the following jobs on three machines in order ABC. Processing time in minutes are gives below. **[8]**

Jobs →	I	II	III	IV	V
Machine A	8	10	6	7	11
Machine B	5	6	2	3	4
Machine C	4	9	8	6	5

b) Assume a single channel service system of a library in a school. On an average 8 students visit per hour & book issue rate is 10 students/hour

Determine:

    i)   Probability of librarian being idle. **[2]**

    ii)   Probability that there are at least 3 students in the system. **[3]**

    iii)   Expected time that a student is in queue. **[3]**

Q6) a)   A small project has following data

activity	1-2	1-3	1-4	2-5	3-5	4-6	5-6
Time optimistic	1	1	2	1	2	2	3
Weeks Most likely	1	4	2	1	5	5	6
Pessimistic	7	7	8	1	14	8	15

    i)   Draw NW, find C.P. & its duration, find slack & floats. **[12]**

    ii)   What is probability that project will be completed 4 weeks latter than expected & 2 weeks earlier than expected. **[4]**

    iii)   What is expected duration for 75% chance of project completion.**[2]**

<div align="center">OR</div>

  b) i)   Discuss cost aspects & crashing of Network. **[6]**

      ii)   Discuss resource levelling in project management & use of histogram in it. **[6]**

      iii)   Differentiate between CPM & PERT. **[6]**

      Given Data:

          $Z =$ -0.5 -1.00 -1.33 -2.00 $+1.65$

          $P =$ 0.30 0.25 0.16 0.09 0.95

P1070   **[3964]-132**

B.E. (Mechanical Engineering)
POWER PLANT ENGINEERING

(Sem. - II) (2003 Course) (402048) (Backlog)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1)   Answer 3 questions from Section I and 3 questions from Section II.

2)   Answers to the two sections should be written in separate books.

3)   Neat diagrams must be drawn wherever necessary.

4)   Figures to the right indicate full marks.

5)   Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

6)   Assume suitable data, if necessary.

SECTION - I

Q1) a)   What factors are required to be considered in selecting a site for steam power plant? Explain   **[6]**

b)   Diesel Power Plants are more suitable as peak load plants than base load power plants. Justify.   **[5]**

c)   List the different starting systems used in diesel power plants. Explain how compressed air is used to start diesel power plant.   **[5]**

OR

Q2) a)   What are the different factors considered for classifying the nuclear power plants?   **[6]**

b)   Explain the working of CANDV reactor with a neat sketch.   **[5]**

c)   What are the functions of the following in nuclear power plant?   **[5]**

i)   Moderator.   ii)   Control rod.   iii)   Coolant.

Q3) a)   What do you understand by Fluidized Bed Combustion boiler? Explain with neat Sketch the working of Fluidized Bed combustion boiler   **[8]**

b)   Explain with a neat sketch the working of coal pulverising plant. What is the difference between unit system and central system of supplying pulverised coal to the boiler?   **[8]**

OR

Q4) a) List the different types of coal burners used in a pulverised coal fired furnace and explain with a neat sketch any one such coal burner. **[8]**

b) Write short notes on: **[8]**

i) Coal - oil Mixture (COM)

ii) Dust collectors.

Q5) a) Explain the salient features of high pressure boilers. How do they improve the performance of a boiler? **[8]**

b) In a Rankine cycle plant, steam is supplied to turbine at 30 bar, 400ºC and is expanded to a pressure of 0.16 bar. Calculate percentage of moisture at the exhaust of the turbine, if the steam is re - heated at 6 bar to a temperature of 350ºC. Also find the thermal efficiency of the plant. **[10]**

OR

Q6) a) Explain ideal regenerative feed heating cycle. Why it is not used in practice? Explain. **[6]**

b) A steam power plant of 100 MW capacity is equipped with regenerative as well as reheating arrangements. The steam is supplied to the turbine at 80 bar and 50ºC, super heat. The steam is extracted at 7 bar for feed heating and remaining steam is reheated to its initial temperature, before it is expanded to 0.35 bar in the L.P. stage.

Assume direct contact type feed heater.

Determine:-

i) Percentage steam bled from the turbine.

ii) Generating capacity of the boiler.

iii) Thermal efficiency of the cycle.

Assume no losses and ideal processes of expansion. **[12]**

SECTION - II

Q7) Write notes on: **[16]**

a) Subsonic, supersonic nozzles and diffusers.

b) Super saturated flow of steam.

c) Nozzle efficiency.

d) Choking of nozzles.

Q8) a) Explain the different types of condensers with neat sketches. **[8]**

b) Using the data given below, find

i) mass of air present per m^3 of condenser volume.

ii) the state of steam entering the condenser.

Condenser vacuum: 70 cm of Hg, Barometer 76 cm of Hg. Mean temperature of condenser = 34°C.

Mass of condensate per hour = 2620 kg.

Mass of cooling water per hour 102000 kg with inlet and exit temperatures of 17°C and 31°C, assume hot well temperature = 29°C. **[8]**

Q9) Write notes on: **[18]**

a) Methods of fixing turbine blades to discs and drum.

b) Labrynth packings.

c) Throttle governing of steam turbines.

d) Losses in steam turbines.

OR

Q10) a) Explain the working of an impulse steam turbine with neat sketch. Explain the velocity diagrams and diagram work. Derive expression for maximum diagram efficiency. **[10]**

b) The following data refers to a 50% reaction turbine running at 3000 r.p.m.

i) Mean blade speed = 100m/s.

ii) Velocity ratio = 0.56.

iii) The exit angle of blades = 20°.

iv) Mean specific volume of steam = $0.65 \, \dfrac{m^3}{kg}$ and mean height of blades = 25mm.

Calculate the mass flow of steam through the turbine in kg/hr. Neglect the effort of blade thickness on the annulus flow. Also calculate the useful enthalpy drop and diagram power. **[8]**

Q11) Write notes on (any two): **[16]**

    a)   Load sharing - Incremental rate theory and condition for maximum efficiency.

    b)   Load curves and load duration curve for different type of consumers.

    c)   Cost analysis and unit energy cost.

<div align="center">OR</div>

Q12) a)   Define and explain: Load factor, Diversity factor, plant capacity factor and Demand factor. **[8]**

    b)   A power station is to supply three regions having peak loads of 200 MW, 150MW and 250 MW. The annual load factor is 50% and diversity factor is 1.5. Determine the following: **[8]**

        i)   Maximum demand on the station.

        ii)   Installed capacity and

        iii) Annual energy supplied in kWh.

P1079   **[3964]-151**

B.E. (Production)

PRODUCTION MANAGEMENT

(Sem. - I) (2003 Course) (411081)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

   1)   Answer any 3 questions from each section.

   2)   Answer 3 questions from Section I and 3 questions from Section II.

   3)   Answers to the two sections should be written in separate books.

   4)   Neat diagrams must be drawn wherever necessary.

   5)   Figures to the right indicate full marks.

   6)   Your answers will be valued as a whole.

   7)   Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

   8)   Assume suitable data, if necessary.

SECTION - I

UNIT - I

Q1) a)   Explain in brief the history and development of Production Management.**[8]**

   b)   Explain the effect of functional and operational aspects of product design.**[8]**

OR

Q2) a)   What do you understand by concurrent engineering? Explain its concept in brief.   **[8]**

   b)   Explain production organization for single and multi product.   **[8]**

UNIT II

Q3) a)   What are the different quantitative models for layout problems.   **[8]**

   b)   Explain how material handling system is analysed.   **[8]**

OR

Q4) a)   Enumerate minimum 8 principles of material handling & explain in brief.**[8]**

   b)   Explain what are the different factors considered while selecting a location for gear box manufacturing industry?   **[8]**

P.T.O.

UNIT - III

Q5) a) Explain total productivity & labour productivity in brief. **[9]**

b) With the help of block diagram explain the process of capacity planning. **[9]**

OR

Q6) a) Explain PIP - productivity improvement programme in brief. **[9]**

b) What is aggregate capacity planning used in industry? Explain in detail. **[9]**

SECTION - II
UNIT - IV

Q7) a) Explain different challenges manufacturing industry has to fair in information age. **[9]**

b) Explain in brief the contribution of schonberger in WCM. **[9]**

OR

Q8) a) Explain what is Maskal's model used in WCM? **[9]**

b) What are the todays world class practices used in industry. **[9]**

UNIT - V

Q9) a) What is work authorisation and control in industrial maintanance. **[8]**

b) Explain different operating practices used to reduce maintanance work. **[8]**

OR

Q10) a) Describe the policies for **[8]**

i) Allocation of work.

ii) Costs in on industrial maintanance.

b) What are different types of maintanance? Explain **[8]**

UNIT - VI

Q11) a) What are the responsibilities of industry towards environment and Ecology? **[8]**

b) Write short note on ISO 14000 Environmental standards. **[8]**

OR

Q12) a) Explain in brief recyling of energy from waste. **[8]**

b) What is Agile manufacturing? Explain. **[8]**

☛ ☛ ☛

[3964]-160

P1086

B.E. (Production Engineering)
PROCESS PLANNING & TOOL SELECTION
(2003 Course) (Sem. - II)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1)   *Answer 3 questions from Section I and 3 questions from Section II.*

2)   *Answers to the two sections should be written in separate books.*

3)   *Neat diagrams must be drawn wherever necessary.*

4)   *Figures to the right indicate full marks.*

5)   *Use of electronic pocket calculator is allowed.*

6)   *Assume suitable data if necessary.*

SECTION - I

Q1) a)   What role do the industrial and quality engineering functions play in the company with regards to process planning?   **[8]**

     b)   Explain the functions of product engineering department.   **[8]**

OR

Q2) a)   Where is the product engineer and process engineer located in the organization? Explain with the help of neat flow chart.   **[8]**

     b)   Process engineering is the hub of the organization. Explain.   **[8]**

Q3) a)   What sort of information can the process planner obtain from the engineering drawings of a component?   **[8]**

     b)   How to determine the areas suitable for locating, supporting and clamping the work - pieces?   **[8]**

OR

Q4) a)   Describe at least five types of geometrical tolerances with proper symbols.   **[8]**

     b)   What key points to be considered in determining the nature of work to be performed on the work - piece?   **[8]**

P.T.O.

Q5) a) List the problems incurred due to tolerance stacking. **[2]**

b) What are the causes of work - piece variations? What are the variables which interfere with work - piece control? **[8]**

c) Why are the locators generally arranged in 3-2-1 pattern? What is the effect of excess locator? **[8]**

OR

Q6) a) What do you mean by selective assembly and its advantage? **[2]**

b) What are the design and process tolerance stacks? Explain with suitable example. **[8]**

c) Explain geometric control for cylindrical shapes. **[8]**

SECTION - II

Q7) a) What sources of information usually available to the process engineer to assist him making a machine selection? **[8]**

b) What are the most influencing factors in terms of tool performance? How selection of cutting fluid will affect on tool performance in various processes? **[8]**

OR

Q8) a) Explain the steps involved in machine selection method with a neat flow chart. **[8]**

b) What is meant by tooling economics, How it is applied in process engineering? **[8]**

Q9) a) What do you mean by major operations, critical operations, qualifying and requalifying operations and how to identify them? **[8]**

b) Explain the benefits of computer aided process planning (CAPP). **[8]**

OR

Q10) a) Discuss Computerised machinability data system in detail. **[8]**

b) What are the advantages and disadvantages of combining operations? **[8]**

Q11) Prepare a process sheet for the component as shown in fig. 1. The required quantity: 5000/ month. Write detailed manufacturing plan, operation sequence, proper tooling and equipment selection, process parameters with sample calculations. **[18]**
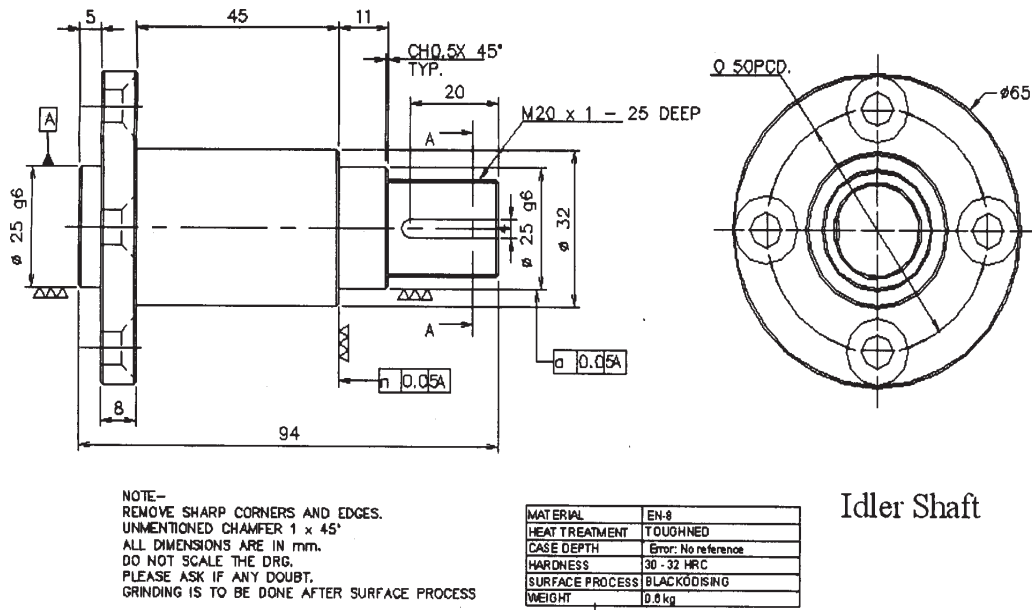

NOTE—
REMOVE SHARP CORNERS AND EDGES.
UNMENTIONED CHAMFER 1 x 45'
ALL DIMENSIONS ARE IN mm.
DO NOT SCALE THE DRG.
PLEASE ASK IF ANY DOUBT.
GRINDING IS TO BE DONE AFTER SURFACE PROCESS

MATERIAL	EN-8
HEAT TREATMENT	TOUGHNED
CASE DEPTH	Error: No reference
HARDNESS	30 - 32 HRC
SURFACE PROCESS	BLACKODISING
WEIGHT	0.8 kg

Idler Shaft

Fig. No. 1.

OR

*Q12)*Prepare a process sheet for a component as shown in figure 2. which is to be manufactured in batches of size 600. Analyse the part print carefully and prepare the process sheet containing manufacturing plan with operation sequence, equipments, tooling, fixtures, process parameters and sample calculation of operation time. **[18]**
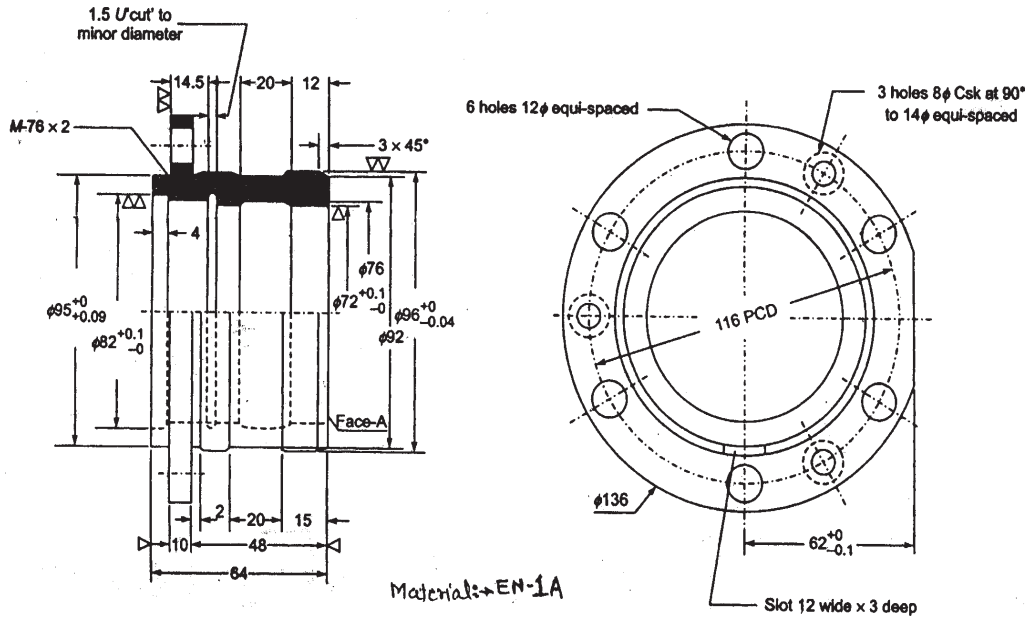

Fig. No. 2

P1091   **[3964]-172**

B.E. (Prod./SW)

MECHATRONICS & ROBOTICS

(2003 Course) (411121) (Sem. - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1)   *Answers to the two sections should be written in separate books.*

2)   *Neat diagrams must be drawn wherever necessary.*

3)   *Figures to the right indicate full marks.*

4)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

5)   *Assume suitable data, if necessary.*

6)   *All questions are compulsory.*

SECTION - I

Q1) a)   Explain the difference between open & closed loop control with reference to applications.   **[8]**

b)   What are the basic elements of closed loop control system? Explain with example.   **[10]**

OR

a)   What is meant by First & Second order system? Give examples for each of them.   **[7]**

b)   What is signal conditioning?   **[4]**

c)   Explain Data Acquisition system with neat sketch & example.   **[7]**

Q2) a)   Compare combination Logic & sequential Logic.   **[4]**

b)   Explain the following for a Microprocessor.   **[8]**

i)   Program Counter.

ii)   Stack pointer.

iii)   ALU.

iv)   General purpose Registers.

c)   Explain the basic structure of Microcontroller.   **[4]**

OR

a)   Represent $(-41)_{10}$ by   **[6]**

   i)   Sign magnitude method.

   ii)   1's complement method.

   iii) 2's complement method.

b)   What is sequential Logic System? Explain SR flipflop.   **[6]**

c)   Distinguish between Microprocessor & Microcontroller.   **[4]**

Q3) a)   Compare interfacing of computer & printer with that of computer & a CNC.   **[8]**

b)   How interfacing device is selected? Explain with example.   **[8]**

<div align="center">OR</div>

a)   Explain the commands with example   **[9]**

   i)   MVI.   ii)   ADD.   iii)   DAA.

b)   Write a simple program for 8085 to clear the memory.   **[7]**

<div align="center">

SECTION - II

</div>

Q4) a)   What are the different symbols used in a PLC ladder diagram? Explain any four.   **[10]**

b)   Write a ladder diagram for an engine 'On' & kept running till stopped by pressing a button.   **[4]**

c)   Explain the importance of ladder diagram.   **[4]**

<div align="center">OR</div>

For a typical FMC with two machining centers, a tunning centre, a conveyour system, a robo arm for each CNC write a ladder diagram to control & identify the no. of I/PS & O/PS.   **[18]**

Q5) a)   Explain the mechanical aspects of Motor selection.   **[4]**

b)   Classify & explain the D.C. Motors with field coils.   **[8]**

c)   Design a system of two cylinder A & B with following requirement. **[4]**

   i)   When the start button is pressed, the piston of cylinder A extends fully.

   ii)   Then the piston of cylinder B extends fully.

   iii) After that the piston of cylinder A retracts Fully.

   iv)   Finally the piston of cylinder B retracts fully.

<div align="center">OR</div>

a) Design a Mechanical system which can be used to **[8]**

    i) Move a tool at a steady rate in one direction & then quickly move it back to the beginning of the path.

    ii) Transform a rotation in to a linear back & fourth movement with simple harmonic motion.

    iii) Transform a rotation of a shaft into rotation of another/parallel shaft some distance away.

b) Enumerate & explain the terms used in specifying stepper Motors. **[8]**

Q6) a) What is a 'work envelope' of a Robot? Explain with an example & a neat diagram. **[8]**

b) Explain the following related to Robot **[8]**

    i) Positional accuracy.

    ii) Repeatability.

    iii) Orientation error.

    iv) Resolution.

<center>OR</center>

a) Find the worst case spatial resolution of a cylindrical robot with a digital encoder mounted on a shaft which emits 2500 pulses/rev., if maximum horizontal arm length is 800 mm. **[6]**

b) Explain Robot applications in any two of the following areas with suitable block diagram. **[10]**

    i) Welding.

    ii) Inspection.

    iii) Medical.

<center>☛ ☛ ☛</center>

P1100   **[3964]-208**

B.E. (Electrical Engineering)
PROJECT MANAGEMENT

(2003 Course)(Elective - I) (Theory) (403143)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

    1)   Section I & Section II should be solved on separate answer sheets.

    2)   Solve 3 questions from Section I & 3 Questions from Section II.

    3)   Figures to the right indicate max. marks for the respective questions.

    4)   Use of scientific calculator is allowed.

SECTION - I

Q1) a)   Explain various types of Project Organisations.   **[8]**

     b)   Elaborate the concept of Project Life Cycle in detail.   **[8]**

                      OR

Q2) Define Project Management. Explain scope, Importance & characteristics of Project Management.   **[16]**

Q3) a)   State & explain various types of costs Associated with Project.   **[8]**

     b)   What precaution should be taken while selecting a project?   **[8]**

                      OR

Q4) "Projects looks attractive or managable on paper but in Reality all the projects dosen't get succesfully completed". Do you agree? Explain the various reasons of failure of Projects.   **[16]**

Q5) a)   Explain Programme Evaluation & Review Technique (PERT) in detail.**[9]**

     b)   Elaborate the Graphical Evaluation & Review Technique (GERT) in detail.**[9]**

                      OR

Q6) Prepare a Gantt chart for a Imaginative Project of your choice. Elaborate each stage of Gantt chart. Make necessary assumptions wherever required.   **[18]**

SECTION - II

Q7) "Effective & Efficient Material Management System helps to reduce cost of production" do you Agree? Justify with suitable Example. **[16]**

OR

Q8) a) Elaborate the concept of Vendor Rating. **[8]**

b) Explain cycle of Purchase in detail. **[8]**

Q9) a) Explain the concept of Inventory Management. State & Explain types of Inventories. **[8]**

b) Indian Pharma Co. (IPC) buy 'ibuprofen' from Ravi labs. The price schedule quoted by Ravi labs is as follows.

Quantity in Kgs.	Price/Unit (Rs.)
1-99	100.00
100-499	90.00
500 and above	80.00

IPC estimates their annual requirement of 'ibuprofen' as 4000 kgs. The order of costs are estimated to be Rs. 500/- per order and the inventory carrys costs are charged at 25%. What is the optimal quantity to be ordered. **[8]**

OR

Q10) a) Explain the various functions of stores. **[8]**

b) Explain various types of stores. **[8]**

Q11) Write short notes.

a) Risk Management. **[6]**

b) Methods of Measuring Risk. **[6]**

c) Diversible & non - diversible risk. **[6]**

OR

Q12) a) "Tendering' is become the best method for buying in todays Globalised & competitive business Scenario". Elaborate the statement with suitable examples. **[9]**

b) Explain various types of Tenders. **[9]**

☛ ☛ ☛

P1101

[3964]-211

B.E. (Electrical)

SWITCHGEAR AND PROTECTION

(2003 Course) (403148) (Sem. - II)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

   1)   *Answer any 3 questions from each section.*

   2)   *Answer 3 questions from Section I and 3 questions from Section II.*

   3)   *Answers to the two sections should be written in separate books.*

   4)   *Neat diagrams must be drawn wherever necessary.*

   5)   *Figures to the right indicate full marks.*

   6)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

   7)   *Assume suitable data, if necessary.*

<u>SECTION - I</u>

Q1) a)   What are different types of faults taking place in power system? What are the causes of these faults?   **[8]**

   b)   What do you mean by primary and backup protection explain with suitable illustration and diagram.   **[8]**

OR

Q2) a)   What are the essential qualities of protective relaying? Explain in detail.**[8]**

   b)   Explain in brief following protection principles.   **[8]**

   i)   Over current.   ii)   Differential.

   iii) Directional overcurrent.   iv)   Distance.

Q3) a)   What are the theories postulated for arc interruption?   **[8]**

   b)   Derive the expression for RRRV & define restriking voltage & RRRV.**[8]**

OR

Q4) a)   Explain the following terms :   **[8]**

   i)   Resistance switching.   ii)   Current chopping.

   b)   Explain the use of various LT switchgears given below: **[8]**

   i)   Fuses.   ii)   MCCB.

   iii) MCB.   iv)   ELCB.

Q5) a) What are the different ratings of circuit breakers taken into consideration for their applications? **[10]**

b) Explain the working and constructional features of ABCB. **[8]**

OR

Q6) Write short notes on (any three) **[18]**

a) VCB - advantages and disadvantages.

b) Auto reclosing.

c) GIS.

d) SF_6 circuit breaker.

SECTION - II

Q7) a) Explain the inrush current phenomenon in case of a transformer. What do you mean by harmonic restraint differential relay. **[8]**

b) Explain construction and working principle and operation of Buchholz relay. Draw neat diagram. **[8]**

OR

Q8) a) Explain the phenomenon of loss of excitation and protection used against loss of excitation. **[8]**

b) What do you mean by differential protection used for busbars? Explain it in detail. **[8]**

Q9) a) Write a note on following concepts for three phase feeder protection using overcurrent relay. **[8]**

i) Time graded system protection.

ii) Current graded system protection.

b) Explain impedance, reactance and mho relay characteristics. **[8]**

OR

Q10) a) Explain the effect of arc resistance, power swing on performance of distance relay. **[8]**

b) What is carrier - aided protection of transmission line. **[8]**

*Q11)*a) Give the block diagram at static relay. What are different components of static relay? Explain the operation in detail. **[10]**

b) Compare the static relay interms of merits and demerits with conventional relay. **[8]**

OR

*Q12)*a) Explain the microprocessor based over current relay with it's block diagram, in detail. **[9]**

b) What do you mean by numerical protection? Give the block diagram of numerical relay with detail explanation. **[9]**

☜ ☜ ☜

P1105   **[3964]-221**

B.E. (Electronics)
COMPUTER NETWORKS
(Sem. - I) (2003 Course) (404201)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answer three questions from each section.*
2) *Answers to the two sections should be written in separate books.*
3) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What is networking? Explain network design issues?   **[8]**

  b) What are critique of OSI model and TCP/IP reference model?   **[8]**

                                    OR

Q2) a) Explain OSI model in details.   **[10]**

  b) Compare centralized vs distributed N/W.   **[6]**

Q3) a) Calculate the maximum Theoretical channel capacity if the signal to noise ratio is 36 dB and channel B.W. is 2 MHz. Explain how channel capacity is to increased?   **[6]**

  b) Explain the communication satellite?   **[10]**

                                    OR

Q4) a) Explain cable T.V. Network.   **[8]**

  b) Compare circuit switching vs packet switching.   **[8]**

Q5) a) What is HDLC? Explain HDLC Frame format and its control field? **[9]**

  b) What is CSMA/CD? Explain Adaptive tree wolk protocol.   **[9]**

                                    OR

Q6) a) What is sliding window protocol? Explain one bit sliding window protocol.**[9]**

  b) Explain the static and dynamic channel allocation in LAN and MAN.**[9]**

                                                              P.T.O.

SECTION - II

Q7) a) Computer system on 6 mbps Network is regulated by a token bucket is filled at a rate of 2 mbps. It is initially filled to capacity 12 mbits. How long can the computer system transmit at full rate of 6 mbps. **[6]**

b) What is Routing? What are its types? Explain distance Vector Routing Algorithm. **[10]**

OR

Q8) a) What is congestion in the network? Explain leaky Bucket algorithm. **[8]**

b) Compare datagram subnet and virtual circuit subnet. **[8]**

Q9) a) What is cryptography? Explain symmetric key cryptography and Asymmetric key cryptography. **[8]**

b) What is www? Explain Architecture of www. **[8]**

OR

Q10) a) Compare public key and private key security algorithm. Explain RSA algorithm in details. **[8]**

b) Explain Video on demand. **[8]**

Q11) a) Explain TCP/IP protocol suite. **[8]**

b) Compare IPv4 vs IPv6. **[6]**

c) What is DNS? What are three main component of DNS? **[4]**

OR

Q12) Write a short notes (any three): **[18]**

a) FTP.   b) ICMP

c) Telnet.   d) Socket programming

e) SMTP.

☞ ☞ ☞

P1116

[3964]-241

B.E. (E & TC)

COMPUTER NETWORKS

(Sem. - I) (2003 Course) (404214)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answers to the two sections should be written in separate books.*

2) *Neat diagrams must be drawn wherever necessary.*

3) *Figures to the right indicate full marks.*

4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain why LAN technology is not suitable for WAN implementation?**[4]**

   b) What is service primitive? Explain the four classes of service primitives with an example. **[6]**

   c) State with reasons which of the seven layers of the OSI reference model will play a role in the following circumstances. **[6]**

   i) A user wants to have a secure communication for selected messages.

   ii) A user wants to acquire realtime data from a remote site.

   iii) A user with a line mode terminal wants to communicate with a user having screen mode terminal.

OR

Q2) a) Explain the term network architecture with suitable example. Compare TCP/IP model with OSI model. **[8]**

   b) Explain in detail network software design issues. **[8]**

Q3) a) Compare circuit switching, message switching and packet switching with each other. Why packet switching is used in computer networks? **[8]**

b) Write short note on VSATs. **[4]**

c) A noiseless 6kHz channel is sampled every 1m Sec. What is the maximum data rate? **[4]**

OR

Q4) a) Explain in detail how Internet service is provided on cable TV network?**[8]**

b) Which are the different guided medias used in computer networks? Compare them. **[6]**

c) Television channels are 6MHz wide. How many bits/sec. Can be sent if four level digital signals are used. Assume noiseless channel. **[2]**

Q5) a) What is Point - To - Point protocol? Explain its working in detail. **[8]**

b) What is Transparent Bridge? How it works? **[6]**

c) Calculate throughput 'S' for a pure ALOHA if the offered load or traffic (G) is 0.7 and also for slotted ALOHA if the offered traffic (G) is 2.2.**[4]**

OR

Q6) a) Explain the working of any two collision free protocols. **[8]**

b) Explain sliding window protocol using Go Back to N. **[6]**

c) If the following bit string is to be transmitted using bit stuffing what will be the output string after stuffing? Given reason.

01111011111011111111111000001 **[4]**

SECTION - II

Q7) a) Which are the design goals of network layer services? Which services are provided by the network layer to the transport layer? **[6]**

b) Explain the Socket primitives for TCP? **[6]**

c) Write short note on any two: **[6]**
   i) Choke packets.
   ii) Jitter Control.
   iii) Load shedding.

OR

Q8) a) Which are the elements of Transport protocols? Explain any one in detail. **[6]**

b) Explain in detail link State Routing algorithm. **[6]**

c) What is remote procedure call in transport layer? Explain in detail. **[6]**

Q9) a) Explain in brief the client side and the server side of the world wide web. **[8]**

b) What is Public - key Algorithm? Explain in detail RSA algorithm. **[8]**

OR

Q10) a) Explain the steps in processing the information from an HTML form with reference to dynamic web documents. **[8]**

b) What is DNS? Which resource records are associated with it? **[8]**

Q11) a) BOOTP is the protocol of which layer? How it works? **[6]**

b) Explain in detail TELNET. **[6]**

c) A router has the following (CIDR) entries in its routing table: **[4]**

Address/mask	Next hop
135.46.56.0/22	Interface 0
135.46.60.0/22	Interface 1
192.53.40.0/23	Router 1
default	Router 2

For each of the following IP addresses, what does the router do if a packet with that address arrives?

i) 135.46.57.14

ii) 192.53.40.7

OR

Q12) a) Explain in detail how ICMP works? **[6]**

b) ARP and RARP both map addresses from one space to another. In this respect, they are similar. However, their implementations are fundamentally different. In what major way do they differ? **[6]**

c) Convert the IP address whose hexadecimal representation is C22F1582 to dotted decimal notation. **[4]**

☞ ☞ ☞

[3964]-251

B.E. (E & T/C)

TELECOMMUNICATION NETWORK MANAGEMENT

(Sem. - II) (2003 Course) (404223)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answer 3 questions from Section I and 3 questions from Section II.*
2) *Answers to the two sections should be written in separate answer sheet.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) How Computer Telecommunication networks are represented in the form of layers? What is the need of representing computer network in the form of layers? Describe OSI reference model in detail mentioning the functions of each layer. Describe how these layers are used communication between two users.   **[18]**

OR

Q2) Which are the most popular packet switched technologies? Describe them in detail.   **[18]**

Q3) To which class of networks frame relay networks belongs whether circuit switched of packet switched? What are the advantages of frame relay networks over its predecessors? What are the features of Frame Relay Networks? Describe frame relay networks using neat diagram.   **[16]**

OR

Q4) Bring out the differences between Switched Virtual Connection (SVC) and Permanent Virtual Connection (PVC). How SVCs are identified in Frame Relay Networks? What DLCI Represents? How DLCIs are assigned in frame relay networks? What is the relevance of LMI specification in Frame Relay Networks?   **[16]**

Q5) Write Notes on:

   a)   Digital Subscriber Lines (DSL)   **[8]**

   b)   Broadband Cable Modem.   **[8]**

<div align="center">OR</div>

Q6) Write Notes on:

   a)   Local Multipoint Distribution Systems.   **[8]**

   b)   ADSL verses SDSL.   **[8]**

<div align="center">

SECTION - II

</div>

Q7) What are various types of routing methods? Explain them in detail.   **[16]**

<div align="center">OR</div>

Q8) What is static and dynamic routing? With the help of neat diagrams explain static and dynamic routing in detail?   **[16]**

Q9) Write Notes on:

   a)   Delay and jitter in Networks.   **[8]**

   b)   Bandwidth and Crosstalk in Networks.   **[8]**

<div align="center">OR</div>

*Q10)*a)   Describe various issues in Network operation and maintenance.   **[8]**

   b)   Discuss security aspects of networks and how security is ensured.   **[8]**

*Q11)*What are the traps? To which devices traps are associated? How traps are represented? What information traps contain?   **[18]**

<div align="center">OR</div>

*Q12)*Answer only in one sentence.   **[18]**

   a)   What is network protection?

   b)   What are the basic requirement of protection?

   c)   What are the network protection Mechanisms?

   d)   What are the approaches for implementation of protection mechanisms?

   e)   What are the scopes of repair?

   f)   What are the two layers of recovery model?

   g)   Which layer is responsible for providing QoS?

   h)   What is network survivability?

   i)   What is the use of Repeater?

<div align="center">☛ ☛ ☛</div>

P1133   **[3964]-261**

B.E. (Instrumentation and Control)
PROCESS INSTRUMENTATION - I

(406261) (2003 Course) (Sem. - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

    1)   *Answer 3 questions from Section I and 3 questions from Section II.*

    2)   *Answers to the two sections should be written in separate books.*

    3)   *Neat diagrams must be drawn wherever necessary.*

    4)   *Figures to the right indicate full marks.*

    5)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

    6)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   State various factors considered in testing capacity of a control valve by ISA 75.02. Explain any two factors in detail. **[8]**

      b)   Explain the effect of Cavitation and Flashing. Explain the remedial measures to minimize it. **[8]**

OR

Q2) a)   Elaborate Control Valve Selection Criteria. **[8]**

      b)   State the 'Steady State Equation' for a pneumatic actuator. Explain different terms involved in the said equation. **[4]**

      c)   For a 1 inch single ported valve, area is 45 in^2 X = 5/8 in, k = 885. Calculate the pressure. **[4]**

Q3) a)   Explain the step analysis method used for computing second time constant of a process. **[9]**

      b)   Explain the effect of P + I action on a Dead time dominant Process. **[9]**

OR

Q4) a) Compare Single Capacity and Multi Capacity Process. **[9]**

b) With a suitable application, explain Process Simulator. **[9]**

Q5) a) With a suitable example explain the role of Adaptive Control in improving performance of a process. **[8]**

b) Explain how Valve Position can be used as a Secondary Control in a Cascade Control. **[8]**

OR

Q6) a) Comment on Selective Control strategy with reference to protection of equipment. **[8]**

b) What is Multivariable Control? Describe its advantages and limitations. **[8]**

SECTION - II

Q7) a) With the help of appropriate example, discuss the salient features of non linear controllers. **[9]**

b) Apply scaling and develop Instrument Scheme for distillation column for following data. **[9]**

- Internal Reflux Rate : 0 – 15000 GPM (Li)

- External Reflux Rate : 0 –10000 GPM (L)

- Temperature of overhead vapors : 150 - 250ºF

- External Reflux Temperature: 125 - 225ºF

- ΔT_{max} : 50ºF
- Cp: 0.65 BTU/lb ºF

- ΔH: 250 BTU/hr

Consider the Equation:

$$\frac{Li}{L} = \left[1 + \frac{Cp}{\Delta H}(T_0 - T_r) \right]$$

OR

Q8) a) Enumerate detailed specifications of SLPC. **[9]**

b) With the help of necessary diagram and equations explain the analysis of a typical Pressure Control Loop. **[9]**

Q9) a) With the help of a neat block diagram, explain the working of an Optimal Control. **[8]**

b) What is 'Predictive Control'? Explain its use for improving performance of process. What are its limitations? **[8]**

OR

Q10) a) Compare Conventional and Intelligent Controllers. **[8]**

b) Differentiate clearly between Adaptive Control and Self tuning Control method. **[8]**

Q11) a) With the help of block schematic, explain the working of Model Predictive Control. **[8]**

b) Explain the use of Fuzzy Logic in Process Control applications. **[8]**

OR

Q12) Write short notes on: **[16]**

a) Applications of SPC.

b) ANN based Control.

[3964]-270

P1140

B.E. (Instrumentation & Control)
COMPUTER TECHNIQUES AND APPLICATIONS

(Sem. - II) (2003 Course) (402268)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:
1) *Answer any 3 questions from each section.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full makrs.*
5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain the four conditions necessary for occurrence of deadlocks. **[8]**

     b) Explain the five CPU scheduling criteria.   **[10]**

OR

Q2) a) Explain the following with respect to Process Scheduling.   **[8]**

        i) Long term scheduler.

        ii) Short term scheduler.

        iii) Context Switching.

        iv) Mid term scheduler (with a diagram).

     b) List the various services offered by Operating Systems.   **[10]**

Q3) a) What is paging? Why is it needed in memory management? Explain the hardware required for paging.   **[8]**

     b) With neat diagrams, explain any four types of Directory Structures. **[8]**

OR

Q4) a) Explain page fault handling in demand paging on the basis of following points:

        i) A neat diagram.   **[2]**

        ii) The six steps in handling a page fault.   **[6]**

     b) What is external and internal fragmentation? How does paging help in minimizing fragmentation?   **[8]**

Q5) a) Design a Huffman code for a source that puts out symbols a1, a2, a3, a4, a5 and a6 with their respective probabilities of occurrence as 0.15, 0.25, 0.25, 0.05, 0.2 and 0.1 **[8]**

b) Write a note on Systolic Arrays on the basis of following points: **[8]**

   i) Functional block diagram.

   ii) Working.

<div align="center">OR</div>

Q6) Write a short note on: **[16]**

a) Array Processors.

b) Flynn's classification of Parallel computers.

<div align="center">

SECTION - II

</div>

Q7) Write short notes: **[16]**

a) IEEE 802.3.

b) TCP / IP reference model.

<div align="center">OR</div>

Q8) a) Explain the following with respect to Networks.

   i) LAN. **[1]**

   ii) WAN. **[1]**

   iii) Tree Topology. **[2]**

   iv) Star Topology. **[2]**

   v) Ring Topology. **[2]**

b) Draw the ISO - OSI seven layer model. Discuss the functions of each layer in brief. **[8]**

Q9) Write short notes: **[16]**

a) Operating modes of ARM processors.

b) IEEE 1394.

<div align="center">OR</div>

*Q10)*a) i) Define Software Reliability. **[2]**

ii) Explain the following Software reliability terms which can be used to quantify the reliability of software products: **[6]**

    1. Mean time between failure.

    2. Mean time to repair.

    3. probability of Failure on Demand.

    4. Rate of Occurrence of failure.

    5. Mean time to failure.

    6. Availability.

b) Discuss the technical details of IEEE 488. **[8]**

Q11) Write short notes: **[18]**

a) White Box and Black box testing.

b) Validation testing.

c) CASE tools.

OR

*Q12)*a) Explain Integration testing and explain the following three Integration test approaches: **[10]**

    i) Big - Bang Integration Testing.

    ii) Bottom - Up Integration Testing.

    iii) Top - Down Integration Testing.

b) Explain the five levels of SEI Capability Maturity Model. **[8]**

P1147   **[3964]-301**

B.E. (Chemical)

PROCESS DYNAMICS & CONTROL

(2003 Course) (Sem. - I) (409342)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

   1)   Answers to the two sections should be written in separate books.

   2)   Neat diagrams must be drawn wherever necessary.

   3)   Figures to the right indicate full marks.

   4)   Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

   5)   All questions are compulsory.

SECTION - I

Q1) a)   State languages of process control used in different countries to solve process control problems. State the nature of problems which can be solved in each language.   **[6]**

   b)   A 250 lit tank has uniform cross - sectional area of $0.25m^2$ and outlet valve resistance of 10 min/m^2. The entire system is initially at steady state with the inlet flow rate 37 lit/min.   **[6]**
        Find:
        i)   Initial liquid level in the tank.
        ii)   Transfer function of the tank system.
        iii) If the inlet flowrate was suddenly changed to 87 lit/min, then find the time required to reach level of 0.8m and also find final steady - state level of liquid.

   c)   Sketch qualitatively unit step response curves for the systems having following transfer functions.

        i) $G(s) = \dfrac{2}{1+3s}$ ii) $G(s) = \dfrac{2e^{-2s}}{1+3s}$

        iii) $G(s) = \dfrac{2}{s^2+2s+3}$ iv) $G(s) = \dfrac{R^{-3s}}{s^2+3s+2}$

        Comment on order of the system and show important response characteristics on the graphs.   **[6]**

Q2) a) Explain step - by - step procedure for developing control strategy for controlling level of liquid in surge tank based on manipulation of flow rate of liquid entering the tank. Clearly state CV, MV, OP & SP variables. Draw the corresponding diagram. **[6]**

b) Linearize the Arrhenius equation $K(T) = Ko \exp(-E/RT)$ around steady - state temperature Ts. Find laplace transform of this linearized model. **[6]**

c) A surge tank having 1m diameter supplies liquid stored in it to downstream vessel through centrifugal pump. Find transfer function of the tank relating input flow rate F_i & height h of liquid inside the tank. If input flow rate is given unit step change, find change in height after 1min. **[6]**

Q3) a) The output Y of first - order process having $K = 2, \tau = 3$min is controlled using PI - controller (having $K_c = 1$, $\tau_I = 2$ min), with first - order measuring element $(K = \tau = 1)$ and pure gain final control element $(K = 1)$. **[8]**

     i) Draw block diagram for the feedback control system described above.

     ii) Derive servo and regulator transfer functions for the system if the process has first - order disturbance $(K = 0.5, \tau = 1)$.

     iii) Find poles of the servo and regulator transfer functions and predict nature of servo & regulator response of the system.

b) i) If a first - order systems having transfer functions $G_1(s) = \dfrac{K_1}{\tau_1 s + 1}$

     is connected in parallel in opposition with first - order system having

     transfer function $G_2(s) = \dfrac{K_2}{\tau_2 s + 1}$, find the transfer function of the overall system which relates input u(t) and output y(t) of the overall system. Find poles and zeros of the transfer function.

     ii) If above system is subjected to step change in input u(t), find steady - state output response y and initial slope dy/dt of the response curve (assume $K_1 > K_2$ & $K_2/\tau_2 > K_1/\tau_1$). Sketch the response curve and comment on the response characteristics. **[8]**

OR

Q4) a) Consider two liquid tanks having $A_1 = A_2$, $R_1 = R_2/2$. Write the transfer functions relating input flow rate F_i to the first tank and level of liquid h_2 in second tank if the tanks are connected in series in:- **[8]**

  i) interacting arrangement.

  ii) non - interacting arrangement.

  iii) Compare effective time constants for both the responses and find their ratio in both the cases.

  iv) Comment on effect of interaction on speed of response of both the tanks.

b) Derive the unit step response of system having transfer function.

$$\frac{\bar{y}(s)}{\bar{u}(s)} = \frac{K(\tau_1 s + 1)}{(\tau_2 s + 1)}$$ in the form $u(t) = K\,[1-(1-\rho)\,e^{-t/\tau_2}]$, $\rho = \tau_1 / \tau_2$. sketch

the unit step response curves for $\rho < 1$, $= 1$ & > 1. **[8]**

Q5) a) i) Draw block diagram of feedback control system and explain the variables involved in it. Explain how output $y(t)$ of a process is maintained near the set - point $ysp\,(t)$ by the controller, in spite of disturbance $d(t)$.

  ii) Derive the closed - loop transfer functions for change in set - point (servo operation) and disturbance (regulator operation) variables (assume $Gm(s) = Gf(s) = 1$). **[8]**

b) i) If output $y(t)$ of a first - order process having transfer function $Gp(s) = Kp/\tau_p s+1$ is controlled using p - controller having

  $Gc = Kc$, then find the closed - loop transfer function $\bar{y}(s)/\bar{y}sp(s)$.

  ii) Comment on order of the closed - loop response and find its parameters.

  iii) Find the expression for offset if any.

  iv) Compare the gain and time constant of open - loop and closed - loop responses. **[8]**

OR

Q6) Output of second - order process having transfer function $Gp(s) = Kp/(\tau^2 s^2 + 2\tau\varsigma s + 1)$ is controlled using P controller with $G_m = G_f = 1$.**[16]**

a) Find Closed - loop transfer function and corresponding response characteristics.

b) Find the values of offset if any.

c) Compare open and closed - loop response curves and final steady - state response.

d) Describe the effects of increasing K_C & τ_I on closed - loop response.

SECTION - II

Q7) a) i) Select the gain Kc of a P - controller using the one - quarter decay ratio criterion for the process having transfer function.

$$G_p(s) = \frac{10}{(s+2)(2s+1)}, \text{ assuming that } G_m(s) = G_f(s) = 1.$$

ii) Also find the value of gain Kc for which the output undergoes sustained oscillations. Find the frequency of resulting oscillations. (Use Routh Hurwitz method)

[8]

b) The process reaction curve of a temperature control system gave the values $K = 10$, $\tau = 2$min, $td = 0.1$min. Compute the settings of

i) P - only controller.

ii) PI controller.

iii) PID controller.

Justify variation in Kc values for the above controllers (Use cohen - coon method) **[8]**

OR

Q8) a) The out put of second - order system is controlled using a PID - controller. If the actual PRC of the system (with Gm = Gf = 1) is approximated to

$$G_{PRC} = \frac{e^{-2.5s}}{20 s + 1}.$$

Then calculate the settings of the following controllers using the cohen - coon tuning technique.

i) P - only controller.

ii) PI controller

iii) PID controller

Comment on relative magnitudes of K_C & τ_I values for the above controllers. **[8]**

b) If the output second - order process having transfer function $G_p(s) = 1/(5s + 1)(2s + 1)$ is controlled using P, PI, PID controllers. If $Gm = \frac{1}{10s+1}$ & $G_f = 1$, then it is observed that the output response shows phase cross - over frequency of 0.415 rad/min. **[8]**

    i) Derive the expression for amplitude ratio (AR) of the system and hence find the values of ultimate gain Ku & ultimate period Pu.

    ii) Find settings of P, PI & PID controller using Ziegler - Nichols tuning method.

Q9) a) A feedback control system has open - loop transfer function $GH(s) = \frac{K}{s(s^2+6s+25)}$. **[10]**

    i) Draw root locus diagram for the system. Find the value of K at which the output of closed - loop system exhibit sustained oscillations. Find the corresponding frequency of oscillations.

    ii) Find the values of closed - loop poles for $K_C = 30$ & $K_C = 50$. Whether system becomes more stable or unstable as K_C is increased from 30 to 50.

b) A jacketed C.S.T.R. is used to carry out enothermic liquid phase reaction $A \rightarrow B$. **[8]**

    i) Draw and explain conventional feedback control strategy for controlling temperature inside the reactor by manipulating flow rate of cooling water circulated through jacket. Identify CV, MV, PV, DV clearly and show them on the diagram.

    ii) Draw and explain cascade control strategy for the above C.S.T.R. using temperature of cooling water as secondary controlled variable. What are advantages of using cascade control strategy over conventional feedback control?

OR

Q10) a) Explain override control system for protection of boiler drum against any damage due to excess steam pressure and / or fall in level of water below the heating coil. **[6]**

b) Explain Split - range control strategy for controlling pressure inside the reactor used to carry out gas - phase reactions. Sketch and explain the graph showing coordination of actions of control valves fitted in reactant (inlet) and product (outlet) lines. **[6]**

c) Explain feedforward control strategy for maintaining temperature of hot fluid leaving counter - current heat exchanger based on flow rate and temperature of entering cold fluid by manipulating flow rate of steam used as heating medium. **[6]**

*Q11)*a) A jacketed C.S.T.R. is used to carry out exothermic reaction A →B. There is provision for circulating cold as well as hot fluid through the jacket. Draw and explain split - range control strategy for controlling temperature inside the reactor by manipulating the proportion of flows of hot and cold fluids circulated through jacket by coordinating the actions of control valves installed in the hot and cold fluid lines. **[8]**

b) State the advantages and contents of control design form (CDF) used in design of control systems. **[8]**

OR

*Q12)*a) Draw and explain control strategy for controlling the following variables in a distillation column. **[10]**

    i) Pressure inside the column.

    ii) Level in distillate receiver.

    iii) Level in reboiler.

    iv) Top and bottom tray temperatures.

    v) Feed flow rate.

b) Explain the distinguishing issues involved in plantwide control. **[6]**

☛ ☛ ☛

[3964]-306

B.E. (Chemical)

BIOPROCESS ENGINEERING

(2003 Course) (Elective - I) (409341) (Sem. - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

   1)   Answers to the different sections must be written in separate answer books.
   2)   Assume suitable data, if necessary.
   3)   Draw neat sketches wherever necessary.

SECTION - I

Q1) a)   Explain protist kingdom with example of each class.   **[5]**

   b)   Explain co-enzymes and their applications.   **[5]**

   c)   Discuss disaccharides, polysaccharides and their functions.   **[6]**

                                    OR

Q2) a)   Explain the structure of steroids.   **[5]**

   b)   Explain yield co-efficient.   **[5]**

   c)   Explain fatty acids and their classifications with example.   **[6]**

Q3) a)   Explain process for manufacture of lactic acid.   **[10]**

   b)   Explain the manufacturing process of vitamin - A.   **[8]**

                                    OR

Q4) a)   Explain process for manufacture of penicillin.   **[10]**

   b)   Explain the manufacturing process of citric acid.   **[8]**

Q5) Derive the kinetic expression for the following:

$$E + S \Leftrightarrow ES; \qquad K_m \qquad (1)$$

$$ES \xrightarrow{\quad k \quad} E + P; \qquad (2)$$

$$E + P \Leftrightarrow EP; \qquad K_p \qquad (3)$$

Where K_m and K_p are the thermodynamic dissociation constants for reversible reactions 1 and 3 respectively. 'k' is the kinetic constant for reaction 2. What type of kinetics is represented by the above equations?   **[16]**

Q6) An enzyme was assayed at an initial substrate concentration of 10^{-5} M. The K_m for the substrate is 2×10^{-5} M. At the end of 1 min, 2% of the substrate has been converted to the product. **[16]**

    a)   What percent of the substrate will be converted to the product at the end of 3 min? What would be the product and substrate concentrations after 3 min?

    b)   If the initial substrate concentration were 10^{-6} M, what percent of the substrate will be converted to the product after 3 min?

    c)   What is the maximum attainable velocity 'V_{max}' with the enzyme concentration used?

    d)   At about what substrate concentration will 'V_{max}' be observed?

SECTION - II

Q7) What is the relative activity and the degree of inhibition caused by a competitive inhibitor when $[S] = K_m$ and $[I] = K_i$? **[18]**

OR

Q8) a)   Explain how balanced growth of microbes is needed to be maintained for chemostat and prove that for sterile feed $D = \mu$. **[8]**

    b)   Operation of a typical CSTR follows the Monod kinetics where $\mu_{max} = 0.5$ h^{-1} and $K_s = 2g/l$.

         i)   At steady state with no cell death, if $S_0 = 50$ g/l and $Y = 1$ (g cells / g substrates), what dilution rate D will give the maximum total rate of cell production?

         ii)   For the same value of D using tanks of the same size in series, how many vessels will be required to reduce the substrate concentration to l g/l? **[10]**

Q9) a)   A marine microorganism contains an enzyme that hydrolyzes glucose - 6 - sulphate (S). The assay is based on the rate of glucose formation. The enzyme in a cell - free extract has kinetic constants of $K_m = 6.7 \times 10^{-4}$ M and $V_{max} = 300$ nmoles.lit^{-1} min^{-1}. Galactose - 6 - sulphate is a competitive inhibitor (I). At 10^{-5}M galactose - 6 - sulphate and 2×10^{-5} M glucose - 6 - sulphate, 'v' was 1.5 nmoles. lit^{-1}. min^{-1}. Calculate K_i for galactose - 6 - sulphate. **[12]**

b) Calculate the peak oxygen consumption of specific yeast population in g/(lit.h). Actively respiring yeast population requires 0.32 g oxygen/ (hr.g of dry cell mass). Cell population density is 10^9 cells per ml and single cell volume is 10^{-10} ml. 80% of active cell mass is water. **[4]**

OR

Q10) An enzyme has a K_m of 4.7×10^{-5} M. If the V_{max} of the preparation is $22\,\mu$ moles/ (lit.min), what velocity would be observed in the presence of 2×10^{-4} M substrate and 5×10^{-4} M of **[16]**

a) a competitive inhibitor,

b) a non - competitive inhibitor. What is the degree of inhibition in these cases? K_i is 3×10^{-4}M.

Q11) a) Explain various geometries of enzyme catalyzed CSTRs with schematic diagram. **[5]**

b) Explain bioreactor dynamics. **[5]**

c) Explain Monod growth kinetics. **[6]**

OR

Q12) a) Explain in brief methods of immobilization of enzymes. **[8]**

b) Explain the methods of continuous sterilization of bioreactor. **[8]**

☛ ☛ ☛

P1152　　　　　　　　　**[3964]-308**

B.E. (Chemical)

POLYMER TECHNOLOGY

(2003 Course) (Elective - I) (409341) (Sem. - I)

Time : 3 Hours]　　　　　　　　　　　　　　　*[Max. Marks :100*

Instructions to the candidates:

　　1)　Answer 3 questions from Section I and 3 questions from Section II.

　　2)　Answers to the two sections should be written in separate books.

　　3)　Neat diagrams must be drawn wherever necessary.

　　4)　Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

　　5)　Assume suitable data, if necessary.

SECTION - I

Q1) a) Classify the polymer based on 　　　　　　　　　　　**[5]**

　　　i)　Natural and Synthetic polymers.

　　　ii)　Organic and inorganic polymers.

　　　iii)　Thermoplastic and thermoset polymers.

　b) Explain the factors that influence the polymer properties. 　　**[5]**

　c) What are different microstructures exist in polymers based on the chemical structure and geometrical structure explain. 　　**[6]**

　　　i)　homopolymer and copolymer.

　　　ii)　linear, branched and Cross linked polymers.

　　　iii)　random alternating and block and graft copolymers.

OR

Q2) Differentiate the following: 　　　　　　　　　　　　**[16]**

　a) Difference between thermoplastic and thermosetting polymers.

　b) Difference between Addition polymers and Condensation polymers.

Q3) What are different techniques used for polymerization, explain bulk polymerization in detail with engineering aspects of bulk and suspension polymerization. 　　　　　　　　　　　　　　**[16]**

P.T.O.

Q4) Differentiate Addition & Condensation polymers, explain Emulsion
Polymerization Techniques in detail. **[16]**

Q5) a) Explain in detail the following terms with example Molecular Weights,
Mn, Mw, Mv, polydispersity Index. **[8]**

b) Explain with neat diagram for determination of molecular wt using Gel
permeation chromatography. **[10]**

OR

Q6) a) With neat diagram explain different Methods of determination of
Molecular weight. **[8]**

b) Discuss the effect of Molecular weight on Engg. Properties of Polymers.
[10]

SECTION - II

Q7) Explain the Kinetics of free radical polymerization using nonelementory kinetics
find the rate of polymerization. **[16]**

OR

Q8) Discuss in details of kinetic of Step growth polymerization. Also explain the
Kinetics Coordination Polymerization. **[16]**

Q9) Explain details along with figure for role of compounding unit "Extrusion"
with neat temperature zones and diagram. **[16]**

OR

Q10) Explain different moulding methods of polymers and explain role of different
additives, fillers in compounding process. **[16]**

Q11) With detail flow sheet explain synthesis procedure of "Styrene Monomer".**[18]**

OR

Q12) Explain in detail with Manufacturing of typical polymers Polypropylene and
polyethylene with flow - sheet diagrams, their properties & applications.**[18]**

☛ ☛ ☛

P1153   **[3964]-309**

B.E. (Chemical)

CATALYSIS

(Sem. - I) (2003 Course) (Elective - I) (409341)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

   1)   *Answer to the different sections must be written in separate answer books.*

   2)   *Assume suitable data, if necessary.*

   3)   *All questions are compulsory.*

SECTION - I

Q1) a)   Discuss the role of supports in heterogeneous catalysis.   **[8]**

    b)   Explain homogeneous catalysis with two examples.   **[8]**

OR

Q2) a)   How homogeneous and heterogeneous catalysis is industrially useful?**[8]**

    b)   Explain the important characteristics of catalyst and their significance in industrial processes.   **[8]**

Q3) a)   State various adsorption isotherms and explain their significance.   **[8]**

    b)   Explain catalyst reforming.   **[8]**

OR

Q4) a)   Explain diffusional effect in pores of a catalyst particle.   **[8]**

    b)   Explain concept of Thiele's Modulus and its application in catalysis.**[8]**

Q5) a)   Derive Langmuir expression for adsorption theorem.   **[9]**

    b)   Derive L-H model in engineering kinetics.   **[9]**

OR

Q6) Write short notes on the following.   **[18]**

    a)   Mechanism of liquid-liquid catalysis.

    b)   Phase transfer catalysis.

    c)   Mass transfer in catalysis.

SECTION - II

Q7) a) Derive mathematical equation for determination of catalyst surface area by BET method. **[10]**

b) Describe the characteristics of supported metal catalysts, with examples. **[6]**

OR

Q8) a) What is pore volume distribution? Describe the mercury penetration method for measurement of pore volume distribution. What is N_2 desorption method? **[8]**

b) Describe the method of manufacture of Raney nickel catalyst. **[8]**

Q9) What is the relative activity and the degree of inhibition caused by a competitive inhibitor when $[S] = K_m$ and $[I] = K_i$? Derive the necessary equations. **[16]**

OR

Q10) Write short notes on the following. **[16]**

a) Michaelis - Menten kinetics.

b) protein denaturation.

c) Substrate inhibition.

d) Protein.

Q11) Write short notes on the following. **[18]**

a) Catalyst deactivation.

b) Zeolite modification.

c) Alumina as a support.

OR

Q12) Write short notes on the following. **[18]**

a) Catalytic cracking with zeolites.

b) Industrial application of molecular sieves.

c) Selectivity in zeolites.

☛ ☛ ☛

P1154   **[3964]-310**

B.E. (Chemical)

ADVANCED SEPARATION PROCESSES

(409341) (2003 Course) (Elective - I) (Sem. - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answer 3 questions from Section I and 3 questions from Section II.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of algarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain characterization of chromatography processes.   **[6]**

b) Explain fouling of membranes. How will you prevent it?   **[6]**

c) State advantages of reactive separation methods over conventional methods.   **[6]**

OR

Q2) a) Explain the characteristics of solids to be used in adsorption separation methods.   **[6]**

b) State applications of MF, UF & RO processes.   **[6]**

c) State advantages of membrane separation processes over conventional methods.   **[6]**

Q3) a) Explain TSA technique used for separation of gas mixtures.   **[8]**

b) Explain applications of chromatography in separation of enzymes and proteins.   **[8]**

OR

Q4) a) Explain PSA technique used for separation of gas mixtures.   **[8]**

b) Explain basic concepts of chromatography separation methods.   **[8]**

Q5) a) Explain deadend & crossflow MF processes used for separation of proteins. **[8]**

b) Explain reactive extraction process. **[8]**

OR

Q6) a) Distinguish between pervaporation and gas permeation processes. **[8]**

b) Explain LEM process for separation of liquid mixtures. **[8]**

SECTION - II

Q7) a) Explain foam collapse and drainage phenomena. **[6]**

b) Describe construction & MOC of molecular sieves. **[6]**

c) Describe ring oven technology used for separation. **[6]**

OR

Q8) a) Explain adsorption properties of foam. **[6]**

b) Explain adductive crystallization process. **[6]**

c) Explain ultra centrifugation process. **[6]**

Q9) a) Describe modes of operation of foam fractionation equipments. **[8]**

b) Explain froth flotation process. **[8]**

OR

Q10) a) Explain design and development of flotation equipment. **[8]**

b) How will you use bubble separation method for waste water treatment. **[8]**

Q11) Write short notes on the following:- **[16]**

a) Zone electrophoresis.

b) Use of exchange reactions for separations.

OR

Q12) a) Explain zone refining process. **[8]**

b) Explain foam formation mechanism. **[8]**

☛ ☛ ☛

P1155   **[3964]-311**

B.E. (Chemical)

PETROLEUM REFINING

(Sem. - I) (2003 Course) (Elective - I) (409341)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answer 3 questions from Section I and 3 questions from Section II.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*

SECTION - I

Q1) What is desalting of crude oil? Describe in details single and two stage desalting systems.   **[16]**

OR

Q2) a)   Write a note on chemical composition of petroleum.   **[8]**

b)   Explain various types of crude and their significance.   **[8]**

Q3) Explain any two methods used for dewaxing of lube oil.   **[16]**

OR

Q4) Draw neat flowsheet of absorption method for production of LPG. **[16]**

Q5) Along with reactions involved, discuss in details hydrocracking. **[18]**

OR

Q6) Describe with flowsheet the process of delayed coking.   **[18]**

SECTION - II

Q7) Explain hydrotreating and describe with flowsheet the process of catalytic hydrodesulfurization. **[18]**

OR

Q8) What is FCC? Discuss about FCC unit with regenerator with neat sketches.**[18]**

Q9) Discuss in details on vacuum distillation. **[16]**

OR

*Q10)*What is acid refining? Describe the process of acid refining. **[16]**

*Q11)*Write down Health, Safety and Environmental impact along with precautions in refinery. **[16]**

OR

*Q12)*Note various safety norms for safer operations of a refinery. **[16]**

☛   ☛   ☛

P1156

[3964]-312

B.E. (Chemical)

PROJECT COSTING AND APPRAISAL

(2003 Course) (409350) (Sem. - II)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

   1) *Answer three questions from each section.*
   2) *Answers to the two sections should be written in separate books.*
   3) *Neat diagrams must be drawn wherever necessary.*
   4) *Figures to the right indicate full marks.*
   5) *Use of logarithmic tables, slide ruler, Mollier Charts, electronic pocket calculator and steam tables is allowed.*
   6) *Assume suitable data if necessary.*

SECTION - I

Q1) a)   Explain the concept of market survey and market research.   **[8]**

   b)   What is meant by project evaluation? Explain.   **[8]**

OR

Q2) Explain the terms in detail.   **[16]**

   a)   Supply and demand.
   b)   Concept of cost.
   c)   Break even chart.
   d)   Techno - economic feasibility

Q3) a)   Discuss the statement of income and expenditure in detail   **[8]**

   b)   The annual direct production costs for a plant operating at 70 percent capacity are Rs. 2,80,000 while the sum of the annual fixed charges, overhead costs, and general expenses is Rs. 2,00,000.

   What is the break - even point in units of production per year if total annual sales are Rs. 5,60,000 and the product sells at Rs. 40 per unit?

   What were the annual gross earnings and net profit for this plant at 100 percent capacity when corporate income taxes required a 15 percent tax on the first Rs. 50,000 of annual gross earnings,

   25 percent on annual gross earnings of Rs. 50,000 to Rs. 75,000.

   34 percent on annual gross earnings above Rs. 75,000,

   and 5 percent on gross earnings from Rs. 1,00,000 to Rs. 3,35,000. **[8]**

OR

P.T.O.

Q4) a) Discuss with example the concept of journal and ledger entries. **[8]**

b) Explain the balance sheet with detailed analysis. **[8]**

Q5) a) What are the basic factors involved in equipment costing? **[8]**

b) Explain the terms. **[10]**

   i) Prime Cost.

   ii) Overhead Cost.

OR

Q6) a) Calculate in detail the cost of any equipment of your choice giving details about technical specifications. **[8]**

b) Explain how the allocation of over heads of various cost elements is worked out. **[10]**

SECTION - II

Q7) a) Write in detail about various methods for raising the finance. **[8]**

b) Explain the terms. **[8]**

   i) Fixed capital.

   ii) Working Capital.

OR

Q8) Write note on: **[16]**

   a) 6/10 factor rule.

   b) Bonds.

   c) Types of interest.

   d) Shares & debentures.

Q9) a) Explain in detail cash flow diagram.   **[8]**

b) With specific example explain concept of capitalized cost.   **[8]**

OR

*Q10)*a) Discuss the concept of marginal additional investment.   **[8]**

b) Explain the concept of taxes and their types.   **[8]**

*Q11)*a) Define depreciation and discuss its need and significance with limitations.
                                                                            [8]

b) Discuss various methods of determining depreciation charge.   **[10]**

OR

*Q12)*The original value of a piece of equipment is Rs. 22,000, completely installed and ready for use.   **[18]**

Its salvage value is estimated to be Rs. 2000 at the end of a service life estimated to be 10 years.

Determine the asset (or book) value of the equipment at the end of 5 years using:

a) Straight - line method.

b) Textbook declining - balance method.

c) Double declining - balance (200 percent)

P1159　　　　　　　　　　**[3964]-326**

B.E. (Petroleum Engineering)

APPLIED COMPUTATIONAL TECHNIQUES

(412385) (2003 Course) (Elective - I) (Sem. - I)

Time : 3 Hours]　　　　　　　　　　　　　　　*[Max. Marks :100*

Instructions to the candidates:

　　1)　Answers to the two sections must be written in separate answer books.

　　2)　Attempt three questions from each section.

　　3)　Figures to the right indicate full marks.

　　4)　Neat diagrams should be drawn wherever necessary.

　　5)　Use of a electronic pocket calculator is allowed.

　　6)　Assume suitable data if necessary.

SECTION - I

Q1) a)　Find the roots of the equation $x^3 + 3x^2 + 3x - 5 = 0$, using Bisection method. **[6]**

　　b)　Find the roots of the equation using $x^2 + xy = 10$, $y + 3xy = 52$ by Newton Raphson method. **[6]**

　　c)　Give one example of linear and non linear equations in Petroleum Engineering. What do the roots represent? **[4]**

Q2) Given the differential equation, $y' = 2xy + x.$ $y(0) = 3$, $h = 0.1$

　　a)　Using Runge Kutta 5, find $y(0.1)$ **[6]**

　　b)　Using Adams Bashforth Predictor Corrector Method find $y(0.1)$. **[8]**

　　c)　Give two examples of differential equations in Petroleum Engineering.**[2]**

Q3) Write a detailed note on software package in Petroleum Engineering Reservoir Simulation, with reference to data required, equations used. **[18]**

Q4) a)　Write an algorithm for solving an integration using simpson 3/8 rule. **[7]**

　　b)　Write an algorithm for solving an integration using Gauss Quadrature.**[7]**

　　c)　Give two examples of numerical integration in Petroleum Engineering.**[2]**

Q5) Do only one iteration for the problem below and use (1, 1, 1) as the starting value.

For the system of equations $3x - y + 2z = 13$, $x - 7y - 3z = -34$, $3x - 2y + 10z = 50$, find x, y, z using Jacobi method and LU Decomposition method $w = 1.1$.   **[16]**

SECTION - II

Q6) a)   Explain the concept of designing the database.   **[14]**

b)   Draw a flow chart to explain any root finding process?   **[4]**

Q7) a)   Explain LAN, WAN.   **[8]**

b)   Draw a flow chart to show any area finding algorithm.   **[8]**

Q8) a)   Explain fuzzy logic, genetic algorithm and AI in Petroleum Industry.   **[8]**

b)   Draw a flow chart to show the SOR technique.   **[8]**

Q9) a)   Explain the various forms of Inheritance and write a programme for the following problem using Inheritance. Create class PI containing variables, q,L Pr, and Pwf and find K. Inherit the class PI. $Q = K/Delp$, $K = 1/L$.   **[10]**

b)   Explain the concept of classes.   **[6]**

Q10) a)   Explain the use of Petroleum Engineering Software in real time oil industry.   **[10]**

b)   Draw the flow chart to explain any one Petroleum Engineering Software.   **[6]**

☛   ☛   ☛

P1162   **[3964]-345**

B.E. (Polymer Engineering)
POLYMER REACTION ENGINEERING

(Sem. - I) (2003 Course) (Elective - I) (409366)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answers to the two sections should be written in separate books.*

2) *Draw neat diagrams wherever necessary.*

3) *Numbers to the right indicate full marks.*

4) *Assume suitable data, if necessary.*

5) *Use of logarithmic table, electronic pocket calculators is allowed.*

SECTION - I

Q1) a) Discuss the distinction between chain polymerization Vs Step Polymerization based on kinetics. **[8]**

b) Discuss the importance of molecular weight and molecular weight distribution of polymer. **[8]**

OR

Q2) a) Explain the role of residence time distribution and the concentration history in Polymerization reaction. **[8]**

b) Explain the importance of Polymerization reaction engineering. **[8]**

Q3) a) Discuss all the mechanism steps to be used in Free radical polymerization with one suitable example. **[8]**

b) Derive the necessary relationship obtained in giving Molecular weight distribution in CSTR for free radical type polymerization. **[10]**

OR

Q4) a) Discuss in detail Molecular weight distribution obtained via step growth polymerization. **[10]**

b) Discuss the Instantaneous number Degree of Polymerization. **[8]**

Q5) Discuss the model to find the rate of polymerization in case of emulsion polymerization. **[16]**

OR

Q6) Estimate a model for predicting rate of propagation in irreversible step growth polymerization at high conversion level where diffusion effect is predominates. **[16]**

SECTION - II

Q7) Give technology overview for the following polymer **[18]**
   a)   SBR rubber.
   b)   Nylon 6.
   c)   Polystyrene.

OR

Q8) Write a short note on reactor systems used for PET, PVC polymers. **[18]**

Q9) a)   Discuss the role of mass transfer in step growth polymerization. **[8]**
   b)   Write a note on gel effect in step growth polymerization. **[8]**

OR

*Q10)*a)   Discuss the conclusion from kinetics studies in free radical polymerization. **[8]**
   b)   Discuss the necessary equation of the total rate of the disappearance of the monomer M via Initiation, Propagation, and the termination reaction by monomer transfer. **[8]**

*Q11)*a)   Discuss in detail the control problem in polymer reactor. **[8]**
   b)   Discuss the choice between batch and continuous reactor for polymerization process. **[8]**

OR

*Q12)*a)   Write a short note on Reactor Selection for carrying out polymerization reaction. **[8]**
   b)   Explain the reactor design in terms of following factors
       Polymerization Mechanism, Stoichiometric Factors, Thermodynamics Factors, and Transport Limitations. **[8]**

☛ ☛ ☛

P1164   **[3964]-365**

B.E. (Computer)

IMAGE PROCESSING

(2003 Course) (Elective - I) (410445) (Sem. - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

  1)   *Neat diagrams must be drawn wherever necessary.*

  2)   *Figures to the right indicate full marks.*

  3)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   Explain with neat diagram the fundamental steps used in image processing.   **[10]**

   b)   Discuss in detail the Orthogonal transform.   **[6]**

                                     OR

Q2) a)   Explain in context with image processing following terms.   **[10]**

      i)   Fuzzy sets.   ii)   Vector Algebra.

   b)   How will you represent a digital image.   **[6]**

Q3) a)   Define image sampling and Quantization and explain the process of Digital Image Formation.   **[8]**

   b)   Explain the Geometry aspect of Digital Imaging.   **[8]**

                                     OR

Q4) a)   Describe the photographic Model properties and their relation to Image Processing application.   **[8]**

   b)   Discuss the important transformation used in Imaging.   **[8]**

Q5) a) Describe Image Enhancement and write a pseudocode of obtaining the negative of an Image. **[8]**

b) Distinguish between Lossy Compression and Lossless compression. Explain in brief which technique is better and under what circumtances.**[10]**

OR

Q6) Write a short note on **[18]**
a) Square Error Restoration Technique.
b) Homomorphic Filtering.
c) Histogram Equilization.

SECTION - II

Q7) a) An Image Processing package allows the user to design 3×3 convolution filters. Design 3×3 filter to perform following tasks:
i) Bluring.
ii) Edge detechon of Vertical Edges.

Choose one of the two filters
i) or
ii) from the previous part and Explain how it works, using the following image as an example (you may round off any calculated values to the nearest integer).

100	100	100	0	0	0
100	100	100	0	0	0
100	100	100	0	0	0
100	100	100	100	100	100
100	100	100	100	100	100
100	100	100	100	100	100 **[12]**

b) Explain the elements of Image Analysis. **[4]**

OR

Q8) a) How Edge detection operator are applied to a real time Application. Explain in detail. **[8]**

b) Explain the concept of region oriented segmentation. **[8]**

Q9) a) How will you obtain HSI component images from an RGB Image. **[8]**

b) Explain the Morphology techniques used in image processing. **[8]**

OR

*Q10)*a)   Explain the pruning methods used in thinning and skeletonizing algorithm.

[8]

b)   Discuss the color models in details.   **[8]**

*Q11)*a)   What is the Role of Image processing in Multimedia Domain.   **[8]**

b)   Explain conceptually any two application of Image Processing in Real time situation.   **[10]**

OR

*Q12)*Write a short note on Application of Image Processing in: **[18]**

a)   Medical Analysis.

b)   Weather Forecasting.

c)   Water Marking.

P1165

[3964]-366

B.E. (Computer)

ADVANCED DATABASES

(2003 Course) (410445) (Elective - I) (Sem. - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1)   Answer three questions from Section I and three questions from Section II.

2)   Answers to the two sections should be written in separate books.

3)   Neat diagrams must be drawn wherever necessary.

4)   Figures to the right indicate full marks.

SECTION - I

Q1) a)   Why Hash partitioning is not well suited for answering range queries?**[3]**

b)   What is meant by Cache - Coherency problem? Explain any one protocol to gurantee Cache - Coherency in shared - disk system.   **[6]**

c)   Explain partitioned parallel Hash join.   **[7]**

OR

Q2) a)   What form of parallelism is likely to be the most important for each of the following tasks?   **[6]**

i)   Increasing the throughput of a system with many small queries.

ii)   Increasing the throughput of a system with a few large queries, when the number of disks and processors is large.

b)   How the execution of a single query can be parallelized?   **[8]**

c)   What is meant by execution skew?   **[2]**

Q3) a)   Explain how the two - phase commit protocol handle the following failures.**[8]**

i)   Network partition.

ii)   Failure of a participating site.

b)   What is meant by Persistent messaging? Explain   **[6]**

c)   Explain the notions of transparency and autonomy. Why are these notions desirable from a human - factor stand point?   **[4]**

OR

Q4) a) Mention different concurrency - control schemes in distributed databases. Explain any two. **[8]**

b) Explain Lazy propagation. **[4]**

c) When is it useful to have replication or fragmentation of data? Explain your answer. **[6]**

Q5) a) What is a three - tier architecture? What advantages does it offer over single - tier and two - tier architectures? Give a short overview of the functionality at each of the three tiers. **[10]**

b) Which are different parsers for XML? Explain them in brief. **[6]**

OR

Q6) a) Why do we have XML DTDs? What is a well - formed XML document? Give an example of an XML document that is valid but not well - formed and Vice Versa. **[10]**

b) Why do we need to maintain state at the middle tier? What are cookies and how does a browser handle cookies? **[6]**

SECTION - II

Q7) a) Suppose that the data for analysis includes the attribute age. The age values for the data tuples are 4, 8, 15, 21, 21, 24, 25, 28, 34. Using the following binning methods for data smoothing, show the resultant data.

 i)   Bin medians.

 ii) Bin boundaries.

 iii) Bin means

Illustrate your steps. **[9]**

b) Explain multidimensional data model in detail. **[7]**

OR

Q8) a) In real - world data, tuples with missing values for some attributes are a common occurrence. Describe various methods for handling this problem. **[8]**

b) Explain the following: **[8]**

 i)   Data Cube.

 ii) OLAP.

Q9) a) A database has five transactions.

Let min - sup = 60% and min - conf = 80% **[8]**

TID	Items - bought
T100	{M, O, N, K, E, Y}
T200	{D, O, N, K, E, Y}
T300	{M, A, K, E}
T400	{M, U, C, K, Y}
T500	{C, O, O, K, I, E}

Find all frequent itemsets using Apriori.

   b) Explain in detail classification and prediction. **[8]**

   c) What is meant by Text Mining. **[2]**

OR

Q10) a) State and explain the algorithm to generate tree from training tuples. **[8]**

   b) Discuss the variants of K - means method. How can we make K - means algorithm more scalable? **[8]**

   c) What is meant by bayesian classifier? **[2]**

Q11) a) What is the difference between a false positive and a false drop? If it is essential that no relevant information be missed by an information retrieval query, is it acceptable to have either false positives or false drops? Why?
[4]

   b) Explain the following **[12]**

   i) Inverted Index   ii) Ontologies   iii) Relevance Ranking.

OR

Q12) a) The Google search engine provide a feature whereby websites can display advertisements supplied by Google. The advertisements supplied are based on the contents of the page - suggest how Google might choose which advertisements to supply for a page, given the page contents. **[4]**

   b) Explain the following: **[12]**

   i) Random walk model.

   ii) Vector space model.

   iii) Hub/authority ranking.

P1166   **[3964]-367**

B.E. (Computer Engineering)

ARTIFICIAL INTELLIGENCE

(Elective - I)(2003 Course) (410445) (Sem. - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1)   Answer 3 questions from Section I and 3 questions from Section II.

2)   Answers to the two sections should be written in separate books.

3)   Neat diagrams must be drawn wherever necessary.

4)   Assume suitable data, if necessary.

SECTION - I

Q1) a)   Define Artificial Intelligence. List the applications of Artificial Intelligence.
     [8]

     b)   What is logic programming? Explain forward and backward chaining.**[8]**

                                    OR

Q2) a)   What are intelligent agents? Explain the architecture of a typical agent.**[8]**

     b)   For the following problem have a state space representation and solve the water jug problem. There are two jugs, a 5 gallon and other a 3 gallon with no measuring marker on them. There is endless supply of water through the tap. Goal is to get 4 gallons of water in the 5 gallon jug. **[8]**

Q3) a)   Explain the A* algorithm to solve a problem. How is it possible to avoid loops in A*?   **[10]**

     b)   Explain Means End Analysis with an example.   **[8]**

                                    OR

Q4) a)   Explain Hill Climbing algorithm. Explain plateau, ridge, local maxima and global maxima.   **[8]**

     b)   Explain alpha beta cut off with an example. Show a game tree to explain.
     [10]

                                                            P.T.O.

Q5) a) State the rules for converting a given well formed formula to clause form. **[8]**

b) Write a note on frames and script. **[8]**

OR

Q6) a) Show how a JTMS could be used to select a TV program to watch. Consider such as, "If it is 6:00, then watch the news on Channel 2 unless there is a cricket match still going on". **[8]**

b) Represent the following sentences in conceptual dependency? **[8]**

i) John is a doctor.   ii) Mary kicked the ball.

iii) John gave flower vase to Mary.   iv) Mary cried.

SECTION - II

Q7) a) Describe any of the two learning methods. **[8]**

b) Explain Goal Stack planning with an example of Block World. **[10]**

OR

Q8) a) Explain Waltz's algorithm with an example. **[8]**

b) Explain Non-Linear Planning and Hierarchical Planning. **[10]**

Q9) a) Explain in brief the various phases in natural language processing. **[8]**

b) Draw a RTN which can parse a sentence correctly for, **[8]**

i) Sally wanted a new car.

ii) The big boy cut a mango with the black knife.

OR

Q10) a) Explain the Robot architecture. **[8]**

b) Explain an ATN with an example. **[8]**

Q11) a) Give detailed architecture of Expert System and explain its components. **[8]**

b) Explain in detail the Single Layer feed forward artificial neural network architecture. **[8]**

OR

Q12) a) Applications of neural network. **[8]**

b) What is the difference between expert system and traditional system? Comment on the advantages and disadvantages of expert system. **[8]**

☛ ☛ ☛

P1168

[3964]-372

B.E (Computer Engg.)
DISTRIBUTED SYSTEMS
(Elective - II) (2003 Course) (Sem. - II) (410451)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:
  1)   *Answers to the two sections should be written in separate answer books.*
  2)   *Neat diagrams must be drawn wherever necessary.*
  3)   *Figures to the right indicate full marks.*
  4)   *Use of logarithmic tables, slide rule, mollier charts, electronic pocket calculator and steam table is allowed.*
  5)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   What is the reason for developing distributed shared memory systems? What do you see as the main problem hindering efficient implementations? **[8]**

   b)   Explain three fundamental models that help to reveal key problems for the designers of distributed systems. **[6]**

   c)   What is an open distributed system and what benefits does openness provide? **[4]**

OR

Q2) a)   Explain what false sharing is in distributed shared memory systems. What possible solutions do you see? **[8]**

   b)   Compare between distributed operation system and middleware based distributed systems. **[6]**

   c)   Explain in brief different challenges in designing distributed systems.**[4]**

Q3) a)   Explain the basic organization of RSVP for resource reservation in a distributed system. **[8]**

   b)   How would you incorporate persistent asynchronous communication into a model of communication based on RMIs to remote objects? **[8]**

OR

P.T.O.

Q4) a) Assume a client call an asynchronous RPC to a server, and subsequently waits until the server returns a result using another asynchronous RPC. Is this approach the same as letting the client execute a normal RPC? What if we replace the asynchronous RPCs with one way RPCs? **[8]**

b) Explain different forms of message oriented communication with diagrams. **[8]**

Q5) a) Explain basic NFS architecture for UNIX systems. **[6]**

b) Explain approaches for caching file data in NFS. **[6]**

c) Explain side effects in Coda's RPC2 systems. **[4]**

OR

Q6) a) Explain in brief approaches to locate mobile entity. **[8]**

b) Compare the following distributed file systems: NFS, CODA, xFS. **[8]**

SECTION - II

Q7) a) Many distributed algorithms require the use of a coordinating process. Explain to what extent such algorithms can actually be considered. **[8]**

b) Explain with suitable example how causality can be captured with vector timestamps. **[6]**

c) Explain importance of clock synchronization in distributed systems. **[4]**

.

OR

Q8) a) Explain and compare three mutual exclusion algorithms. **[8]**

b) Compare Cristian's algorithm and Berkeley's algorithm. **[6]**

c) Explain why optimistic concurrency control is more restrictive than using timestamps. **[4]**

Q9) a) What is dependability? Explain in brief requirements of dependable distributed systems. **[8]**

b) Explain how failure masking can be done using (TMR) triple modular redundancy. **[8]**

*Q10)*a) What is Byzantine failure? Explain Byzantine generals problem with possible solutions. **[8]**

b) Explain different classes of failures that can occur in RPC systems. **[8]**

*Q11)*a) What is GRID? Discuss in detail the difference between Grid and Cluster. **[8]**

b) Explain CORBA ORB Architecture with the help of neat diagram. **[8]**

OR

*Q12)*a) What is Cluster? Describe the design issues of Cluster computing systems. **[6]**

b) Explain steps to build a CORBA application. **[6]**

c) What is virtual organization concept in Grid? **[4]**

☛ ☛ ☛

P1169   **[3964]-373**

B.E (Computer Engineering and Information Technology) (Common)
SOFTWARE ARCHITECTURE
(2003 Course) (Elective - II) (410451) (Sem. - II)
(Theory)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

  1) *Figures to right indicate full marks.*
  2) *Answers to TWO sections should be written in separate answer books.*
  3) *From Section I, Answer (Q1 OR Q2) AND (Q3 OR Q4) AND (Q5 OR Q6).*
  4) *From Section II, Answer (Q7 OR Q8) AND (Q9 OR Q10) AND (Q11 OR Q12)*
  5) *Make suitable assumptions wherever relevant and appropriate.*

SECTION - I

Q1) a) Compare and contrast and also give relationship between requirements and design. Illustrate with examples.   **[6]**

  b) What do you understand by software architecture, give examples of any system to show how architecture impacts the system.   **[6]**

  c) Write short Notes on documenting software architecture.   **[6]**

OR

Q2) a) What do you understand by the statement that architecture is an abstraction (black box with interfaces).   **[6]**

  b) What do you understand by the activity of software architecture: 'Creating the business case for the system'.   **[6]**

  c) List all the common software architecture structures (Hint module, deployment..).   **[6]**

Q3) Discuss for the 'Modifiability' quality attribute of any software system, the given aspects with relevant examples of your choice.   **[16]**

  a) Why does one need to modify software during development process itself?

  b) Why does one need to modify system after user has started using it (maintenance phase).

  c) A sample quality attribute scenario for 'Modifiability'.

  d) 'Maintaining existing Interfaces' tactics for 'Modifiability'.

Q4) Explain the given terms in context of QUALITY. **[16]**
  a) Importance of achieving 'performance' for any system.
  b) Quality attributes.
  c) Testability.
  d) Relationship between design and quality.

Q5) a) Historically what is the role and importance of patterns of Christopher Alexander and Gang of Four patterns. **[6]**
  b) Give code for 'factory method' design pattern in C++. **[6]**
  c) Define design pattern and explain the definition. **[4]**

OR

Q6) a) Write short notes on MVC pattern (in Java) **[6]**
  b) Compare adaptor and mediator pattern. **[6]**
  c) What do you by understand by behavioral patterns. **[4]**

SECTION - II

Q7) a) Describe a system of your choice (that can use relevantly the following java technologies) and describe its requirements. Then show why and how the following java technologies can be used in that system: Core java, Java socket APIs. **[8]**
  b) Compare the following: **[8]**
    i) J2SE and J2EE
    ii) EJB 2.0 and EJB 3.0

.

OR

Q8) a) Compare the java world and Microsoft world for their middleware offerings .NET and J2EE. **[8]**
  b) What is the need for the following technologies. **[8]**
    i) J2ME.   ii) Java APIs.

Q9) a) With respect to World Wide Web, what do you understand by the following terms. **[8]**
    i) URL, domain names   ii) REST.
  b) Write in brief on TECHNOLOGIES important. **[8]**
    i) to connect browsers to servers.
    ii) for us to connect our computers to Internet.

OR

*Q10)*In brief explain the concept and give good examples to illustrate.   **[16]**

    a)   Server side responsibilities.

    b)   XML DOM.

    c)   Custom controls in VB.

    d)   need for JSF.

*Q11)*a)   Write short Notes on Distributed COM.   **[6]**

    b)   What is the idea behind distributed applications.   **[6]**

    c)   Write short Notes on .NET ARCHITECTURE.   **[6]**

OR

*Q12)*a)   Write an implementation for IUnknown interface.   **[6]**

    b)   Compare COM and .NET.   **[6]**

    c)   What are active X controls.   **[6]**

☛ ☛ ☛

P1170   **[3964]-387**

B.E. (IT)

ORGANISATIONAL BEHAVIOUR & MANAGEMENT CONCEPTS (Sem. - I)

(2003 Course) (Elective - I) (414445)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

    1)   *All questions are compulsory.*

    2)   *Use two separate answer books for Section I & Section II.*

    3)   *Figures to the right indicate full marks.*

SECTION - I

Q1) Explain what is organisational behaviour. How is it useful to modern day managers? **[16]**

<center>OR</center>

Elaborate any two models of OB.

Q2) Compare Maslow's need hierarchy with Herzberg's two factor theory of motivation. **[16]**

<center>OR</center>

What are the sources of stress and its ill - effects of humans in organisation?

Q3) Write short notes on any three: **[18]**

    a)   Competency.

    b)   Defence Mechanism.

    c)   Morale & productivity.

    d)   Types of groups.

    e)   Perception.

SECTION - II

Q4) Explain the terms organisational climate and organisational culture. **[16]**

OR

What is leadership? What is its importance to organisations?

Q5) Resistance to change is inevitable but managements overcome resistance to change. How? **[16]**

OR

Explain the concept of TQM in detail.

Q6) Write short notes on any three: **[18]**

a)   Re - engineering.

b)   Constructive conflict.

c)   Leadership style.

d)   Path & Goal theory.

e)   Organisational effectiveness.

☞ ☞ ☞

P1172

[3964]-389

B.E. (Information Technology)

DISTRIBUTED SYSTEM

(2003 Course) (414449) (Sem. - II)

Time : 3 Hours] *[Max. Marks :100*

Instructions to the candidates:

1) *Answer Question 1 or 2, 3 or 4, and 5 or 6 from section - I and Question 7 or 8, 9 or 10, and 11 or 12 from section - II.*
2) *Answers to the two sections should be written in separate answer sheet.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What is marshalling? What are the different approaches of external data representation? **[8]**

b) Scalability can be achieved by applying different techniques. What are these techniques? **[8]**

OR

Q2) a) Give five types of hardware resource and five types of data or software resource that can be usefully shared. Give examples of their sharing as it occurs in distributed systems. **[8]**

b) Distinguish between the client - server and peer - to - peer models of distributed systems. **[8]**

Q3) a) A client makes RMIs to a server. The client takes 5 ms to compute the arguments for each request, and the server takes 10 ms to process each request. The local OS processing time for each send or receive operation is 0.5 ms, and the network time to transmit each request or reply message is 3 ms. Marshalling or unmarshalling takes 0.5 ms per message. Estimate the time taken by the client to generate and return from 2 requests: **[8]**

i) if it is single - threaded, and

ii) if it has two threads which can make requests concurrently on a single processor. Is there a need for asynchronous RMI if processes are multi - threaded?

b) What is group communication? Explain different types of group communication. **[8]**

Q4) a) Routing tables in IBM MQSeries, and in many other message - queuing systems, are configured manually. Describe a simple way to do this automatically. **[8]**

b) What is RMI? How would you incorporate persistent asynchronous communication into a model of communication based on RMIs to remote objects? **[8]**

Q5) a) Write a short note on Caching and Replication in CODA file system.**[10]**

b) Draw and explain NFS security architecture and give detail functions of layers. **[8]**

OR

Q6) a) Highlights desirable features of good distributed file system. List the functions of distributed file system. **[10]**

b) Draw and explain simple auto - mounting for NFS? **[8]**

SECTION - II

Q7) a) Two processes detect the failure of the coordinator simultaneously and both decide to hold an election using election algorithms. Compare Bully algorithm with Ring Algorithm. **[8]**

b) Write Berkeley Algorithm for Clock Synchronization in pseudo C. Explain it with suitable example. **[8]**

OR

Q8) a) Define: **[8]**
   i) International Atomic Time.
   ii) Mean Solar Second.
   iii) Universal Coordinated Time.
   iv) Leap Second.

b) What is a distributed Deadlock? What are the necessary conditions for deadlock to occur in distributed environment? **[8]**

Q9) a) Explain Byzantine generals problem. **[8]**

b) For each of the following applications, do you think at - least - once semantics or at most once semantics is best? Discuss. **[8]**
   i) Reading and writing files from a file server.
   ii) Compiling a program.
   iii) Remote banking.

*Q10)*a) What is message ordering? Explain FIFO order and causally ordered multicast. **[8]**

b) What is check pointing? Explain independent check pointing and coordinated check pointing. **[8]**

*Q11)*a) Draw and explain CORBA ORB architecture. **[10]**

b) Explain in brief the steps to build CORBA application. **[8]**

OR

*Q12)*a) Explain different types of clusters with example. **[10]**

b) How do clustered systems differ from multiprocessor systems? What is required for two machines belonging to a cluster to cooperate to provide a highly available service? **[8]**

☞ ☞ ☞

P1175   **[3964]-392**

B.E. (Biotechnology)

ENZYME AND FERMENTATION ENGINEERING

(Sem. - I) (2003 Course) (416282)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1)   Answer three questions from Section I and three questions from Section II.

2)   Answers to the two sections should be written in separate answer books.

3)   Neat diagrams should be drawn whenever necessary.

4)   Figures to the right indicate full marks.

<u>SECTION - I</u>

Q1) Derive the Michaelis-Menten equation for kinetics of enzyme acting on one substrate. State the assumptions made and explain the significance of the constants in the equation.   **[16]**

OR

Q2) a)   Explain the various mechanisms leading to enzyme deactivation.   **[8]**

b)   Explain the mechanism of substrate activation and inhibition. Also give the expressions representing the respective kinetics.   **[8]**

Q3) a)   What is solid state fermentation? Enlist the characteristics, applications, advantages and disadvantages of solid state fermentation.   **[10]**

b)   Write a note on the construction, working and applications of an air-lift bioreactor.   **[8]**

OR

Q4) a)   Write notes on the following topics (any two):   **[12]**

     i)   Fed - batch mode of fermenter operation.

     ii)   Advantages and disadvantages of submerged fermentation.

     iii) Bubble column.

b)   Enlist the characteristics of the batch mode of operating fermenters. **[6]**

P.T.O.

Q5) a) What are the various factors which affect the power consumption in a mechanically agitated fermenter? Describe each factor in brief. **[10]**

b) What are the different steps involved in the transfer of oxygen from air bubble to the cells? Which of these steps is the rate controlling step?**[6]**

OR

Q6) Write notes on the following: **[16]**

a) Control of dissolved oxygen in a fermenter.

b) Factors affecting the mass transfer in fermenters.

c) Factors causing change in rheology of fermentation broth.

d) Effect of increasing gas velocity on fermenter performance.

SECTION - II

Q7) a) Explain with the help of temperature - time profile, the procedure used for batch sterilization. **[8]**

b) What are the different considerations to be taken into account while scaling up of a fermenter system? **[8]**

OR

Q8) a) What is HTST sterilization? What are its advantages? **[8]**

b) Write notes on the following (any two): **[8]**

i) Inoculum development for a production scale fermenter.

ii) Configurations used for continuous steam sterilization.

iii) Operating parameters for scale - up.

Q9) a) What are the advantages offered by immobilization of enzymes? Describe the different methods of immobilization of enzymes. State their advantages and disadvantages. **[12]**

b) What are the different factors affecting the kinetics when an enzyme is immobilized on the internal surface of a support? Write the steady state equation for diffusion in this case. **[6]**

OR

*Q10)*a)   Enlist the industrial processes utilizing immobilized enzymes. Explain
        one in detail.   **[10]**

    b)   What is the Damköhler's no.? Explain its significance in distinguishing
        between different rate limiting regimes in immobilized enzyme kinetics?**[8]**

*Q11)*Write notes on the following (any four):   **[16]**

    a)   Bioreactors for animal cell cultures.

    b)   Design criteria for bioreactors for plant cell.

    c)   Antibody production using disposable reactors.

    d)   Microfermentation.

    e)   Advantages of semi - synthetic fermentation.

    f)   Disadvantages of disposable bioreactors.

P1209   **[3964]-109**

B.E. (Civil)

ARCHITECTURE AND TOWN PLANNING

(Sem. - I) (2003 Course) (Elective - I) (401005)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Assume suitable data, if necessary.*
2) *Figures to the right indicates full marks.*
3) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from section I and Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from Section II.*

SECTION - I

Q1) a) Explain how Building planning principles and Architecture planning principles are useful in designing any structure. **[9]**

   b) How factors in architecture influence the design? **[8]**

<div align="center">OR</div>

Q2) a) Compare and contrast gothic & Renaissance architecture. **[9]**

   b) Giving suitable examples explain 'A structure depicts qualities of architecture' **[8]**

Q3) a) Explain the importance of Neighbourhood concept in case of urban design. **[9]**

   b) Write a short note on any two: Work of Ebenzar Haward., Garden city giving examples, T.P. Schemes. **[8]**

<div align="center">OR</div>

Q4) a) What planning aspects are dealt with Neighbourhood? **[9]**

   b) Establish the relation within connectivity matrix and planning. **[8]**

Q5) a) How infrastructure is supported through UDPFI? **[8]**

   b) Describe the aims, objectives and contents of MRTP Act. **[8]**

<div align="center">OR</div>

Q6) a) Explain in detail ULC Act.   **[8]**

   b) Define D.P. and mention the surveys & aspect of D.P.   **[8]**

SECTION - II

Q7) a) Describe in details the different landscaping elements.   **[9]**

   b) What is the concept of soft & hard landscape?   **[8]**

                                    OR

Q8) a) What is landscape design? Explain with sketches the various aspects of landscape planning.   **[9]**

   b) Write short note on: Soft landscape, Elements of landscape.   **[8]**

Q9) a) Explain in details how will you carry out a traffic & transportation survey for D.P.   **[8]**

   b) Which factors will you consider for the drainage system of a new town?**[9]**

                                    OR

*Q10)*a) Write a note on Demographic survey.   **[8]**

   b) Which factors will you consider for the water supply scheme of a new town? Explain.   **[9]**

*Q11)*a) Describe the role of GIS, GPS & remote sensing in town planning. **[8]**

   b) Explain the importance of new techniques such as GIS, GPS & remote sensing during disasters.   **[8]**

                                    OR

*Q12)*Write short note on: Use of GPS in transportation., GPS segments, Remote Sensing. Applications of GIS in town Planning.   **[16]**

☛ ☛ ☛

P1210   **[3964]-115**

B.E. (Civil)

ADVANCED STRUCTURAL DESIGN

(2003 Course) (Elective - II) (401007) (Sem. - II)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Attempt Q. 1 or Q. 2, Q. 3 or Q. 4 from Section I and Q. 5 or Q. 6, and Q. 7 or Q. 8 from Section II.*

2) *Answers to the two sections should be written in separate answer books.*

3) *Neat diagram must be drawn wherever necessary.*

4) *Figure to the right indicates full marks.*

5) *Assume suitable data, if necessary.*

6) *Use of cell phone is prohibited in the examination hall.*

7) *Use of electronic pocket calculator, steel table and relevant IS code is allowed.*

SECTION - I

Q1) Select suitable configuration of the truss and determine the maximum compressive and tensile force in the leg at the base for a 40 m microwave antenna tower is to be built near Pune. The terrain at the location is a level ground. It has to carry a 2.5 m diameter hemispherical antenna disc at the top.   **[25]**

a)   Width at the top of tower = 3m

b)   Width of tower at bottom = 5m

c)   Weight of platform at top = 0.75 kN/m²

d)   Weight of railing at top = 0.25 kN/m

e)   Weight of ladder and cage = 0.50 kN/m

f)   Weight of antenna disc and fixture = 10 kN

g)   Self weight of truss = 6 kN/m

h)   Terrain category II and class of building B.

OR

Q2) Two channel sections without bent lips 200 mm × 50 mm and 2.5 mm thick are connected with webs to act as beam. The effective span of a simply supported beam is 8 m. The beam is laterally supported throughout its length. Determine the maximum uniformly distributed load inclusive of self weight which can be supported by the beam. Assume f_y = 232 N/mm² and I_x = 2 x 390.307 x 10⁴ mm⁴.   **[25]**

P.T.O.

Q3) Design a hoarding board of size 4 m x 8 m, with minimum height from ground = 3.8 m. Take basic wind velocity in the area as 40 m/s. Try alternative support systems design the anchor block. **[25]**

OR

Q4) Design an open web (castellated beam) for a span of 16.2 m. The dead load coming on roofing is 1 kN/m^2 and live load on the roof is 1.8 kN/m^2. Calculate the spacing of the beam and check for shear and deflection. Adopt suitable pattern of castellation and adjust the section such that overall depth of section should not exceed 900mm. Assume f$_y$ = 250 Mpa. **[25]**

SECTION - II

Q5) A simply supported rectangular R C grid floor is 12 m x 15 m with centre to centre spacing of grid 1.5 m in both the directions. Take live load = 3kN/m^2 and floor finish = 1.2 kN/m^2. Use M$_{20}$ grade of concrete and Fe$_{500}$ grade of steel. Draw the details of the reinforcement in beams and slab. **[25]**

OR

Q6) Design simply supported circular slab of 6 m diameter, subjected to service live load of 4.5 kN/m^2 and floor finish of 1 kN/m^2. Use M$_{20}$ grade of concrete and Fe$_{415}$ grade of steel. Draw the reinforcement details. **[25]**

Q7) Design a counterfort retaining wall for the following data.

Height of wall above ground level = 6 m

Safe bearing capacity of soil = 160 kN/m^2

Angle of repose = 30º

Unit weight of soil = 16000 N/m^3

Spacing of counterfort = 3m

Coefficient of friction between soil and concrete = 0.5

Use M$_{20}$ grade of concrete and Fe$_{415}$ grade of steel. Draw the reinforcement details. **[25]**

OR

Q8) Design an interior panel of size 6 m x 6 m of a flat slab with suitable drop to support a live load of 4000 N/m^2. The slab is provided with floor finish of 1000 N/m^2. The floor system is supported by columns of size 500 mm x 500 mm. Floor to floor distance is 4 m. Use M$_{20}$ grade of concrete and Fe$_{415}$ grade of steel. Draw the reinforcement details. **[25]**

☛ ☛ ☛

P1225   **[3964]-214**

B.E. (Electrical)

HIGH VOLTAGE ENGINEERING

(403150) (2003 Course) (Elective - II) (Sem. - II)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answer any Three questions from each section.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

SECTION - I

Q1) a) Define Townsend's first and second ionization coefficients. Explain Townsend's criterion for breakdown in gaseous insulation system.   **[8]**

   b) What is Paschen's law? Explain the existence of a minimum sparking potential in Paschen's curve.   **[8]**

OR

Q2) a) Explain the breakdown process under non-uniform field and corona discharge.   **[8]**

   b) In an experiment in a certain gas, it was found that the steady state current is 5.5×10^{-8} A at 8 kV at a distance of 0.4 cm between the plane electrodes. Keeping the field constant and reducing the distance to 0.1 cm result in a current of 5.5×10^{-9} A. Calculate Townsend's primary ionization coefficient α.   **[8]**

Q3) Explain the following theories proposed to explain the breakdown in liquid insulation system.   **[18]**

   a) Suspended particle mechanism.

   b) Cavitation and bubble theory.

   c) Stressed oil volume theory.

OR

P.T.O.

Q4) a) Explain following mechanisms of breakdown in solid insulation system. **[8]**
  i) Thermal breakdown.
  ii) Breakdown due to treeing and tracking.
  b) Explain various properties of composite insulation systems. **[4]**
  c) Explain mechanism of breakdown in composite insulation system. **[6]**

Q5) a) Explain the probabilistic approach of insulation coordination. Explain the relationship between statistical safety factor and risk of failure. **[10]**
  b) Explain reasons and remedies for reducing overvoltages due to switching surges. **[6]**

<div align="center">OR</div>

Q6) a) Explain lightning phenomenon and development of lightning stroke. **[8]**
  b) Explain the occurrence of overvoltage due to system faults and abnormal conditions. **[8]**

<div align="center">

SECTION - II
</div>

Q7) a) Explain standard impulse voltage waveshape along with definition of rise time, tail time. Give properties of impulse voltage wave and tolerances allowed in front time, tail time and peak value. **[8]**
  b) With schematic diagram, explain the Marx circuit for generation of impulse voltage. **[8]**

<div align="center">OR</div>

Q8) a) Explain generation of high ac voltage (power frequency) using cascade transformer connection. **[8]**
  b) Explain with neat sketches, the tripping and control mechanisms for impulse generator. **[8]**

Q9) a) Discuss the use of sphere gap unit for measurement of high magnitude DC, AC and impulse voltage. Explain the effect of various factors influencing the spark-over voltage of sphere gap. **[8]**
  b) Explain the use of series capacitor peak voltmeter for measurement of peak value of ac waveform. **[8]**

<div align="center">OR</div>

Q10) a) Explain the different methods of high current measurements with their relative merits and demerits. **[8]**
  b) Explain with neat diagram the working principle of high voltage schering bridge for the measurement of loss factor. **[8]**

*Q11)*Write short notes on: **[18]**
    a)   Testing of insulators and bushings.

    b)   Testing of isolator.

    c)   Testing of cables.

<div align="center">OR</div>

*Q12)*a)   Explain high voltage testing of following electrical apparatus. **[12]**
      i)   Testing of power transformer.

      ii)   Testing of surge arrester.

    b)   Explain with a schematic diagram one method of radio interference measurement of transmission line. **[6]**

P1229

[3964]-320

B.E. (Chemical)

FUEL CELL TECHNOLOGY

(Sem. - II) (2003 Course) (Elective - II) (409348) (Theory)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

  1)   *Use two separate answer sheets for writing the answers to the two sections.*

  2)   *Draw schematics wherever necessary.*

  3)   *Assume suitable data wherever necessary.*

  4)   *Write the chemical reactions wherever necessary.*

  5)   *All questions are compulsory.*

SECTION - I

Q1) a) Show that the decrease in Gibbs Free Energy ($-\Delta G$) represents the maximum electrical work (W_E) obtainable from an electrochemical cell.**[8]**

  b) Discuss the advantages and limitations of fuel cell operating at low and high temperature respectively, taking the example of PEMFC and SOFC. **[8]**

OR

Q2) What does the name of fuel cell indicate? Differentiate among PEM, phosphoric acid, molten carbonate and solid oxide fuel cells, based on their operating conditions and materials of construction of different components. Draw neat figure in each case. **[16]**

Q3) At STP conditions, Gibbs free energy for the formation of water vapor is -55.14 cal/mole. In typical SOFC, pure methane is fed at the pressure of 3.5 atm. Total pressure of gases on anodic side of fuel cell is observed to be 4.0 atm. Air is supplied at 1.3 atm. Fuel and air are supplied at the same operating temperature of 950ºC. Calculate **[18]**

  a) Standard open circuit potential.

  b) Open circuit potential at the operating conditions.

OR

Q4) a) A Current density of 15 A/m² is obtained when pure hydrogen in fed to SOFC at the pressure of 1.8 atm. Total pressure of gases at anodic side is observed to be 2.5 atm. Air is supplied at 1.8 atm. The cell is operated at 1000°C. The diffusion factors for hydrogen, oxygen and water vapor are 95, 70 and 55 C/s.m². atm, respectively. Calculate concentration overpotentials across anode and cathode. **[9]**

b) Calculate the fuel utilization factor, air ratio, power output and fuel efficiency of SOFC using the following data. **[9]**

Average current density	= 15 A/m²
Active anode surface area	= 0.4 m²
Fuel flow rate	= 25 mol/h
Fuel composition	= H_2 : 70% and CO: 30%
Air flow rate	= 20 mol/h
Output potential	= 230 V
Lower heating value of fuel	= 250000 Kcal/Kg

Q5) Derive Nernst equation for calculating open circuit potential of SOFC using air as an oxidizer for the following conditions: **[16]**

a) H_2 as a fuel

b) Pure butanol as a fuel.

OR

Q6) Calculate the material balance for the SOFC generating 300 kW power at 85% CHP efficiency, by using hydrogen as a fuel and 40% theoretical excess air as an oxidizer. **[16]**

SECTION - II

Q7) a) What is steam reforming? What is its importance in SOFC? **[6]**

b) What are the advantages and limitations of internal steam reforming over external steam reforming? How to overcome the limitations? **[6]**

c) Consider a hydrogen-oxygen fuel cell operating at 25°C and atmospheric pressure. Under these conditions, hydrogen, oxygen and product liquid water are in their standard states. Using the data given below, calculate the thermodynamic cell potential (E^0) and the heat transfer (Q) between the cell and the surrounding, to maintain isothermal condition and the electrochemical efficiency of the fuel cell. **[6]**

$\Delta H^o = -285840$ J/mol

$\Delta G^o = -237190$ J/mol

F $= 96487$ J/V. mol

Q8) a) Explain Kroger - Vink defect structure in solids. What are Schottky, Frenkel and anti - Frenkel defects. **[9]**

b) Discuss defect equilibria and establish relationship between the ionic conductivity and pressure. Drawing the plot, show the ideal operating pressure range for fuel cell. **[9]**

Q9) a) Design tubular SOFC to generate 200 kW power from methane as a fuel. Single tube has anodic diameter of 20 mm and active length of 1.8 m. **[8]**

b) Calculate the mole fraction of defect at 100 and 1000°C temperature. Defect energy is 60 kJ/mol. Comment on the significance of results. **[8]**

OR

Q10) a) Derive the Butler - Volmer form of the charge transfer rates. **[8]**

b) Design planar SOFC to generate 100 kW power for ethanol as a fuel. **[8]**

Q11) Explain the working of hybrid cycle combining biomass gasification with SOFC. **[16]**

OR

Q12) a) What is three phase boundary (TPB)? Explain the mechanism of charge transfer in TPB. **[8]**

b) Explain the required characteristics of materials of construction of electrode, electrolyte and interconnect for SOFC. **[8]**

☞ ☞ ☞

P1230

[3964]-336

B.E. (Petrochemical)
NOVEL SEPARATION PROCESSES
(Sem. - I) (2003 Course) (Elective - I) (412405)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

   1)   *Answer any 3 questions from each section.*

   2)   *Answers to the two sections should be written in separate books.*

   3)   *Neat diagrams must be drawn wherever necessary.*

   4)   *Figures to the right indicate full marks.*

   5)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

   6)   *Assume suitable data, if necessary.*

SECTION - I

Q1) Attempt any the following: **[18]**

   a)   Compare and contrast on Macroemulsions and Microemulsions with suitable examples.

   b)   Classify membrane separation processes by giving examples and its industrial applications.

   c)   Discuss in brief on: adsorptive bubble separation techniques.

   d)   Explain the process principles involved in Froth Flotation. Indicate its Industrial applications.

OR

Q2) Classify the models for gas separation by membranes. Develop complete mixing model for membrane separation processes. State the assumption made.

                                                              [18]

Q3) A 9-micron tubular membrane is used to recover salt A from a dilute solution. The solutions to either side are at 0.028 and 0.004 kmol/m³, with mass transfer coefficients of 3.5×10^{-5} and 2.25×10^{-5} m/s respectively. The distribution coefficient is 0.85 and the diffusivity of A in the membrane is 275×10^{-11} m²/s.

   a)   Calculate the percentage of total resistance to mass transfer contributed by the membrane.

   b)   Calculate the membrane area needed to allow recovery at 0.015 kmol/hr.

Flow inside the tube is turbulent and mass transfer follows the Gilliland, Sherwood & Linton correlation. If the velocities of both solutions are doubled, what will the membrane resistance now be?   **[16]**

OR

Q4) Write notes on: [16]

   a)   Microemulsion and Macroemulsion.

   b)   Froth Flotation: Principles and Industrial applications.

   c)   Solvent Ablation.

   d)   Classifications of Adsorptive Bubble Separation Techniques.

Q5) A membrane is to be used to separate a gaseous mixture of A and B in one of the chemical complex near Mumbai. The following information is known:

Feed flow rate	$= 1 \times 10^5$ cm^3 (STP)/s
Feed composition of A	$= 0.5$ mole fraction
Desired composition of reject	$= 0.25$ mole fraction
Thickness of membrane	$= 2.54 \times 10^{-3}$ cm
Pressure on feed side	$= 80$ cm Hg
Pressure on permeate Side	$= 20$ cm Hg
Permeability of A, P_A	$= 50 \times 10^{-10}$
	cm^3(STP). cm/ (S.cm^2.cm.Hg)
Permeability of B, P_B	$= 5 \times 10^{-10}$
	cm^3 (STP). cm/(s.cm^2.cm.Hg)

Assuming complete mixing model, calculate the following:

   a)   the permeate composition.

   b)   the fraction permeated and membrane area. [16]

OR

Q6) Write short notes on [16]

   a)   Energy requirement for separation processes.

   b)   Different types of membrane modules.

   c)   Ultrafiltration and Nanofiltration - Principles and applications.

SECTION - II

Q7) Answer from the following: [16]

   a)   Differentiate physical or chemical adsorption.

   b)   Give classification of Chromatographic separations.

   c)   Describe a typical thermal - swing adsorption cycle.

   d)   Discuss the concept of retention and equilibrium for chromatography.

OR

Q8) a) Discuss in brief the process principles involved in Pressure Swing Adsorption (PSA) and Temperature Swing Adsorption (TSA) with industrial applications. **[10]**

b) In gas chromatography, a plot of HETP as a function of the mobile phase velocity is described by the Van Deemter equation:

$$HETP = A + B/u + Cu$$

Physically, what do the terms A, B and C represent? Calculate the optimum value of the mobile phase velocity and the plate height in terms of these parameters. **[6]**

Q9) a) From Darcy's Law, the velocity through a packed bed for a given pressure drop (P) is given by:

$$u = \frac{\varphi P d^2 p}{l\eta}$$

Where,

φ = Darcy's constant

P = Pressure drop

d_p = Particle diameter

l = Length of column

η = Viscosity of the mobile phase

Also, from the analysis of the Van Deemter equation, for a well packed column and for a highly retained solute, it is found that:

$$H_{min} = 2.48 \, d_p$$

and the velocity at H_{min} is equal to

$$\frac{1.62 D_m}{d_p}$$

Where D_m is the diffusivity of the solute in the mobile phase. From the above informations, derive an analytical expression for the maximum efficiency obtainable for a column in terms of these parameters, if the maximum allowable pressure drop is P. **[10]**

b) Discuss the process principles involved in elution chromatography and derive the retention equation. **[8]**

OR

*Q10)*a) A wastewater solution having a volume of 2.75m³ contains 0.2 kg phenol/m³ of solution. This solution is mixed thoroughly in a batch process with 4 kg of granular activated carbon until equilibrium is reached. Calculate the final equilibrium values and the percent phenol extracted.

[10]

Equilibrium data:

c, $\dfrac{kg\,phenol}{m^3\,solution}$	0.322	0.117	0.039	0.0061	0.0011	0.009	0.005
q, $\dfrac{kg\,phenol}{kg\,carbon}$	0.150	0.122	0.094	0.059	0.045	0.036	0.030

b) Two solutes have a relative retention of $\alpha = 1.08$ and capacity factor, $k_1' = 5$ and $k_2 = 5.5$. The number of theoretical plates is nearly the same for both the compounds. How many plates are required to give a resolution of 1.5? and of 3? If the plate height is 0.2 mm. How long must the column be for a resolution of 1.5? **[8]**

*Q11)*a) Discuss in brief the process principles and operational fundamentals involved in Ion Exchange separations. **[8]**

b) The retention ratio in chromatography is defined as:

$R = t_M/t_R$

Show that R is related to the capacity factor, given by equation:

$R = 1/k' + 1$. **[8]**

OR

*Q12)*Write Short notes on **[16]**

a) Reactive Separations.

b) Isoelectric Focusing.

c) Biofiltration - Principles and applications.

P1233   **[3964]-348**

B.E. (Polymer)

ADVANCED POLYMER RHEOLOGY

(Elective - I) (2003 Course) (409366) (Sem. - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1)   *All questions from Section I and Section II are compulsory.*

2)   *Marks are given on Right hand side.*

3)   *Use of calculator is allowed.*

4)   *Assume suitable data very necessary.*

SECTION - I

Q1) a)   Derive the continuity equation.   **[6]**

b)   Determine the invariants of the stress tensor P, given below   **[4]**

$$P = \begin{bmatrix} 4 & 3 & -1 \\ 3 & 2 & 1 \\ -1 & 1 & 0 \end{bmatrix}$$

c)   Explain the Wissenberg effect.   **[6]**

OR

Q2) a)   Write down the classification of fluids based on their rheological behaviour. Explain with examples, time dependent non - Newtonian fluids.   **[7]**

b)   Write down strain tensor for steady shear flow and uniaxial extensional flow.   **[3]**

c)   For axial annular flow, it is observed that pressure at the inner cylinder is some what higher than at the outer cylinder. Explain the above phenomena.   **[6]**

Q3) a) Derive an expression for flow of a power law fluid through parallel plates. **[8]**

b) Derive an expression for pressure drop due to shear and extensional flow in a coni cylindrical die. **[8]**

OR

Q4) a) Write a note on Ryan and Johnson stability parameter for understanding transition between laminar and turbulent flow. **[8]**

b) Derive an expression for flow through a slit die for a power law fluid.**[8]**

Q5) a) Derive an expression for stress relaxation, creep and recovery for the Kelvin voight model. **[10]**

b) Explain the Boltzman superposition principle. **[8]**

OR

Q6) a) Explain the terms stress relaxation modulus and creep compliance. **[6]**

b) Viscoelastic behaviour of a certain plastic is represented by spring and dashpot elements having constants E = 2.5 GN/m² and $\eta = 100 \dfrac{GN-S}{m^2}$ respectively. If a stress of 10MPa is applied for 100 seconds, find strain values predicted by Maxwell model and Kelvin - voight model after

a) 40 seconds.   b) 120 seconds. **[12]**

SECTION - II

Q7) a) Discuss the effect of fillers and plasticizers on polymer melt viscosity.**[8]**

b) Discuss the effect of pressure on polymer melt viscosity. **[8]**

OR

Q8) a) Explain the Arhenius equation relating temperature and zero shear viscosity.**[8]**

b) Discuss the effect of co-polymerization and criptallinity on polymer melt rheology. **[8]**

Q9) a) Discuss the classification of various rheometers. **[3]**

b) A cone and plate viscometer with plate diameter 12 cm and cone angle of 2.5° is to be calibrated using a standard Newtonian fluid of viscosity 10.0 poise. Develop the speed of rotation versus torque plot. **[7]**

c) Explain constructional features of capillary Rheometer. **[6]**

<div align="center">OR</div>

*Q10)*a) Discuss the various geometries used in rheometers to understand shear rheology of polymers. **[6]**

b) A concentric cylinder viscometer is used to estimate the rheological behaviour of LDPE melt at 150°C. The inner diameter of outer cylinder, $d_o = 30$ mm and outer diameter of inner cylinder $d_i = 50$ mm. The inner cylinder is rotated at different speeds and the torque on the outer cylinder is measured. Determine the power law constants of the system. Height of inner cylinder h = 50mm. **[10]**

Speed of Rotation Ω (rpm)	5	15	30	50	100	300	500
Torque T(N-m)	1.22	1.83	2.34	2.81	3.61	5.36	6.44

*Q11)*a) Derive an expression for pressure flow and drag flow in a single screw extruder. **[12]**

b) A circular plate with a diameter of 0.3 m is to be compression molded from phenol formaldehyde. If the preform is cylindrical with a diameter of 50 mm and depth 36 mm, estimate the platen force required to produce the plate in 10 seconds. The viscosity of phenol formaldehyde may be taken as 10^3 Ns/m². **[6]**

<div align="center">OR</div>

*Q12)*a) Derive an expression for the flow length of a power law fluid when it is injected at constant pressure in a rectangular section channel assuming isothermal flow. **[8]**

b) Derive an expression for maximum pressure for melt flow between calender rolls. **[10]**

P1239   **[3964]-385**

B.E. (I.T.)

MOBILE COMPUTING

(2003 Course) (Elective - I) (414445) (Sem. - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) Answers to the two sections should be written in separate books.

2) Neat diagrams must be drawn wherever necessary.

3) Assume suitable data, if necessary.

SECTION - I

Q1) a) Explain the functional differences in various generations of mobile networks. **[8]**

b) Explain the significance of Core, Edge and Access Network in mobile computing environment. **[8]**

OR

Q2) a) Explain the three tier architecture for mobile computing environment with the appropriate diagram. **[8]**

b) How many types of informations a context manager maintains? **[8]**

Q3) Write short notes on: **[18]**

a) GSM architecture.

b) GSM security.

c) Value added services in SMS.

OR

Q4) Write short notes on: **[18]**

a) Java card.

b) Mobile IP.

c) Bluetooth protocol stack.

Q5) a) Write a detail note on WAP. **[8]**

b) Explain all the entities used in GPRS architecture. **[8]**

<div align="center">OR</div>

Q6) a) Differentiate CDMA and GSM. **[8]**

b) Explain both the spread spectrum technologies. **[8]**

<div align="center">

SECTION - II

</div>

Q7) a) What are the advantages and limitations of WLAN? **[8]**

b) Explain the 802.11 architecture. **[8]**

<div align="center">OR</div>

Q8) a) Explain SS#7 protocol stack. **[8]**

b) What are the important differences between a desktop computer and a portable handheld device like a PDA? **[8]**

Q9) a) Write a detail note on three prong approach used in Java. **[8]**

b) Describe the Palm OS architecture. **[8]**

<div align="center">OR</div>

*Q10)*a) What is CDC and CDLC in J2ME? **[8]**

b) Explain the functions of various layers in Symbian OS architecture. **[8]**

*Q11)*Write short notes on: **[18]**

a) Any two real time protocols.

b) Windows CE architecture.

c) Comparison between SIP and H.323.

<div align="center">OR</div>

*Q12)*Write short notes on: **[18]**

a) Various components of Information security.

b) Symmetric and asymmetric key cryptography.

c) Various attacks on static assets.

P1240   **[3964]-386**

B.E. (Information Technology)

GIS AND REMOTE SENSING

(Sem. - I) (Elective - I) (2003 Course) (414445)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answer question number 1 or 2, 3 or 4, 5 or 6 from Section I.*

2) *Answer question number 7 or 8, 9 or 10, 11 or 12 from Section II.*

3) *Answers to the two sections should be written in separate answer books.*

4) *Neat diagram must be drawn whenever necessary.*

5) *Figures to the right indicate full marks.*

6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What are the components of GIS architecture. Give classification of GIS. **[8]**

b) What are maps? What is map scale? Explain spatial referencing system.**[8]**

OR

Q2) a) What is grid system? Which grid systems are used in GIS applications.**[8]**

b) What is map projection? Describe different types of map projections.**[8]**

Q3) a) What are the types of raster GIS models? Describe any two. **[8]**

b) What is spatio - temporal data? Explain different types of representations used for spatio - temporal data. **[8]**

OR

Q4) a) What is vector data representation? Explain it with suitable example. **[8]**

b) What are the functions of DBMS supporting GIS applications? **[8]**

Q5) a) What are the various guidelines for digitization in GIS? **[10]**

b) What is overlay analysis? Describe the process of digital terrain modelling. **[8]**

OR

Q6) a) Describe data types and their resources used for GIS in India. **[10]**

b) Which are the main tasks of DTM system? Explain Triangulated irregular network model. **[8]**

SECTION - II

Q7) a) Explain the energy interaction with water body on the earth. Derive the fundamental equation by which the conceptual design of remote sensing technology is built. **[8]**

b) Explain radar principle with required formula. What are the factors affecting microwaves. **[8]**

OR

Q8) a) Describe electromagnetic spectrum along with Maxwell's theory and Quantum theory. **[8]**

b) How is the working of SAR system, Explain in detail. **[8]**

Q9) a) What are different sensor parameters? Describe them with examples.**[8]**

b) Which are the different Meteorological satellites. Describe any two of them. **[8]**

OR

*Q10)*a) What are the different imaging sensor systems? Describe them. **[8]**

b) Classify earth resource satellites. Describe any two series of satellites.**[8]**

*Q11)*a) Why is there a need for integration of remote sensing and GIS? Explain the process of integration. **[10]**

b) Describe the software scenario in GIS focusing on functionalities, products and developers. **[8]**

OR

*Q12)*a) Explain the issues in integration of remote sensing with GIS. **[10]**

b) List and explain application areas of remote sensing and GIS. **[8]**

☛ ☛ ☛

P1297

[3964]-352

B.E. (Polymer)

SPECIALITY POLYMERS

(Sem. - II) (2003 Course) (409367) (Elective - II)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answer 3 questions from Section I and 3 questions from Section II.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Your answers will be valued as a whole.*
6) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
7) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What are liquid crystalline polymers? What is the physical mechanism responsible for liquid crystallinity?   **[5]**

b) Differentiate between lyotropic and thermotropic Liquid Crystalline polymers.   **[5]**

c) State the main properties of LCP's.   **[4]**

d) List a few commercial Liquid Crystalline Polymers.   **[4]**

OR

Q2) a) What is a mesogen? Classify liquid crystalline polymers based on presence of mesogen.   **[6]**

b) Explain as to why LCP's are often blended with engineering plastics?**[4]**

c) Give synthesis of at least one LCP.   **[4]**

d) Write a short note on rheology of LCP's.   **[4]**

Q3) a) What are conducting polymers? Discuss 2 conducting polymers & give their applications.   **[6]**

b) How is conductivity improved in polymers? Discuss the process of electro chemical doping.   **[5]**

c) Draw structures of five conductive polymers.   **[5]**

OR

Q4) a) Explain in brief the band theory of conduction in conducting polymers.**[6]**

b) Give various applications of conducting polymers. **[4]**

c) Explain the follow terms: **[6]**

    i) Solitron.

    ii) Polaron.

    iii) Bipolaron.

Q5) a) Write a short note on various routes to synthesize polyimides. **[5]**

b) Poly (P-Phenylene terephthalamide) has higher thermal stability compared to poly (hexamethylene adipamide). True or False justify your answer.**[3]**

c) Comment on suitability of given polymer for heat resistant applications by refering to thermogram given in figure 1. Justify your answer. **[3]**
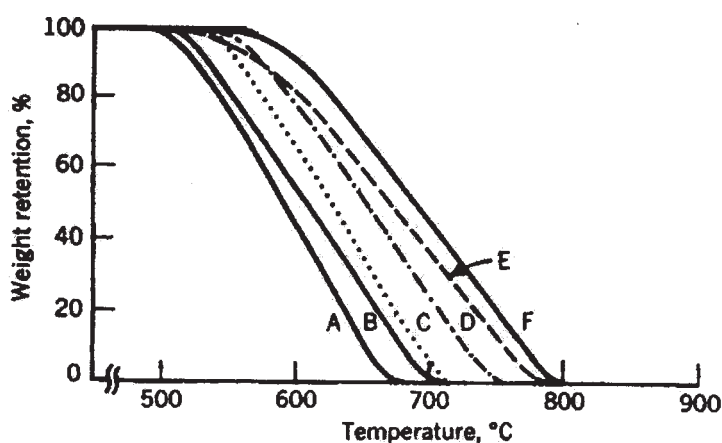
Fig. 1. Thermogravimetric analysis of polyheterocyclics.
A : Polybenzimidazole; B : Polyquinoxaline; C : Polyimide; D : Polybenzoxazaole;
E : poly (N-phenylbenzimidazole) : F : Polybenzothiazole
(Atmosphere : static air; Heating rate : 6.67 ^{0}C/min)

d) Briefly comment on effect of secondary forces on thermal stability of given polymer. Give suitable examples. **[5]**

OR

Q6) a) Enlist at least 2 Heat Resistant Polymers. Draw the repeating unit structure. Give at least 2 applications of heat resistant polymers. **[5]**

b) W.r.t. primary bond strength comment on the Heat resistance of Polyethylene and polythenether ketone **[3]**

c) What criteria given polymeric material should satisfy so as to be considered as "Heat Resistant Polymers"? **[3]**

d) Comment on the effect of Molecular weight on thermal stability and hence heat resistance of given polymeric material. **[2]**

e) Briefly explain "Ablative Plastics". **[3]**

SECTION - II

Q7) a) What are photosensitive polymers? Give 3 examples of photosensitive polymers & how they are synthesized? **[6]**

b) State a few applications of photosensitive polymers. **[3]**

c) Define a "membrane". Give the various methods for manufacturing mambranes. **[6]**

d) Which polymeric materials are used in the making of membranes? **[3]**

OR

Q8) a) What are photoresists? Explain what are positive and negative photoresists give applications of these. **[6]**

b) Explain the various steps by which a photoresist is applied on a substrate. **[4]**

c) Write a short note on various applications of polymeric membranes. **[8]**

Q9) Write a short note on the following. **[16]**

a) Polymers in drug delivery.

b) Biomaterials in dental applications.

c) Scafford materials.

OR

Q10) Write a short note on the following areas. **[16]**

a) Biomaterials in orthopaedic applications & rehabilitation aids.

b) Tissue engineering.

c) Synthetic biopolymers & their applications.

Q11) a) Discuss the use of polymers in agricultural applications. **[8]**

b) Write a short note on polymers used in contruction application. **[8]**

OR

Q12) a) State the advantages & disadvantages of polymer concrete over conventional cement. Give its applications. **[8]**

b) Discuss the use of polymers in fiber optics. **[8]**

☛ ☛ ☛

P1298

[3964]-353

B.E (Polymer)

FIBER TECHNOLOGY

(Sem. - II) (Elective - II) (2003 Course) (409367)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answers to Section - I and Section - II should be written on separate answer book.*
2) *Solve 3 questions from Section - I and 3 questions from Section - II.*
3) *Neat diagrams should be drawn whenever necessary.*
4) *Figures to the right indicate full marks.*
5) *Assume suitable data, if necessary.*
6) *Use of electronic pocket calculator is allowed.*

SECTION - I

Q1) a) "Elongational viscosity should increase with strain rate to stabilize the filament in threadline". Comment whether the statement is True or False. Justify your answer. **[3]**

b) Dry and Wet spinning are the 2 types of Solution spinning. Explain the difference between these two techniques. Give at least one example of fiber produced by these techniques. **[4]**

c) Which spinning technique will be used to manufacture Nylon 66 fibers? Explain the same in detail. **[6]**

d) Write a short note on "Characteristics of Fiber". **[5]**

OR

Q2) a) Cohesive fracture in threadline is more frequent with fiber grade Polyolefins compared to fiber grade Nylons (i.e. Nylon 6 or 66). Why?**[4]**

b) Why is it necessary to understand flow instabilities in threadline of melt spinning operation? What are the 2 types of flow instabilities seen in melt spinning? **[3]**

c) Explain the spinning process used to manufacture poly (p-phenylene terephthalamide) i.e. Kevlar fiber. **[6]**

d) Write a short note on "Criteria for Fiber forming Polymers". **[5]**

Q3) a) Why a company manufacturing polyethylene terephthalate (PET) used for fiber application would prefer terephthalic acid over dimethyl terephthalate during synthesis of PET? **[5]**

b) Explain how DEG affects polyester and its fiber properties? **[5]**

c) Depending on the raw material how fibers are classified? Give suitable examples. **[4]**

d) Write down chemical reaction in synthesis of poly (p-ethylene terephthalamide) i.e. Kevlar polymer used for high tenacity fibers. **[2]**

OR

Q4) a) With neat sketch explain the rate of DEG formation at different stages of PET synthesis. **[5]**

b) Comment on Bye-products due to Thermal Degradation and Formation of Gel during PET synthesis. **[5]**

c) Write a short note on "Acrylic Fibers". **[4]**

d) Write down chemical reaction in synthesis of Nylon 66 polymer used for fibers. **[2]**

Q5) a) Discuss in brief the Chemical Constitution of Spin Finish. Give the role of every component and give at least one example of each component. **[6]**

b) Explain "Dipping Roller" method used for applying spin finish onto the fiber. **[5]**

c) What are the Feed Materials Characteristics that have significant effect on properties of Textured Yarns? **[5]**

OR

Q6) a) What are the primary functions of Spin Finish? Give at least 5 properties spin finish should possess in order to perform these functions. **[6]**

b) Write a short note on Spin Draw Process. **[5]**

c) Write a short note on False Twist Process. **[5]**

SECTION - II

Q7) a) Explain following terminologies - Continuous Monofilament, Filament yarn, Staple Fiber, Staple Yarn, Denier, Tex and dtex. **[7]**

b) Explain the difference between filament and yarn. With an example explain the concept of Filament Denier and how is it helpful in analyzing the quality of fabric. **[7]**

c) What is meant by tenacity? If a load of 250 g will just break with a 100 denier yarn, then, what is its tenacity? Also explain why twist is given to yearn and its effect on denier. **[4]**

Q8) a) Give the steps involved in making yarn from Natural fibers. **[6]**

b) What is the polymer used to obtain polyester fibers and what steps are used to convert that polymer into staple yarn. **[8]**

c) What is the significance of heat setting, and how is it done? **[4]**

Q9) a) What is the difference between acid dye and basic dye? **[3]**

b) What is the difference between Mass colouration and dyeing? Give the advantages and limitations of mass colouration. **[6]**

c) Give methods used for mass colouration for either Polyester fiber or Acrylic fiber. **[7]**

OR

Q10) a) What are the important aspects of dyeing of Polyester fibers? **[4]**

b) Explain the role of disperse dyeing and its limitations. What methods make disperse dyeing effective? **[5]**

c) What is barriness and what can be done to avoid it? **[4]**

d) Explain the role of acid dye in case of dyeing Nylon fibers. **[3]**

Q11) a) To overcome what all the drawbacks are the fibers modified? **[4]**

b) What are the general methods used to modify synthetic fibers? **[5]**

c) How are hollow polyester fibers obtained? What advantages it offers?**[4]**

d) Write a short note on Low Pilling Polyesters. **[3]**

OR

Q12) a) Write a note on Flame Retardant Polyesters. **[3]**

b) What are the 3 types of carrier free dyeable polyesters? What are they used for? **[6]**

c) What is meant by Silk - like polyester? How is it obtained? **[3]**

d) What are the different types of modified acrylic fibers developed? Describe any one in detail. **[4]**

P1299

B.E (Computer)

PRINCIPLES OF COMPILER DESIGN

(Sem. - I) (2003 Course) (410444)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answers to the two sections must be written in two separate answer books.*
2) *Neat diagrams must be drawn where ever necessary.*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data if necessary.*

SECTION - I

Q1) Write Lex specifications and auxiliary routines, if any, to read the source text file and display total number of characters, words and lines in the file.   **[16]**

OR

Q2) Consider the following code fragment.

for (i = 0, j = 50; i < 50, j > 0; i = i + 1, j = j-1)

a = i + j * 5.0 / d;

Assume a and d are integer variables.

Show the output of each phase in the front end of the compiler and also the contents of symbol table. Specify the strategy used to deal with reserve words.

[16]

Q3) a)   Write a CFG to parse an assignment statement consisting of arithmetic expression on RHS of the assignment. '+', '*' and '/' operators needs to be supported with '+' having <u>higher</u> precedence and <u>left</u> associative and '*' and '/' have <u>equal</u> precedence but <u>lesser</u> than '+' and both are <u>right</u> associative. Is your grammar suitable for top-down table driven parser? If not, write equivalent suitable grammar. Compute 'First' and 'Follow' sets of non - terminals of the CFG.   **[10]**

b)   Construct LL(1) parser table for the CFG you have designed in Q3 (a) above. What value will be assigned to variable 'd', if the following statement is executed from the target code generated by the compiler that uses your constructed LL(1) parser table

d = 2 + 3 * 4 / 2

Rewrite the above parser table with error entries. Explain any two error entries.   **[8]**

Q4) Construct LALR parser table for the following CFG

      S → A = B

      S → B

      B → A

      A → * B

      A → I

Here, I (representing identifier), '*' and '=' are terminal symbols, S is the start symbol and A & B are non -terminals.

Resolve the conflicting entries, if any, in the parser table and justify.

Show the moves of the LALR parser for the following input.

      *p = *q   **[18]**

Q5) Write CFG and semantic actions to parse and handle procedure calls and returns. Show the intermediate code for the following source statement in

   a)   Quadruples and   b)   Triples notations.

      a = func (p, q, r);   **[16]**

Q6) a)   What are Marker non-terminal symbols? Explain their significance for generation of intermediate code for "flow - of - control statements" **[8]**

     b)   What do you meant by attributed translation grammar (ATG)? What are synthesized and inherited attributes? What type of attribute (synthesized or inherited) will be required in 'C' and 'PASCAL' to enter in the symbol table the 'type' information of variables appeared in declarative statements? Variables may be of simple types such as integers and float or array of simple types. Write the ATG for both the languages. **[8]**

SECTION - II

Q7) a)   Discuss the "Display" Mechanism used by the Pascal compiler to handle access to non - local names with adequate illustrations. **[10]**

     b)   Compare static scope with dynamic scope. Illustrate with suitable examples. **[8]**

Q8) a)   What do you meant by activation record? With a neat sketch, describe the activation record used by a C compiler. **[8]**

     b)   With suitable examples explain various parameter passing methods. Also explain the mechanism needed to support "procedure parameter". **[10]**

Q9) a) Describe any code generation algorithm you know with suitable illustration. **[8]**

b) What is Peephole optimization? Explain with suitable examples. **[8]**

OR

Q10) a) What is a DAG? Using suitable example, discuss its application in code generation phase. **[10]**

b) Discuss various issues in code generation phase of a compiler. **[6]**

Q11) a) Discuss the various principle sources of Code optimization. **[8]**

b) Discuss the algorithm for live variable analysis. **[8]**

OR

Q12) a) With suitable examples, explain various transformations on basic block. **[8]**

b) What do you meant by Global Common Sub-expression? Write an algorithm for elimination of Global Common Sub expressions. **[8]**

☛ ☛ ☛

P1307

[3964]-382

B.E. (I.T.)

ADVANCED DATABASE MANAGEMENT

(2003 Course) (414442) (Sem. - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answers to the two sections should be written in separate books.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Assume suitable data, if necessary.*
4) *Section I : Q1 or Q2, Q3 or Q4, Q5 or Q6.*
5) *Section II : Q7 or Q8, Q9 or Q10, Q11 or Q12.*

SECTION - I

Q1) a)   Explain different types of Parallel sort with suitable example.   **[6]**

b)   For each of three partitioning techniques, namely round - robin, hash partitioning, and range partitioning, give an example of a query for which that partitioning technique would provide the fastest response.   **[6]**

c)   Explain a nonuniform memory architecture (NUMA).   **[5]**

OR

Q2) a)   Describe a good way to parallelize each of the following: **[6]**

   i)   The difference operation.

   ii)   Aggregation by the count distinct operation.

   iii)   Aggregation by the avg operation.

   iv)   Left Outer Join if the join condition involves only equality.

   v)   Full outer join if the join condition involves comparisons other than equality.

   vi)   Left outer join if the join condition involves comparisons other than equality.

b)   Explain design issues in Parallel Database System.   **[6]**

c)   Explain cache - coherency protocol.   **[5]**

Q3) a) State different types of failures in distributed systems and explain failure handling in distributed database using 2 Phase Commit protocol. **[6]**

b) Suppose that the employee relation is stored in Madison and the tuples with salary < 100000 are replicated at New York. Consider the following three options for lock management : all locks managed at a single site, say ABC ; primary copy with Madison being the primary for employees; and fully distributed. For each of the lock management options, explain what locks are set for the following queries. Also state from which site the page is read. **[6]**

    i) A query at Austin wants to read a page of employees tuples with salary <= 50000.

    ii) A query at Madison wants to read a page of employees tuples with salary <= 50000.

    iii) A query at New York wants to read a page of employees tuples with salary <= 50000.

c) Write a short note on LDAP. **[5]**

<div align="center">OR</div>

Q4) a) Define semi-join. Compute semi-join r α s for the relations r and s. **[6]**

Relation r				Relation s		
A	B	C		C	D	E
1	2	3		3	4	5
4	5	6		3	6	8
1	2	4		2	3	2
5	3	2		1	4	1
8	9	7		1	2	3

b) Explain Phantom deadlock with suitable example. Compare the relative merits of centralized and hierarchical deadlock detection in distributed DBMS. **[6]**

c) Explain Optimistic methods for Distributed Concurrency Control. **[5]**

Q5) a) Consider following DTD **[12]**

```
<?xml version = " 1.0 " encoding = "UTF-8"?>
<!ELEMENT report (section *)>
<!ELEMENT section (section.title, section.content)>
<!ELEMENT section. title(#PCDATA)>
```

<!ELEMENT section. content (#PCDATA| anesthesia | prep | incision | action | observation)*>

<!ELEMENT anesthesia (#PCDATA)>

<!ELEMENT prep (# PCDATA | action)*>

<!ELEMENT incision (#PCDATA | geography | instrument)*>

<!ELEMENT action (#PCDATA | instrument)*>

<!ELEMENT observation (# PCDATA)>

<!ELEMENT geography (#PCDATA)>

<!ELEMENT instrument (#PCDATA)>

Create XML document, XML Schemas and solve the following queries in XQuery on XML.

i)   In the Procedure section of Report 1, what Instruments were used in the second Incision.

ii) In Report 1, what Instruments were used in the first two Actions after the second Incision?

iii) In Report 1 , find "Procedure" sections where no Anesthesia element occurs before the first Incision.

b) Explain web architecture in short.   **[4]**

<div align="center">OR</div>

Q6) a) Consider following DTD.   **[12]**

<?xml version = "1.0" encoding = "ISO - 8859 - 1"?>

<!ELEMENT news (news_item*)>

<!ELEMENT news_item (title, content, date, author?, news_ agent)>

<!ELEMENT title (#PCDATA)>

<!ELEMENT content (par | figure)+>

<!ELEMENT date (#PCDATA)>

<!ELEMENT author (#PCDATA)>

<!ELEMENT news_agent (#PCDATA)>

<!ELEMENT par (#PCDATA | quote | footnote)*>

<!ELEMENT quote (#PCDATA)>

<!ELEMENT footnote (#PCDATA)>

<!ELEMENT figure (title, image)>

<!ELEMENT image EMPTY>

<!ATTLIST image source CDATA #REQUIRED>

Create XML document, XML Schemas and solve the following queries in XQuery on XML.

i) Find the titles of all news items where the string "Foobar Corporation" appears in the title.

ii) For each news item that is relevant to the Gorilla Corporation, create an "item summary" element. The content of the item summary is the content of the title, date, and first paragraph of the news item, separated by periods. A news item is relevant if the name of the company is mentioned anywhere within the content of the news item.

b) Write a short note on SOAP. **[4]**

SECTION - II

Q7) a) You are given a set of m objects that is divided into K groups, where the ith group is of size mi. If the goal is to obtain a sample of size n < m, what is the difference between the following two sampling schemes? (Assume sampling with replacement) **[6]**

i) We randomly select n*mi/m elements from each group.

ii) We randomly select n elements from the data set, without regard for the group to which an objects belongs.

b) What is Meta data? Explain different types of meta data in data warehouse. **[6]**

c) Write a short note on Bitmap Index. **[5]**

OR

Q8) a) Describe Data Warehouse Manager in detail. **[6]**

b) Assume that we apply square root transformation to a ratio attribute x to obtain the new attribute x*. As part of your analysis, you identify an interval (a, b) in which x* has a linear relationship to another attribute y.

i) What is the corresponding interval (a, b) in terms of x?

ii) Give equation that releases y to x. **[6]**

c) Design Multidimensional Data Model for Building Construction builder and customers system using Aggregates, Cube Aggregation, Cube Operators, Cube, Aggregation using Hierarchy and design some queries base on the same. **[5]**

Q9) a) Explain different Measures for selecting the Best Split in Decision Tree Classification Model with suitable example. **[10]**

b) Explain the Key issues in Hierarchical Clustering with suitable example. **[7]**

OR

*Q10)*a) Describe any one candidate item set generation procedure with suitable example. **[9]**

b) Consider following training data set. **[8]**

Age	Income	Student	Credit_rating	Buys_Computer
<=30	high	No	Fair	no
<=30	high	No	Excellent	no
31...40	high	No	Fair	yes
>40	medium	No	Fair	yes
>40	low	Yes	Fair	yes
>40	low	Yes	Excellent	no
31...40	low	Yes	Excellent	yes
<=30	medium	No	Fair	no
<=30	low	Yes	Fair	yes
>40	medium	Yes	Fair	yes
<=30	medium	Yes	Excellent	yes
31...40	medium	No	Excellent	yes
31...40	high	Yes	Fair	yes
>40	medium	No	Excellent	no

Write Naïve Bayesian Classifier algorithm. Consider Buys_Computer as a Class Attribute with values yes and no classes. Find the class label for data sample.

X = (age <= 30, Income = medium, Student = yes Credit_rating = Fair) using Naïve Bayesian Classifier.

*Q11)*a) Define Information Retrieval System. Describe Vector Space Model.**[6]**

b) Write short notes on Inverted Index. **[5]**

c) Explain the following terms in Information Retrieval with suitable example.**[5]**

i) Synonyms.   ii) Homonyms.

iii) Proximity.   iv) TF - IDF.

OR

*Q12)*a) Explain any linked based search algorithm. **[6]**

b) Write short notes on: **[10]**

i) Web Crawler.   ii) Signature Files.

P1324

[3964]-114

B.E. (Civil)

ADVANCED TRANSPORTATION ENGINEERING

(2003 Course) (Elective - II) (401007) (Sem. - II)

Time : 4 Hours]   *[Max. Marks :100*

Instructions to the candidates:

    1)   *Answer Q.No. 1 or 2, Q. No. 3 or 4 and Q.No. 5 or 6 from section I and Q.No. 7 or 8, Q.No. 9 or 10 and Q.No. 11 or 12 from section II.*

    2)   *Answers to the two sections should be written in separate books.*

    3)   *Neat diagrams must be drawn wherever necessary.*

    4)   *Figures to the right indicate full marks.*

    5)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

    6)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   Explain in brief the following: **[6]**

       i)   JNNURM schemes.

       ii)   Mono Rail Project.

    b)   Explain with an example, how the multiple linear regression analysis is useful in traffic forecasting. Detail out the basic steps in the same.   **[6]**

    c)   Explain "Furness" method with an example.   **[6]**

OR

Q2) a)   Explain in brief the following: **[6]**

       i)   Pune metro, its problems.

       ii)   Solutions to BRT problems.

    b)   With a flow diagram, explain the comprehensive traffic and transportation methodology.   **[6]**

    c)   Explain O-D matrix and its importance in transportation planning, with an example.   **[6]**

Q3) With respect to the Bandra - Worli Sea - link project explain.

    a)   Surveys conducted, primary - secondary data collection.   **[4]**

    b)   WTP survey, time - delay studies in detail.   **[6]**

    c)   Traffic projections and generalised cost modelling.   **[6]**

OR

Q4) With respect to the Theur Phata - Hadapsar - Saswad easterly bypass, explain
   a) Traffic studies conducted and traffic projections thereof. **[10]**
   b) Suggestion of 3 alternatives and their evaluation. **[6]**

Q5) The client associated with Infrastructure development has decided to evaluate two highway proposals with the following cash flows. **[16]**

	Option I			Option II	
Year	Cash Inflow (Rs.)	Cash Outflow (Rs.)	Year	Cash Inflow (Rs.)	Cash Outflow (Rs.)
1	-	10,00,000	1	-	35,00,000
2	-	35,00,000	2	10,00,000	2,00,000
3	-	20,00,000	3	12,00,000	3,00,000
4	15,00,000	2,00,000	4	15,00,000	50,000
5	20,00,000	3,00,000	5	11,00,000	50,000
6	25,00,000	2,00,000	6	9,00,000	1,50,000
7	30,00,000	3,00,000	7	3,00,000	2,50,000

The decision criteria is based on the NPV at 12%. Work out the values and suggest
   i) whether both proposals are worth investing, and
   ii) the better alternative, stating reason.

OR

Q6) Explain merits and demerits of **[16]**
   a) ARR and IRR.
   b) BOT and BOOS.
   c) NPV and B/C.
   d) BT and BOO.

SECTION - II

Q7) a) Explain, with an example the moving vehicle method of survey. **[8]**
   b) Explain in brief any 5 advantages of rigid pavements over flexible pavements. **[10]**

OR

Q8) a) Discuss the various functional and structural requirements of any pavement. **[8]**

b) Explain, with an example, the procedure of overlay design as per IRC - 81. **[10]**

Q9) a) Design a flexible pavement for the following data as per IRC - 37.
   i)   3 lane dual carriage way.
   ii) Expected year of completion - 2012 year.
   iii) CVPD in both directions in - 2009 year - 1800.
   iv) Design life - 10 years.
   v)   Traffic growth rate - 12%.
   vi) Terrain - plain.
   vii) C.B.R. for subgrade - 6%.
   Draw a typical cross - section showing all the basic layers. **[12]**

b) Explain how the drainage is taken care of in the case of flexible as well as the rigid pavements. **[4]**

OR

Q10) a) Differentiate between the design philosophy of flexible pavements and rigid pavements. **[4]**

b) Explain how the strength of an existing pavement is assessed before performing the overlay design. **[4]**

c) Explain Intelligent Transport Systems and Intelligent Tell Collection in detail. **[8]**

Q11) a) Design a rigid pavement as per IRC - 58 based on the following data.
   i)   2 way CVPD = 2400.
   ii)   Flexural strength of concrete = 50 kg/cm^2.
   iii) Effective modulus of subgrade reaction = 8 kg/cm^3.
   iv)   Elastic modulus of concrete = 3.2×10^5 kg/cm^2.
   v)   Poissons ratio = 0.18.
   vi)   Coefficient of thermal expansion of concrete = 10×10^{-6} per °C.
   vii) Tyre pressure = 8.5 kg/cm^2.
   viii) Traffic growth rate = 7.5%.
   ix)   Design life = 20 years.
   x)   Spacing of contraction joints = 4.5m.

xi)   Width of slab = 3.5m.

xii) Load safety factor = 1.1.

xiii) Maximum temperature difference between top & bottom of slab = 25°C.

xiv) Centre to centre distance between tyres = 33cm.

xv)   Axle load spectrum is as follows.

Single Axle Loads		Tandem Axle loads	
Load in Tons	%	Load in Tons	%
20	0.5	36	0.3
18	1.4	32	4.0
16	3.8	28	3.0
14	12.0	24	2.0
12	20.0	20	4.0
10	22.0	16	1.0
<10	25.0	<16	1.0

xvi) Trial thickness - 32 cms.

xvii) Use the following table if required.

L/l or B/l	C	L/l or B/l	C
1	0.000	7	1.03
2	0.040	8	1.07
3	0.175	9	1.08
4	0.440	10	1.075
5	0.720	11	1.050
6	0.920	12	1.000

Check whether the pavement is safe for

i)   Critical condition with dowel bars.

ii)   Critical condition without dowel bars.

If the pavement fails, take the next thickness as 36 cms.   **[12]**

b)   Explain how the load gets transferred through the dowel bar system at joints. Do all the bars take part in the load transfer? The dowel bar is designed for failure in the steel or the failure in the concrete? Explain.**[4]**

OR

*Q12)*Explain the entire design philosophy and procedure for the plain jointed rigid pavements related to the design of concrete slabs, dowel bars and tie bars as per IRC - 58. Draw sketches wherever necessary.   **[16]**

PAVEMENT DESIGN CATALOGUE
PLATE 1 – RECOMMENDED DESIGNS FOR TRAFFIC RANGE 1-10 msa

CBR 5%

Cumulative Traffic (msa)	Total Pavement Thickness (mm)	PAVEMENT COMPOSITION			
		Bituminous Surfacing		Granular Base (mm)	Granular Sub-base (mm)
		Wearing Course (mm)	Binder Course (mm)		
1	430	20 PC		225	205
2	490	20 PC	50 BM	225	215
3	530	20 PC	50 BM	250	230
5	580	25 SDBC	55 DBM	250	250
10	660	40 BC	70 DBM	250	300

THICKNESS & COMPOSITION (mm)

CBR 5%

TRAFFIC (msa)

GSB GB DBM BM BC SDBC PC

Contd.

24

PAVEMENT DESIGN CATALOGUE
PLATE 1 – RECOMMENDED DESIGNS FOR TRAFFIC RANGE 1-10 msa

CBR 6%

Cumulative Traffic (msa)	Total Pavement Thickness (mm)	PAVEMENT COMPOSITION			
		Bituminous Surfacing		Granular Base (mm)	Granular Sub-base (mm)
		Wearing Course (mm)	Binder Course (mm)		
1	390	20 PC		225	165
2	450	20 PC	50 BM	225	175
3	490	20 PC	50 BM	250	190
5	535	25 SDBC	50 DBM	250	210
10	615	40 BC	65 DBM	250	260

THICKNESS & COMPOSITION (mm)

CBR 6%

TRAFFIC (msa)

GSB GB DBM BM BC SDBC PC

Contd.

25

PAVEMENT DESIGN CATALOGUE
PLATE 2 – RECOMMENDED DESIGNS FOR TRAFFIC RANGE 10-150 msa

CBR 5%

Cumulative Traffic (msa)	Total Pavement Thickness (mm)	PAVEMENT COMPOSITION		
		Bituminous Surfacing		Granular Base & Sub-base (mm)
		BC (mm)	DBM (mm)	
10	660	40	70	
20	690	40	100	
30	710	40	120	Base = 250
50	730	40	140	
100	750	50	150	Sub-base = 300
150	770	50	170	

THICKNESS & COMPOSITION (mm) — CBR 5%

Legend: GSB   GB   DBM   BC

TRAFFIC (msa)

32

Contd.

PAVEMENT DESIGN CATALOGUE
PLATE 2 – RECOMMENDED DESIGNS FOR TRAFFIC RANGE 10-150 msa

CBR 6%

Cumulative Traffic (msa)	Total Pavement Thickness (mm)	PAVEMENT COMPOSITION		
		Bituminous Surfacing		Granular Base & Sub-base (mm)
		BC (mm)	DBM (mm)	
10	615	40	65	
20	640	40	90	
30	655	40	105	Base = 250
50	675	40	125	
100	700	50	140	Sub-base = 260
150	720	50	160	

THICKNESS & COMPOSITION (mm) — CBR 6%

Legend: GSB   GB   DBM   BC

TRAFFIC (msa)

33

Contd.

Stresses in Rigid Pavement (Single Axle Load = 12 tons)

Slab thickness (cm)

Contd..

Stresses in Rigid Pavement (Single Axle Load = 14 tons)

Slab thickness (cm)

Contd..

Stresses in Rigid Pavement (Single Axle Load = 16 tons)

38

Stresses in Rigid Pavement (Single Axle Load = 18 tons)

39
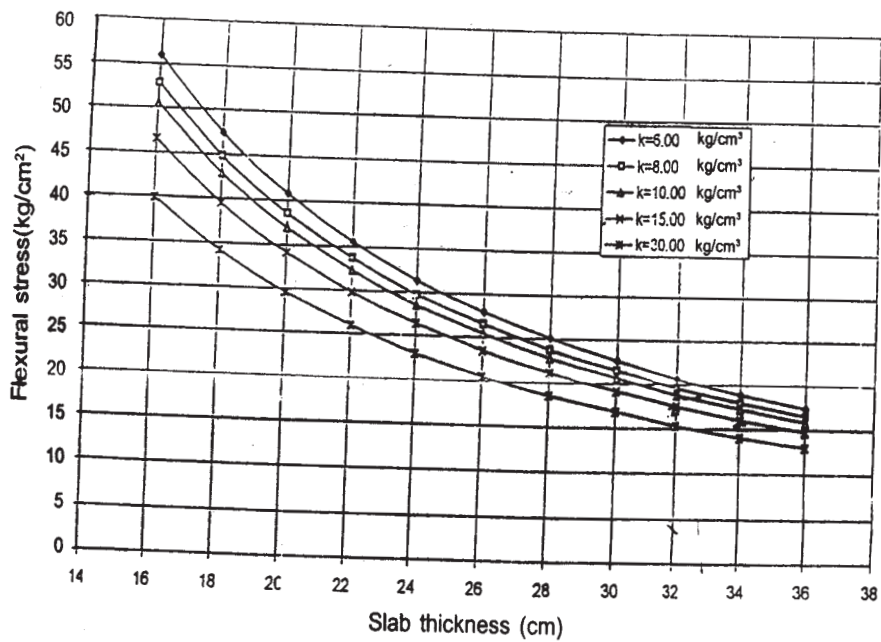
Stresses in Rigid Pavement (Single Axle Load = 20 tons)
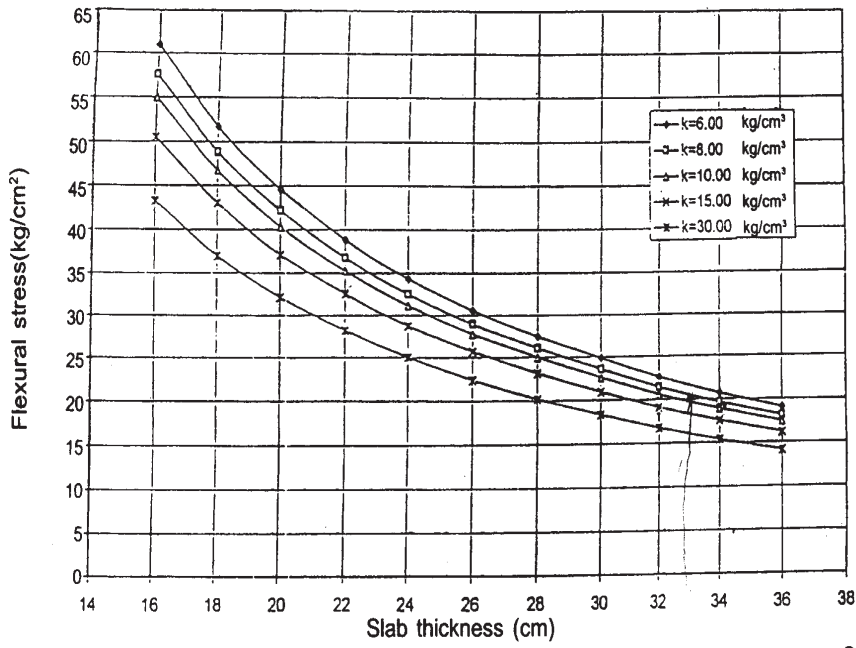
40

Contd..

Stresses in Rigid Pavement (Single Axle Load = 22 tons)
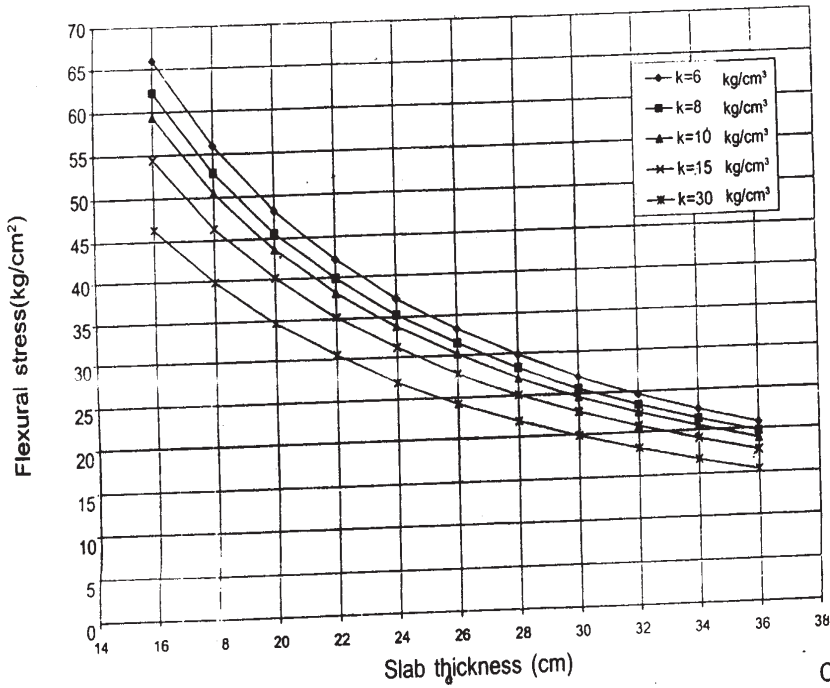
41

Contd..

Stresses in Rigid Pavement (Tandem Axle Load 24 tons)
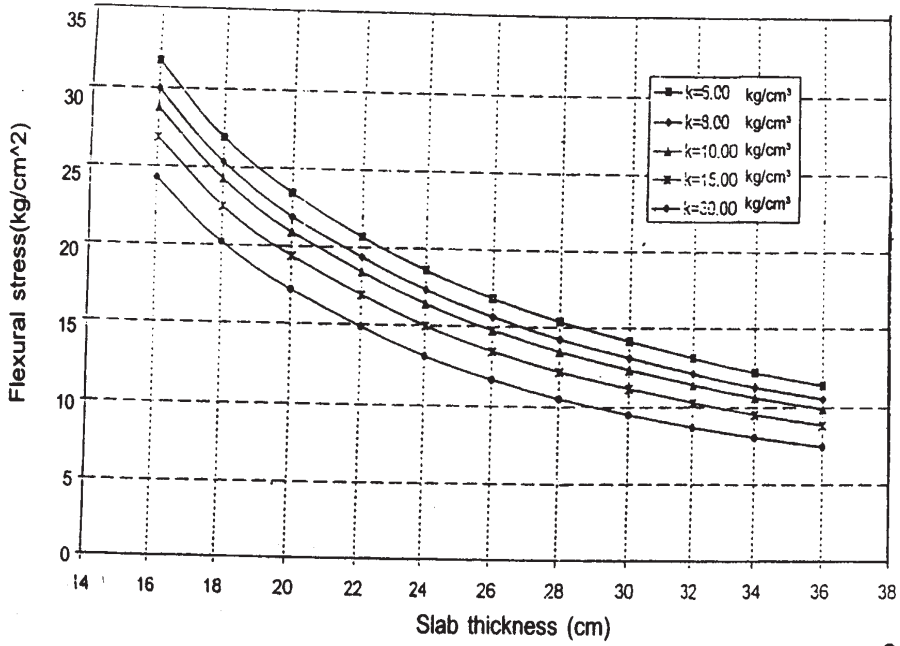
Stresses in Rigid Pavement (Tandem Axle Load 28 tons)
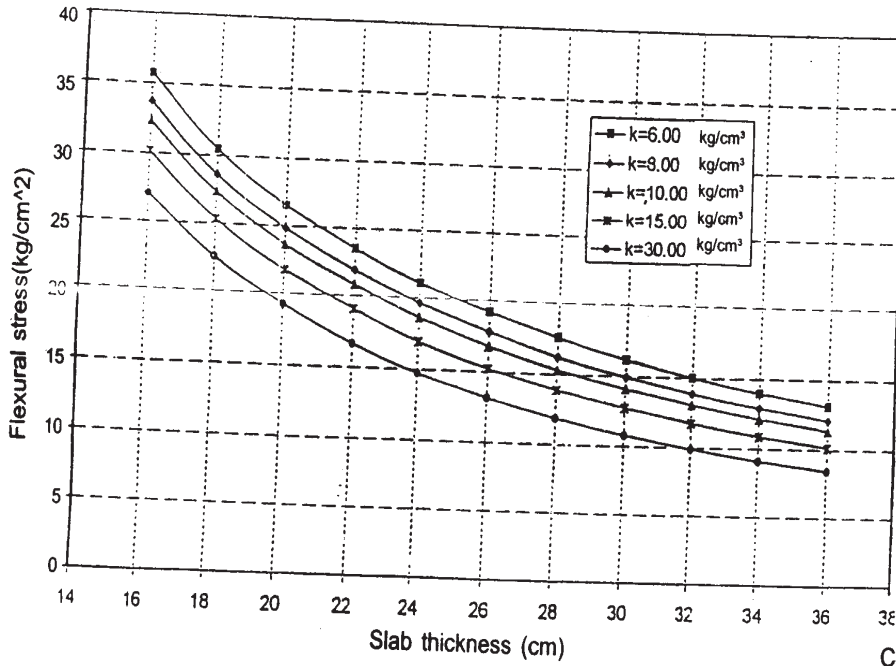
Stresses in Rigid Pavement (Tandem Axle Load 32 tons)

48
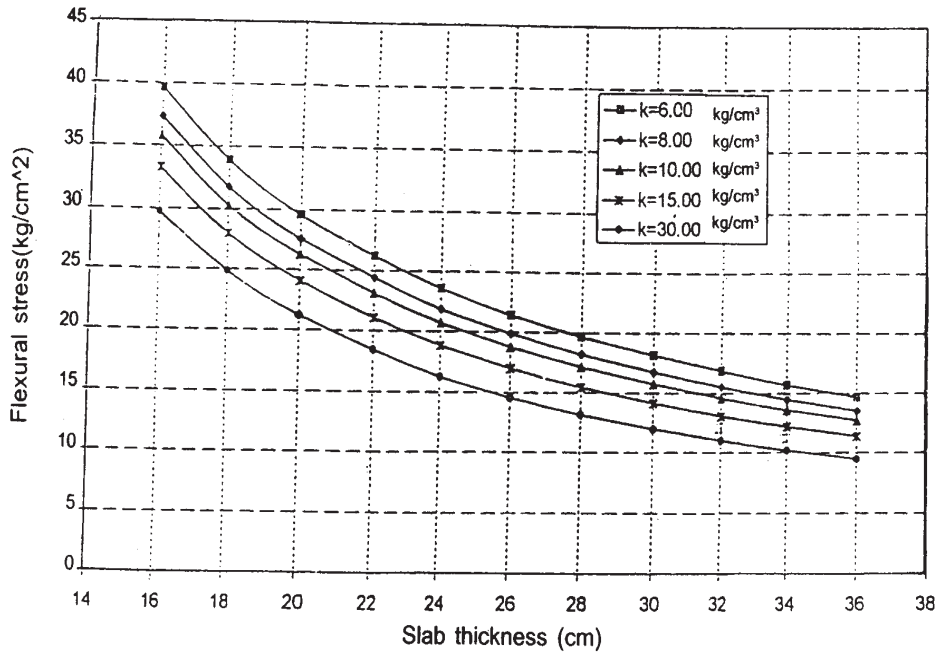
Contd..

Stresses in Rigid Pavement (Tandem Axle Load 36 tons)

49

IRC:58-2002
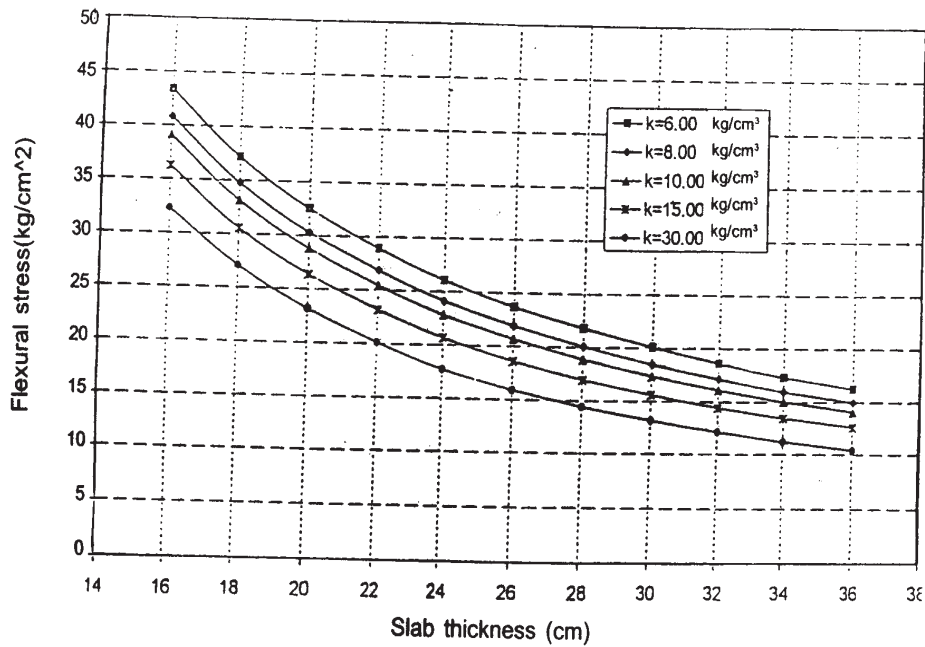
Contd..

Stresses in Rigid Pavement (Tandem Axle Load 40 tons)

50
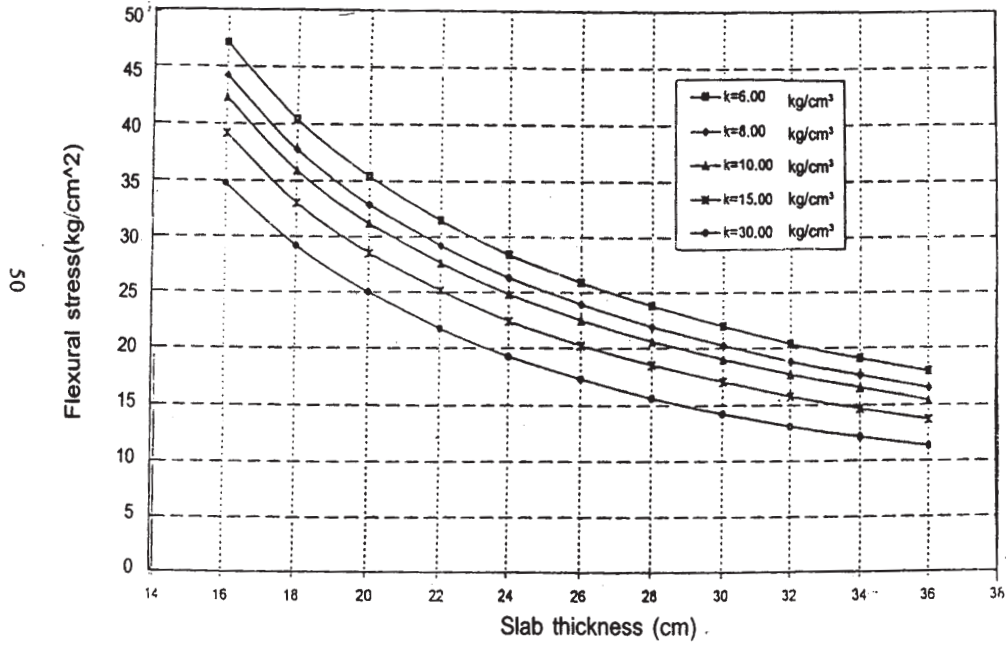
Stresses in Rigid Pavement (Tandem Axle Load 42 tons)

51
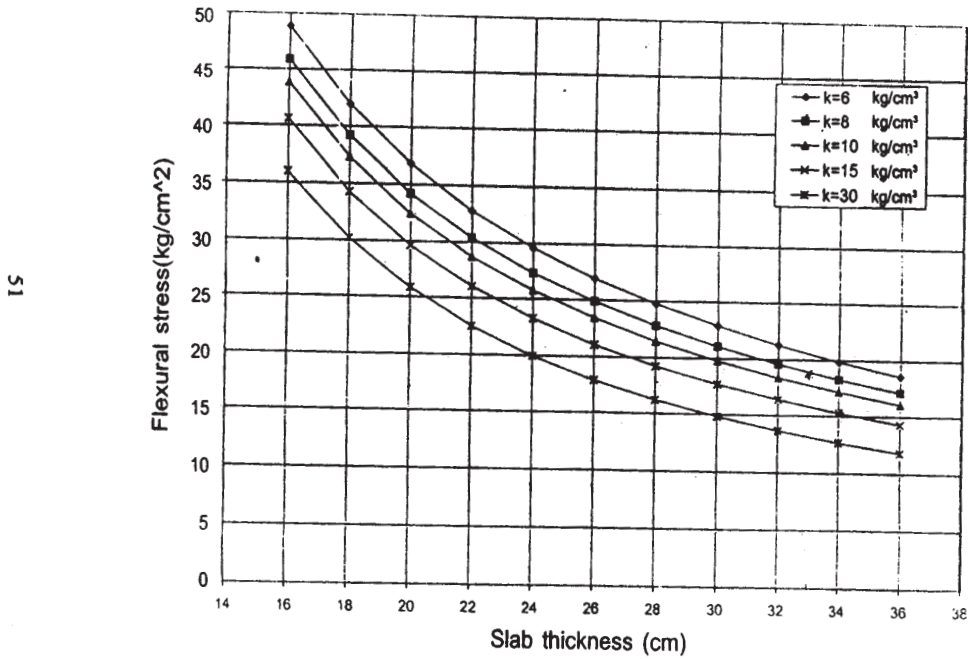
P1328   **[3964]-291**

B.E. (Printing)

STUDY OF ADVERTISING AND MULTIMEDIA

(408287) (2003 Course) (Elective - II) (Sem. - II)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

    1)   *All questions are compulsory*

    2)   *Write Answers to different sections on separate answer sheets.*

SECTION - I

Q1) Explain AIDA model with any suitable example.   **[16]**

OR

Write in details about types of appeals used in advertising. Justify with suitable example.   **[16]**

Q2) What is campaign planning? Why it is necessary? What benefits are derived out of its execution? Are there any limitations or constraints? Explain in details.   **[18]**

OR

Explain any case study of campaign planning along with its period, USP, theme, target audience, brand positioning, market share and other details if any.   **[18]**

Q3) Explain following types of advertising with suitable examples.   **[16]**

    a)   Public Service Advertising.

    b)   Service advertising.

OR

Write short notes on: **[16]**

    a)   Public relations advertising.

    b)   Marketing and advertising communication process.

SECTION - II

Q4) Which are the various types of copy writing? Explain any 5 with suitable examples. **[18]**

OR

What is significance of following in designing of print advertisement. **[18]**
a) White space.
b) Color.
c) Image of product.

Q5) "Marketing Research is an excellent tool for decision maker to decide on product launch" - Justify. **[16]**

OR

What are different ways of budgeting the advertisement expenditure. Explain in details. **[16]**

Q6) Write down those features of print media which makes it the "Preferred One" over the other media. Justify with suitable case/example. **[16]**

OR

Compare and contrast between **[16]**
  Print media Vs Electronic Media.

☞ ☞ ☞

P1330   **[3964]-330-C**

B.E. (Petroleum)
DEEP WATER TECHNOLOGY
(2003 Course) (412391) (Elective - II) (Sem. - II)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

  1) *Question Nos. 4 and 8 are compulsory. Out of the remaining attempt 2 questions from Section I and 2 questions from Section II.*

  2) *Answers to the two sections should be written in separate books.*

  3) *Neat diagrams must be drawn wherever necessary.*

  4) *Figures to the right indicate full makrs.*

  5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

  6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Discuss the step by step procedure / operation of drilling 26" hole, 20" casing and cementation in deep water drilling with diverter system installed on top of riser. **[10]**

b) Discuss floating vessel motions with suitable sketch. **[6]**

Q2) a) What is off set? What are different methods of station keeping? Discuss any one in detail. **[8]**

b) Calculate new KG if rig displacement of 21,000 Tons and KG of 60 feet. A weight of 190 tons with VCG of 10 ft is moved to VCG of 168 ft. **[4]**

c) Explain **[4]**

   i) Centre of gravity.   ii) Metacentre.

Q3) a) Discuss different factors in well planning & design of deep water wells. **[8]**

b) Describe different ports of riser system used while drilling deep water well. **[8]**

Q4) Write short note on: **[18]**

a) Down hole problems & remedy in deep water drilling.

b) Different tubular joints to form a truss structure of a platform.

c) Mud systems in HPHT wells.

SECTION - II

Q5) a) Draw subsea well head system, compair subsea and surface well head system. **[10]**

b) Discuss different types of production platforms in brief. **[6]**

Q6) a) Discuss design consideration & working principles of vertical and horizontal separators. **[8]**

b) Discuss drill stem test in deep water well. **[8]**

Q7) a) Discuss different EOR techniques used in deep water wells. Explain any one in detail. **[8]**

b) Discuss Darcy's equation & way - mouth equation for pipe line design.**[8]**

Q8) a) Discuss plug and abdonment plan in deep water well. **[6]**

b) Driller's method of well control in deep water well. **[6]**

c) Write short note any two. **[6]**

i) HSE (Health, Safety & environment) policy on offshore rig.

ii) Storage tank.

iii) Logistic planning during offshore drilling operations.

☞ ☞ ☞

[3964]-354

P1337

B.E. (Polymer Engineering)
MECHANICS OF COMPOSITES

(Elective - II) (2003 Course) (40967) (Sem. - II)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Attempt Q. No. 1 or 2, Q. No. 3 or 4 and Q.No. 5 or 6 from Section - I. Attempt Q.NO. 7 or 8, Q.No. 9 or 10 and Q.No. 11 or 12 from Section - II.*
2) *Figures to the right indicate full marks.*
3) *Use of scientific calculator, log paper, log-log paper is allowed.*
4) *Answers to the two sections must be written in two separate answer books.*
5) *Assume suitable design data, if required.*

SECTION - I

Q1) a) Discuss in short 'particulate composites'.   **[3]**

b) Discuss manufacturing process of Prepreg lay - up process. Discuss with a neat sketch steps required for vacuum bagging in prepreg lay up process.   **[8]**

c) Give advantages and disadvantages of resin transfer moulding.   **[5]**

Q2) a) Discuss helical winding process and list out common defects in filament wound parts.   **[6]**

b) Give schematic sketch of pultrusion process and list out different process parameters.   **[6]**

c) Give tooling requirement in case of wet lay up and prepreg lay up.   **[4]**

Q3) a) Prove that for an orthotropic lamina, condition for restriction on poisson's ratios is given by

$$\gamma_{21}\gamma_{32}\gamma_{13} < \frac{1 - \gamma_{21}^2\left(\frac{E11}{E22}\right) - \gamma_{32}^2\left(\frac{E22}{E33}\right) - \gamma_{13}^2\left(\frac{E33}{E11}\right)}{2} < \frac{1}{2}$$ **[8]**

b) State Tsai - Hill - Azzi theory. Reduce it to unidirectional lamina. Also give failure envelope in all the quadrants.   **[8]**

c) Define - coefficient of mutual influence of the first land. $\eta_{i, ij}$ **[2]**

P.T.O.

Q4) a) The failure strengths for a angle ply lamina are

$F_{1t} = 1100$ MPa

$F_{1c} = 600$ MPa

$F_{2t} = 40$ MPa

$F_{2c} = 200$ MPa

$s = 100$ MPa

't' refers to tensile and 'c' refers to compressive s is shear strength in 1-2 plane.

The engineering constants of the lamina are $E_{11} = 30$ GPa $E_{22} = 10$ GPa $G_{12} = 2$ GPa $\gamma_{12} = 0.25$

If load of $\sigma x = 5$MPa is applied at 45° to fiber direction, find whether lamina will fail according to maximum strain theory. **[8]**

b) Give merits of Tsai-Wn failure theory. **[4]**

c) Give statement of maximum stress theory and reduce it to unidirectional lamina with fiber orientation 'θ'. **[6]**

Q5) a) Assuming reinforcing factor $\xi = 1$ for circular fibers in square array, find shear modulus for a lamina having 50% of fiber volume fraction. Shear modulus of fiber and matrix can be taken as 35 MPa and 2 MPa respectively. Use Halpin - Tsai equations. **[6]**

b) Derive an equation for determination of in plane shear modulus, G_{12}; using mechanics of material approach. **[6]**

c) Give lower bound and upper bound on apparent young's modulus using elasticity approach to stiffness. **[4]**

Q6) a) Reduce Halpin - Tsai equations to lower and upper bound of composite materials. **[6]**

b) A unidirectional lamina with 30° angle has following properties.

$E_f = 200$ GPa $E_m = 3$ GPa $\gamma_f = 0.3$ $\gamma_m = 0.4$

Calculate $E_{11}, E_{22}, \gamma_{12}, \gamma_{21}$ and G_{12}. Assume fiber volume fraction as 50%. **[6]**

c) Derive an equation for critical fiber volume fraction to obtain fiber strengthening of the composite material. **[4]**

Q7) a) A $[- 60 | + 60 |- 60 | + 60 |]$ anti - symmetric angle ply laminate has each layer of 1mm thickness. Calculate [A], [B], [D] matrix for the laminate. The reduced transformed stiffness matrix for individual layers are given below. **[8]**

$$[\overline{Q}]_{-60} = \begin{bmatrix} 20 & 25 & -15 \\ 25 & 85 & -41 \\ -15 & -41 & 28 \end{bmatrix} \text{GPa}$$

$$[\overline{Q}]_{+60} = \begin{bmatrix} 20 & 25 & +15 \\ 25 & 85 & +41 \\ +15 & +41 & 28 \end{bmatrix} \text{GPa}$$

b) Discuss in short regular symmetric angle ply laminate. Explain why values of elements A_{16}, A_{26}, D_{16} and D_{26} become quite small as the number of layers increase. **[6]**

c) Explain why coupling matrix $[B_{ij}]$ is zero for any single layered configuration. **[4]**

Q8) a) Write force and moment resultants for antisymmetric cross ply laminate. What is regular antisymmetric cross ply laminate? **[7]**

b) 1mm thick single layered isotropic laminate has following engineering constants

E = 100 MPa

γ = 0.4

Write down force and moment resultants. **[7]**

c) Discuss 'Regular symmetric cross ply laminate'. **[4]**

Q9) a) Calculate the angle of twist per unit length and maximum torsional shear stress for a thin walled tube of balanced symmetric laminate which serves as a torsional member

Mean radius = 0.45 m

Thickness of tube = 2.5 x 10^{-3} m

G_{xy} = shear modulus

= 25 GPa

Torque = 1000 N-m. **[8]**

b) Obtain an expression for bending stiffness of a sandwich beam made of central core material and outer skin material on either side. **[6]**

c) Explain the term 'hydrid laminate'. **[2]**

*Q10)*a) A cylindrical container is made up of sandwich laminate. The [Q] matrix for outside skin layers and central core layer is given below. Consider both layers as isotropics.

$$[Q]_{skin} = \begin{bmatrix} 1000 & 500 & 0 \\ 500 & 1000 & 0 \\ 0 & 0 & 300 \end{bmatrix} N/mm^2$$

$$[Q]_{core} = \begin{bmatrix} 4 \times 10^3 & 2 \times 10^3 & 0 \\ 2 \times 10^3 & 4 \times 10^3 & 0 \\ 0 & 0 & 10^3 \end{bmatrix} N/mm^2$$

Consider all layers of 1 mm thickness. Diameter of the container is 200 mm. and is subjected to 200 kN/m². Find hoop and axial strains in individual layers. **[10]**

b) Obtain an expression for beam deflection for a simply supported beam of length L and a uniformly distributed load, 'F'. **[6]**

*Q11)*a) Explain the test arrangement for (IITRI) compression test. **[4]**

b) Give stepwise procedure for plotting Weibull distribution and explain why it is used to represent test results of composites. **[6]**

c) Discuss 'Iosipescu shear test' and explain how shear stress and strain is calculated. **[6]**

*Q12)*a) With a neat sketch, explain two rail shear test. **[4]**

b) Write short notes on any two: **[12]**
    i)   Low energy impact test.
    ii)   Tension - tension fatigue test.
    iii) Failure modes in pin bearing test.

P1052

[3964] - 104

B.E. (Civil)

STRUCTURAL DESIGN - III

(2003 Course) (401004) (Sem. - I)

Time : 4 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answer Q.1 or Q.2, Q.3 or Q.4 in section-I*
2) *Answer Q.5 or Q.6, Q.7 or Q.8 in section-II.*
3) *Answers to the two sections should be written in separate books.*
4) *Figures to the right indicate full marks.*
5) *Use of IS 1343, IS 456, IS 3370 & non programmable calculator is allowed.*
6) *Neat diagrams must be drawn wherever necessary.*
7) *Assume any other data if necessary & mention it at the starting of the answer.*
8) *Mere reproduction from IS Code as answer, will not be given full credit.*
9) *Assume any other data if required.*

SECTION - I

Q1) a) A rigid mass less bar is hinged at A & 1s hanged by a spring at B is supporting a mass 'm' at C through another spring as shown in fig. (1). Derive the expression for natural frequency of the system with usual notations.   **[8]**

Fig (1)
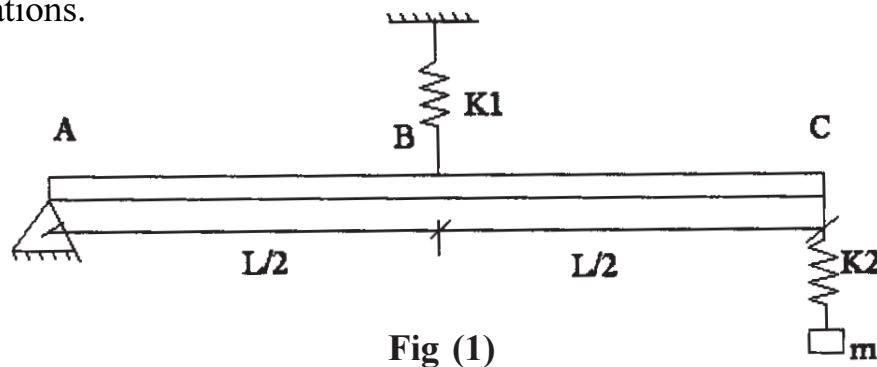
b) Calculate extreme fiber stresses in concrete at midspan at initial and final stage in a post tensioned prestressed concrete beam having cross section as top flange 450×150, web 120×450 and bottom flange 300×235mm, is simply supported over a effective span of 13 m and carries a super imposed load of 12.5 kN/m over entire span. The 3 No. of 12/5 Freyssinet cables having zero eccentricity at supports and c.g. area of steel at 80 mm from soffit of the section and are stressed to initial prestress of 930 Mpa. Take loss ratio as 0.82 and unit weight concrete as 25 kN/m^3.   **[17]**

Q2) a) Explain in brief with sketches: **[8]**

    i)   Effects of damping in RC structures.

    ii)   Multi degree freedom system.

b) A post tensioned prestressed concrete beam section has top flange 430 × 160, web 125 × 500 and bottom flange 360 × 240 mm, is simply supported over a effective span of 17m . The beam is prestressed with 3 No. of 12/7 Freyssinet (fy = 1500Mpa) parabolic cables stressed up to 0.6fy, with their c.g. at 100mm from extreme bottom fiber, stressed one at a time from both the ends. Calculate total loss of prestress at the age of 100 days, if coefficient friction = 0.28, k = 0.0026/m length of cable, slip of anchorage = 1.5mm, Cc = 1.8, Es = 2 × 10^5 MPa, concrete grade = M40, Creep and relaxation of steel = 2% of initial prestress. **[17]**

Q3) Design a post tensioned prestressed concrete rectangular or 'I' section beam for flexure to carry a live load of 11.4 kN/m over entire simply supported span of 13m with M40 grade of concrete and Freyssinet cables of 12/5 (fy = 1750 MPa) or 12/7 (fy = 1500 MPa), including the design of end block. Draw sketches showing cable profiles and end block reinforcement details. Check fiber stresses in concrete and deflection. **[25]**

OR

Q4) a) Compare PSC beam with RCC beam. **[8]**

b) A post tensioned prestressed concrete continuous beam ABC having cross section 230 × 750 mm as shown in fig (2)is prestressed with initial prestressing force of 1500 kN . The loads shown are exclusive of dead load. Locate centerline of thrust under prestress plus dead load also & make it concordant stating the shift of cable at salient points find the stresses in concrete at extreme fibers at intermediate support Take loss ratio of 0.85, AD = 11m, DB = 7m and BE = EC = 9m. The eccentricities at A & C = 0, at D = 200mm (downwards), at B = 160mm (upwards), and at D = 220mm (downwards). **[17]**
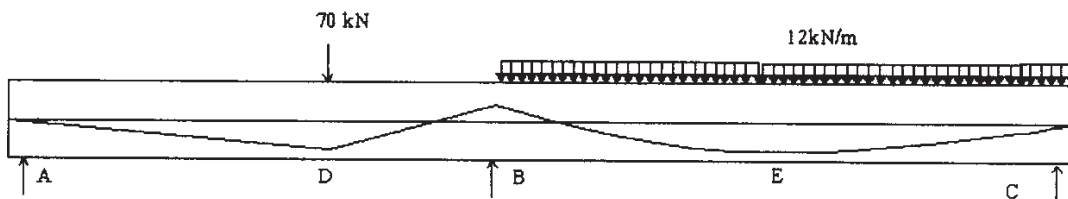
Fig(2)

SECTION - II

Q5) a) Write detailed note on cantilever method. **[8]**

b) Analyze a rigid jointed frame shown in fig (3) by portal method for lateral loads. Flexural rigidity for all members is same. Analyze beam GHI using proper substitute frame, if it is subjected to vertical ultimate live & dead load incl. of its self wt. intensities of 12 kN/m & 14 kN/m on GH and 17 kN/m & 19 kN/m on HI respectively. The horizontal forces are Fl = 12 kN, F2 = 14 kN & F3 = 16 kN. Calculate max. span moment for span HI and support moment at H. Design section for combined effect of vertical and horizontal Loads. Adopt 15% redistribution of moments for vertical load moments Use M20, Fe500. **[17]**
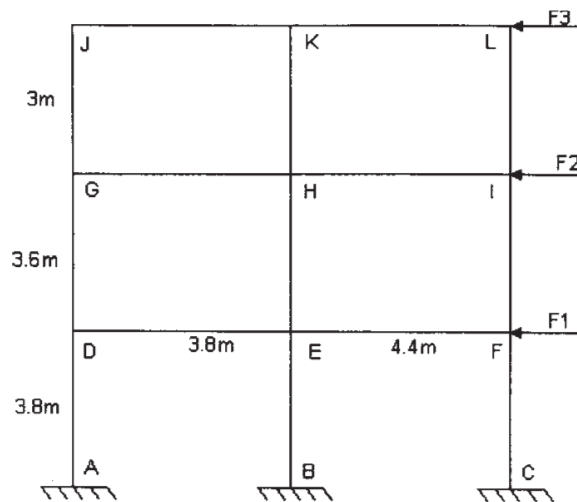
Fig(3)

OR

Q6) a) Write detailed note on substitute frame method. **[8]**

b) Analyze a rigid jointed frame shown in fig (4) by cantilever method for lateral loads. Flexural rigidity for all members is same. Analyze beam GHI using proper substitute frame, if it is subjected to vertical ultimate live & dead load incl. of its self wt. intensities of 22kN/m & 20kN/m on GH and 16kN/m & 15kN/m on HI respectively. The horizontal forces are Fl = 10 kN, F2 = 15 kN & F3 = 22 kN. Calculate max. span moment for span HI and support moment at H. Design section for combined effect of vertical and horizontal Loads. Adopt 10% redistribution of moments for vertical load moments Use M20, Fe500. **[17]**
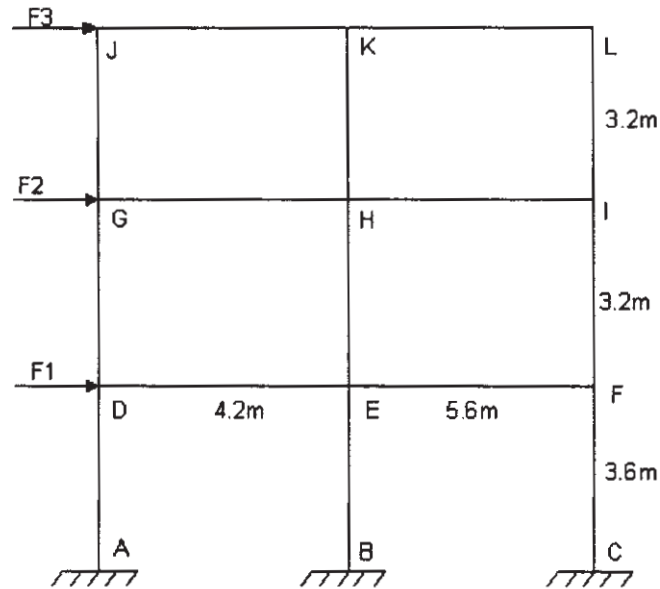
Fig(4)

Q7) a) Write a note on combined footings with strap beam. **[5]**

b) Design rectangular reinforced concrete tank resting on ground to store 4 lakh liters of water the top of tank is open Take the safe bearing capacity of the supporting strata as 200 kN/m². Design the wall and bottom slab of the tank using IS code. Use M25, Fe500 Draw all details of reinforcements. **[20]**

OR

Q8) Design a 'T' shaped cantilever retaining wall with leveled backfill carrying surcharge for the following data:

height = 5.6m above the foundation level,

$\varphi = 30°$,

$\gamma = 18$ kN/m³

Surcharge = 20 kN/m²

Safe bearing capacity of the underlying strata = 160 kN/m², the coefficient friction between the base slab and the underlying strata = 0.56. Draw lateral pressure diagram and details of reinforcement of stem and base showing curtailment if any Use M20, Fe500. **[25]**

❄ ❄ ❄

P1053

[3964] - 106

B.E. (Civil)

SYSTEMS APPROACH IN CIVIL ENGINEERING

(401005) (2003 & 1997 Course) (Elective - I) (Sem. - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

    1)   *Answer three questions from section I and three questions from section II.*

    2)   *Answers to the two sections should be written in separate books.*

    3)   *Neat diagrams must be drawn wherever necessary.*

    4)   *Figures to the right indicate full marks.*

    5)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

    6)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   Solve using Big M method.   **[14]**

        Maximize $Z = 7x_1 + 10x_2$

        Subject to

$$x_1 + x_2 \leq 30$$
$$x_1 \geq 6$$
$$x_2 \leq 12$$
$$x_1 - x_2 \geq 0$$
$$x_1 ; x_2 \geq 0$$

    b)   Explain feasible solution and optimal solution.   **[4]**

OR

Q2) a)   Solve the problem in Q1 (a) above using two phase method.   **[14]**

    b)   Differentiate between slack variables and artificial variables.   **[4]**

Q3) Material is to be transported from 3 sources to 4 destinations. The supply and demand conditions as well as the unit cost of transporting are given below. **[16]**

Source	Destination				Supply
	1	2	3	4	
A	10	6	11	9	60
B	7	5	8	13	100
C	5	9	8	4	40
Demand	20	50	50	80	

Find the initial basic feasible solution by VAM. Using the solution obtained by VAM, find the minimum cost of transportation.

OR

Q4) a) How will you solve a transportation problem, **[8]**

   i) If it is not balanced.

   ii) For maximization.

b) A company has four sales representatives who are to be assigned to four different sales territories. The monthly sales estimated for each sales representative for different areas (in lakh rupees) are shown in the following table. Suggest optimal assignment so as to maximize the total sales per month. **[8]**

Salesman	Territory			
	1	2	3	4
A	21	16	18	23
B	17	13	16	15
C	20	21	20	21
D	19	18	17	20

Q5) a) Compare the various one - dimensional search techniques in NLP. **[6]**

b) Use Fibonacci method to maximize $Z = 24x - 0.2x^2$ in the range (20 to 120) to an accuracy of 0.05%. Carry out computations for the first 4 stages only. **[10]**

OR

Q6) a) Use steepest ascent method to maximize $f(x) = 2x_1 + 2x_1x_2 - 2x_1^2 - x_2^2$. Take initial point as (0, 0) and carry out only two iterations. **[10]**

b) Compare Newton's method with the Steepest Gradient Method. **[6]**

SECTION - II

Q7) a) Use Lagrange Multiplier Technique to **[10]**

Minimize $Z = \dfrac{18}{x_1 x_2^2}$

Subject to $x_1^2 + x_2^2 = 9$

b) Explain the concept of Dynamic programming. **[6]**

OR

Q8) a) A company has proposals to invest Rs. 6 crore in three possible projects. The returns depend upon the level of investment, as given below. Use dynamic programming to determine the investment policy so as to maximize the total returns. **[12]**

Investment in Rs. crore	Returns from projects		
	A	B	C
0	0	0	0
1	8	9	13
2	18	17	19
3	33	23	31
4	37	34	36
5	43	45	42
6	53	52	51

b) In case the amount available is Rs. 5 crore, what would be the investment policy and the corresponding total returns. **[4]**

Q9) a) Eight jobs are to be processed on three machines A, B & C in the sequence A - B - C. The processing time in minutes, of the jobs, are given below. Determine the sequence for the 8 jobs so as to minimize the total elapsed time. Also find the idle times of the machines B & C. **[12]**

Jobs	Processing Time in minutes on		
	A	B	C
1	8	3	7
2	9	3	6
3	7	2	5
4	7	4	5
5	8	4	3
6	9	3	2
7	6	5	6
8	8	3	6

b) What are the various components of a queueing system? **[6]**

OR

Q10) a) Vehicles arrive at a service station in a poisson fashion with average time between two consecutive arrivals being 60 minutes the service time which is distributed exponentially has a mean value of 45 minutes. Determine:

[12]

i) The fraction of time for which the service station is being used.

ii) The chance that the vehicle will straight away be taken up for servicing.

iii) The average queue length and the number of vehicles in the system.

iv) The average waiting time of the vehicles in the queue and in the system.

v) The probability that there are two vehicles waiting in the queue.

vi) The arrival rate of the vehicles if the service facility has to be duplicated in case the waiting time exceeds 3 hours.

b) Explain Monte carlo method of simulation. Give at least two examples of its application to Civil Engineering. **[6]**

Q11) a) Explain the following terms pertaining to Games theory. **[8]**

i) Pure strategy. ii) Mixed strategy.

iii) Saddle point. iv) Payoff matrix.

b) Solve the following game whose pay off matrix to A is given below. **[8]**

	B$_1$	B$_2$	B$_3$	B$_4$
A$_1$	150	−18	78	90
A$_2$	6	50	54	70
A$_3$	130	−30	78	80

Find the optimal strategies for A and B and the value of the game.

<div align="center">OR</div>

Q12) a) Distinguish between   **[12]**

   i)   Mutually compatible projects and mutually exclusive projects.

   ii)   Interest rate and discount rate.

   iii)   Capital Recovery factor and sinking fund factor.

   b) What are the various parameters affecting the choice of a project from amongst various alternatives.   **[4]**

<div align="center">❄ ❄ ❄</div>

P1058

[3964] - 113

B.E. (Civil)

EARTHQUAKE ENGINEERING

(2003 Course) (Elective - II) (401007) (Sem. - II)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *From section I answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and from section II answer Q.7 or Q. 8, Q.9 or Q.10, Q.11 or Q.12 .*

2) *Answers to the two sections should be written in separate answer books.*

3) *Figures in bold to the right, indicate full marks.*

4) *IS 456, IS 1893, IS 13920 are allowed in the examination.*

5) *Neat diagrams should be drawn where ever necessary.*

6) *If necessary, assume suitable data and indicate clearly.*

7) *Use of electronic pocket calculator is allowed.*

SECTION - I

Q1) a) Explain plate tectonic theory. **[10]**

    b) With a neat sketch explain the interior of the earth. **[6]**

OR

Q2) a) Explain magnitude and intensity of an earthquake. **[6]**

    b) Explain the various scales used for measuring earthquakes. **[10]**

Q3) a) Obtain the solution for the. mathematical model shown in Fig. 3.a. **[10]**
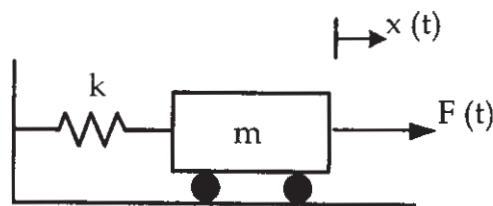
Fig. 3.a

b) For the mathematical model shown in Fig. 3.b, determine the equivalent stiffness. **[6]**
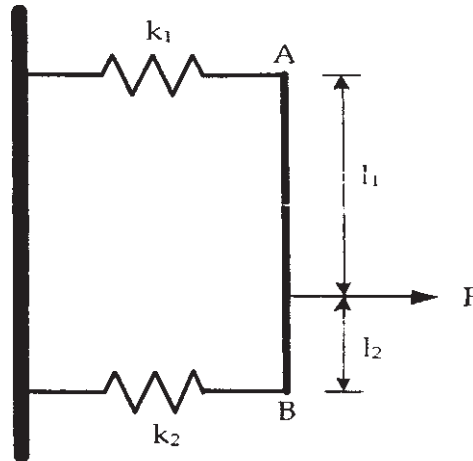
Fig. 3.b

OR

Q4) a) An elevated water tank is modeled as shown in Fig. 4.a. Determine the natural frequency. **[4]**
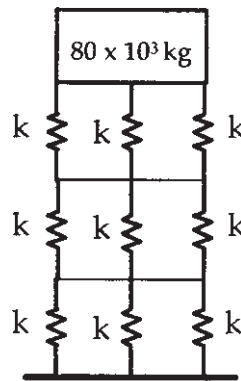
Fig. 4.a

b) A motor of 8 kg is isolated from the floor slab by a sheet of rubber and a sheet of felt as shown in Fig. 4.b. The rubber sheet has a stiffness of 2600 N/m and an equivalent damping coefficient of 75 N.s/m. The felt sheet has a stiffness of 10000 N/m and an equivalent damping of 300 N.s/m. Determine the undamped and damped natural frequencies of the system in the vertical direction. Neglect the mass of the isolators. **[12]**
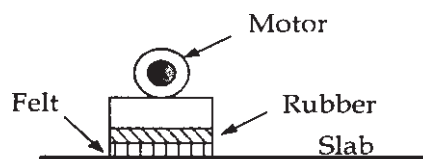
Fig. 4.b

Q5) a) What are shear walls? Explain with neat sketches. **[10]**

b) Explain the various structural arrangements by which the lateral loads on a structure can be resisted. **[8]**

OR

Q6) Fig. 6 shows plan of an 8-storey building located in zone IV. Two shear walls are provided in each direction (A and C; B and D) to resist the seismic forces. The building has the following data: **[18]**

a) Floor-to-floor height = 3.25 m.

b) Dead load per unit area of floor = 4 kN / m²

c) Live load on each floor = 3 kN / m²

d) Live load on roof = 1.5 kN / m²

e) Axial load on each shear wall = 4800 kN

f) Size of columns = (350 × 350) mm

g) Soil below the foundation = Hard

h) Grade of materials = M25 grade of concrete and Fe 415 grade of steel

Design the shear walls and show the reinforcement details.
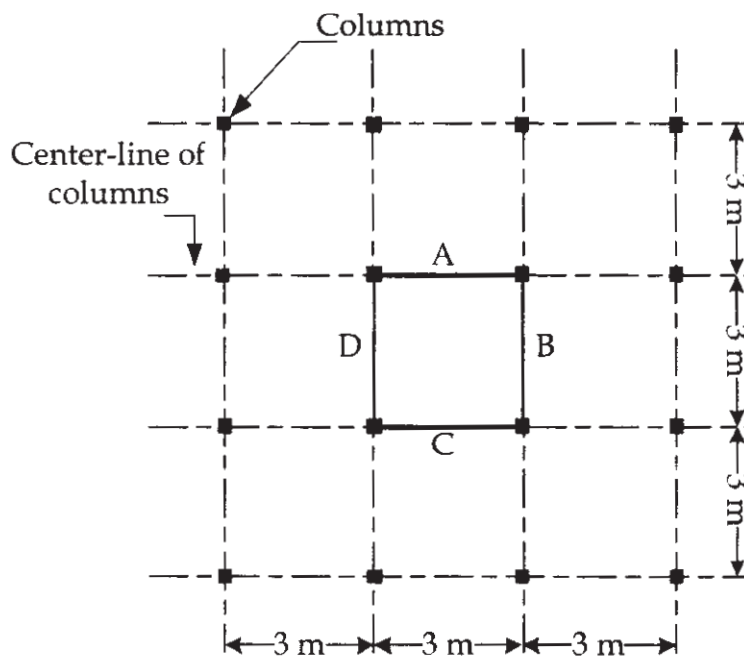
Fig. 6

SECTION II

Q7) The G + 3 building shown in Fig. 7 is located in seismic zone V. The floor-to-floor height is 3.2 m. The building is supported on medium stiff soil. The R.C. frames are in-filled with masonry walls. The lumped weight due to dead loads is 10 kN / m² on floors and 8 kN / m² on the roof. The floor slabs are designed for a live load of 3 kN / m² and the roof is designed 1.5 kN / m². Perform dynamic analysis along x-axis only. **[18]**
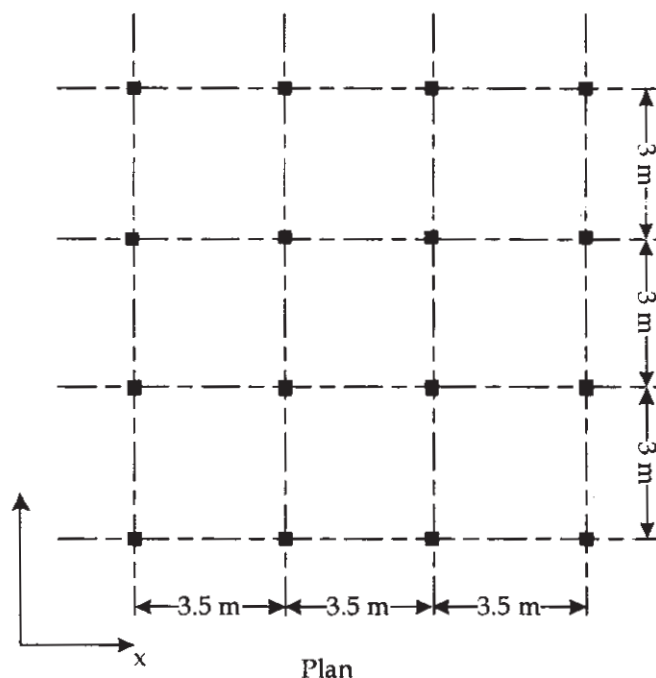

Fig. 7

OR

Q8) a) What are lap splices? Explain with neat sketches for a beam and a column. **[9]**

b) Explain static analysis and dynamic analysis of structure for seismic loads. **[9]**

Q9) A (350 × 350) mm column is reinforced with 12-16#. It is supported on an isolated footing. The load coming on the footing is 1350 kN and a moment of 45 kNm. The SBC of the soil is 290 kN / m². Using M25 grade of concrete and steel of grade Fe 415, design the footing. **[16]**

OR

Q10) What are the various methods available to control the lateral forces acting on a structure? Explain in detail. **[16]**

Q11) Explain the following with neat sketches: **[16]**

- Soft story
- Plan irregularity
- Mass irregularity
- Liquefaction

OR

Q12) a) What is retrofitting and rehabilitation of structures? **[8]**

b) Explain the various techniques of retrofitting. **[8]**

❊ ❊ ❊

[3964] - 124

P1067

B.E. (Mech. Engg.)
GAS TURBINES & JET PROPULSION
(Sem. - I) (2003 Course) (402044)

Time : 3 Hours]　　　　　　　　　　　　　　　　　　*[Max. Marks :100*

Instructions to the candidates:

　　1)　Answer three questions from section I and three questions from section II .

　　2)　Answers to the two sections should be written in separate books.

　　3)　Neat diagrams must be drawn wherever necessary.

　　4)　Figures to the right indicate full marks.

　　5)　Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

　　6)　Assume suitable data, if necessary.

SECTION - I

Q1) a)　What is velocity of sound? Derive an equation for the velocity of sound for a perfect gas. Explain the terms mach cone and mach angle. **[6]**

　　b)　Explain the concept of stagnation properties.

　　　　Air is moving in a pipe with a velocity of 100m/s. The temperature and pressure at one section in the pipe is 40ºC and 2 bar respectively. Find **[10]**

　　　　i)　Stagnation pressure　　　　ii)　Stagnation temperature

　　　　iii)　Stagnation density and　　　iv)　Stagnation enthalpy.

OR

Q2) a)　Why is it necessary to use a convergent divergent nozzle instead of convergent nozzle only? Derive an equation for the maximum flow rate through the nozzle and show that the critical pressure ratio for air nozzle is 0.5283. **[8]**

　　b)　Explain the working of convergent and convergent divergent nozzles under varying pressure ratios. **[8]**

Q3) a) Derive the relation for degree of reaction in case of axial flow compressors. Why the degree of reaction gnerally kept is 50%? **[8]**

b) A double sided centrifugal compressor has impeller eye root and tip diameters of 18 cm and 30 cm and is to deliver 16 kg of air per second at 1600 rpm. The design ambient conditions are 15°C & 1 bar and compressor is to be a part of a stationary power plant. Find suitable values for the impeller vane angles at roof and tip of the eye if air is given 20° of prewhirl at all radii. The axial component of inlet velocity is constant over the eye and is 150m/s.

Find also the maximum Mach No. AT the eye. What is the disadvantage of reducing the Mach No. by introducing prewhirl? **[10]**

OR

Q4) a) Explain the phenomen on of stalling, surging and chocking in rotary compressors. How these can be controlled? **[10]**

b) Compare centrifugal and axial flow compressors and enlist their fields of applications. **[8]**

Q5) a) What are the various thermodynamic variables that affect the performance of simple gas turbine plant? Explain with sketch the effect of pressure ratio and show that optimum pressure ratio is given by the square root of maximum pressure ratio. **[10]**

b) What are the different methods used for improving the performance of gas turbine cycle? Explain any one of them. **[6]**

OR

Q6) a) A continuous combustion, constant pressure gas turbine takes in air at 100 kPa and 17°C. The air is compressed in a rotary compressor through a pressure ratio of 6:1. The air then passes at constant pressure through a heat exchanger, the effectiveness of which is 65%. From the heat exchanger air passes at constant pressure through a combustion chamber in which its temperature is raised to 870°C. From the combustion chamber air passes through a gas turbine in which it is expanded to a pressure of 100 pa and it then passes through the heat exchanger to exhaust. The isentropic efficiency of the compressor is 85% while that of turbine is 80%. Neglect the mass of fuel and take the air mass flow rate of 5 kg/s. Take $\sqrt{} = 1.4$ and Cp = 1.005 kJ/kg.K. Determine: **[12]**

i) Net power output of the plant.

ii) The exhaust temperature from the heat exchanger.

iii) The thermal efficiency if the plant.

iv) The thermal efficiency if there was no heat exchanger.

b) Compare gas turbines with diesel engines. **[4]**

SECTION - II

Q7) a) Derive the condition for maximum utilization factor of De-laval turbine and hence prove that the discharge is axial. **[8]**

b) What is compounding of impulse turbine? What are the different methods used for compounding of gas turbines? Explain any one method with neat sketch. **[8]**

OR

Q8) a) Differentiate very clearly the reaction and impulse turbine. **[2]**

b) Derive the relation for the degree of reaction interms of angles made with the axial direction. **[6]**

c) In a stage of reaction turbine, the main diameter of the rotor is 1.5m and velocity ratio is 0.7. Turbine rotates at 4500 rpm. Blade outlet angle is 70° to flow direction. Find the diagram efficiency and also find the maximum diagram efficiency. **[8]**

Q9) Write short notes on: **[4 × 4 = 16]**

a) Factors considered for good combustion chambers.

b) Materials used in gas turbines.

c) Fuels used in gas turbines.

d) Gas Turbines blade cooling.

OR

Q10) a) Define flame velocity, ignition delay and stability with reference to gas turbine combustion chamber. **[4]**

b) What is the normal range of air-fuel ratio used in gas turbines? How combustion is obtained at this air-fuel ratio? **[4]**

c) What is primary and secondary air in gas turbine combustion chamber? What are their functions? **[4]**

d) What are the different types of combustion chambers used in gas-turbines? Explain with neat sketch any one of them. **[4]**

Q11) a) Define the following terms related to jet propulsion. **[6]**

    i)   Thrust   ii) Thrust power

    iii) Propulsive power   iv) Propulsion efficiency

    v)   Thermal efficiency and   vi) Over all efficiency.

b) A jet propelled air craft consuming air at the rate of 20kg/s is to fly at a Mach No. 0.6 at an altitude of 5000 m where the pressure is 0.55 bar and temperature is –20ºC. The diffuser which has a pressure coefficient of 0.9 decelerates flow to a negative velocity. The compressor pressure ratio is 5 and the maximum temperature in the combustion chamber is 1000ºC. After expanding in the turbine, the gases continue to expand in the nozzle to a pressure of 0.7bar. The isentropic efficiencies of the compressor, turbine and nozzle are 0.81, 0.85 and 0.92 respectively. The calorific value of the fuel is 41870kJ/kg. Assuming that the products of combustion have the same properties as air find. **[12]**

    i)   Power input to compressor

    ii) Power output of turbine.

    iii) Fuel to air ratio

    iv) Exit Mach No.

    v)   Thrust provided by the engine

    vi) Thrust power developed.

<div align="center">OR</div>

Q12) Write short notes on any three of the following: **[3 × 6 = 18]**

    a) Air breathing and rocket engines.

    b) Fuels for air breathing engines and rocket engines.

    c) Staging of rockets.

    d) Applications of jet propulsion engines and rocket engines.

<div align="center">❄ ❄ ❄</div>

P1074   **[3964] - 142**

B.E. (Mech. S/W)

INDUSTRIAL HYDRAULICS AND PNEUMATICS

(Sem. - I) (2003 Course) (402062)

Time : 4 Hours]   *[Max. Marks :100*

Instructions to the candidates:

   1)   *Answers to the two sections should be written in separate books.*

   2)   *Neat diagrams must be drawn wherever necessary.*

   3)   *Figures to the right indicate full marks.*

   4)   *Use of electronic pocket calculator is allowed.*

   5)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   Explain the bypass filter with its merits and demerits.   **[6]**

    b)   Discuss any six important properties of hydraulic fluid.   **[6]**

    c)   What is the difference between static and dynamic seal?   **[6]**

<div align="center">OR</div>

Q2) a)   Write in brief on contamination control in hydraulic systems.   **[6]**

    b)   Discuss applications of fluid power in clamping devices.   **[6]**

    c)   Discuss in bries the different materials used for seals provided in hydraulic components.   **[6]**

Q3) a)   Write short notes on the following

       i)   Temperature switches   **[4]**

       ii)   Pressure switches.   **[4]**

    b)   What is the function of a Hydraulic power unit? Explain with neat diagram.   **[8]**

<div align="center">OR</div>

Q4) a) What are the different accessories used in hydraulic systems? What are their functions? **[6]**

b) Explain working of a Vane pump with the help of a neat sketch. **[6]**

c) What are the different applications of accumulators in hydraulic systems? **[4]**

Q5) a) Classify direction control valves. **[4]**

b) Differentiate open centre and close centre valve position in direction control valves. **[4]**

c) Draw neat sketch and explain working of a pilot operated Relies valve. **[8]**

OR

Q6) a) State the advantages and disadvantages of Meter - in - circuit. **[6]**

b) Explain with neat sketch working of a counter balance valve and draw a circuit showing its application. **[10]**

SECTION - II

Q7) a) What are the different cylinder mountings? **[4]**

b) Draw a typical circuit for motor braking? **[4]**

c) Draw a regenerative circuit explaining its applications. **[10]**

OR

Q8) a) Design a circuit to show how two sequence valves can be used in conjunction with a four way control valve to operate two cylinders in sequence. **[10]**

b) Explain the purpose of quick exhaust valve in Pneumatic system with a circuit. **[8]**

Q9) a) Draw a neat sketch and explain working of a typical 5 way 2 position solenoid operated direction control valve used in pneumatic circuits. **[8]**

b) Explain working of a typical air motor. **[5]**

c) Write a short note on 'Mufflers'. **[3]**

OR

Q10) a) How do pneumatic actuators and control valves differ from hydraulic actuators and control valves? **[8]**

b) Explain Filter, Regulator and Lubricator unit in pneumatics. **[8]**

Q11) a) A pneumatic cylinder is to be continuously moved to and pro. The motion is to be started by operating a knob of a direction control valve. The continuous motion is to be interrupted by operating another knob operated direction control valve, such that the cylinder is retracted before stopping. Develop a suitable pneumatic circuit for this application using standard symbols. **[8]**

b) Draw typical circuits of different speed regulating methods used in pneumatic circuits. **[8]**

OR

Q12) A machine is operated by a hydraulic system. The motion of the hydraulic cylinder is used to operate the machine. Total stroke of cylinder is 500mm.

a) First 300mm of stroke is against a load of 15kN speed is 4.5m/min.

b) Load during remaining 200mm of stroke is 35kN speed is 2.5m/min for first 100mm and 0.5m/min for the remaining 100mm. The return speed should not exceed 6 m/min.

Propose hydraulic circuit which will fulfill these requirements. Select different components used in the circuit from data given. Mention rating of components in case it is not available in the given data. **[16]**

DATA

1. Suction Strainer :

Model	Flow Capacity (/pm)
S_1	38
S_2	76
S_3	152

2. Pressure Gauge :

Model	Range (bar)
PG_1	0 - 25
PG_2	0 - 40
PG_3	0 -100
PG_4	0 - 160

3. Vane Pump :

Model	Delivery in / pm		
	at 0 bar	at 35 bar	at 70 bar
P_1	8.5	7.1	5.3
P_2	12.9	11.4	9.5
P_3	17.6	16.1	14.3
P_4	25.1	23.8	22.4
P_5	39.0	37.5	35.6

4. Relief Valve :

Model	Flow capacity (/ pm)	Max Working Pressure & bar
R_1	11.4	70
R_2	19	210
R_3	30.4	70
R_4	57	105

5. Flow control Valve :

Model	Working Pressure (bar)	Flow Range (/pm)
F_1	70	0-4.1
F_2	105	0-4.9
F_3	105	0-16.3
F_4	70	0-24.6

6. Directional Control Valve :

Model	Max working Pressure (bar)	Flow Capacity (/pm)
D_1	350	19
D_2	210	38
D_3	210	76

7. Check Valve :

Model	Max working Pressure (bar)	Flow Capacity (/pm)
C_1	210	15.2
C_2	210	30.4
C_3	210	76

8. Pilot Operated Check Valve :

Model	Max working Pressure (bar)	Flow Capacity (/pm)
PO_1	210	19
PO_2	210	38
PO_3	210	76

9. Cylinder-(Max Working Pressure-210 bar)

Model	Bore dia. (mm.)	Rod dia (mm)
A_1	25	12.5
A_2	40	16
A_3	50	35
A_4	75	45
A_5	100	50

10. Oil Reservoirs :

Model	Capacity (litres)
T_1	40
T_2	100
T_3	250
T_4	400
T_5	600

❄ ❄ ❄

P1082

[3964] - 154

B.E. (Production)

OPERATIONS RESEARCH

(Sem. - I) (2003 Course) (411084)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

  1) *Attempt either Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from section I and Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from section II.*
  2) *Answers to the two sections should be written in separate books.*
  3) *Neat diagrams must be drawn wherever necessary.*
  4) *Figures to the right indicate full marks.*
  5) *Use of calculator is allowed.*
  6) *Assume suitable data, if necessary.*

SECTION - I
Unit - I

Q1) a) Explain how linear programming technique can be helpful in decision making in production area.   **[6]**

   b) Das Electrical manufactures two models of voltage stabilizers, Prag and Niran. All components of the stabilizers are purchased from outside sources and only assembly and testing is carried out at the company's own works. The assembly and testing time required for the two models are 0.8 hours each for Prag and 1.2 hours each for Niran. Manufacturer capacity of 720 hours at present is available per week. The market for the two models has been surveyed which suggest maximum weekly sale of 600 nos. of Prag and 400 nos. of Niran. Profit per unit for Prag and Niran models has been estimated at Rs. 100 and Rs. 150 respectively. Find the optimal production mix using simplex method of LPP.   **[12]**

OR

Q2) a) What are the various phases in solving O. R. Problems?   **[6]**

   b) Balaji Travels have three tour plans, namely Super Deluxe, Deluxe and Economy for package tour. The package includes air travel, quality accommodation, local sight seeing options and meal plans. It has maximum capacity to accommodate 200 persons in three plans together. The estimates tour prices, hotel costs, meal & other expenses per person plan wise are as under.   **[12]**

P.T.O.

Tour plan	Tour Price (Rs.)	Hotel costs (Rs.)	Meal & other expenses (Rs.)
Super Deluxe	10,000	3,000	4,700
Deluxe	7,000	2,200	2,500
Economy	6,000	1,900	2,200

From the past experience the constraints are:-

i) At least 10% of the total packages must be of super deluxe type.

ii) At least 35% but not more than 70% must be of deluxe type.

iii) At least 30% must be economy type.

iv) The hotel desires at least 120 persons should be of super deluxe and deluxe type together.

v) There should not be any problem for getting 200 persons.

In order to maximize the total profit, how many persons he should offer each tour plan, if the agent has hired an aircraft for the flat fee of Rs. 200000 for entire tour. Formulate the problem as LPP and find optimum solution using graphical method. Interpret the results.

Unit - II

Q3) a) "An assignment problem is a special case of transportation problem". Explain. **[6]**

b) Using a suitable method, find the optimal solution of the transportation problem. **[10]**

	D_1	D_2	D_3	D_4	Supply
O_1	13	25	12	21	18
O_2	18	23	14	9	27
O_3	23	15	12	16	21
Demand	14	12	23	17	

OR

Q4) a) Explain how Travelling salesman problem is solved by using assignment model. **[6]**

b) In the inventory of a company, which deals with large heavy metal blocks, four new blocks are to be placed. There are only five empty places in inventory of the company, A, B, C, D and E, where places A and C are relatively small. Hence the place A can not hold the block 3 and C can not hold block 2. The cost of transferring the blocks into places of inventory is as follows: **[10]**

Place →	A	B	C	D	E
Block 1	9	11	15	10	11
Block 2	12	9	--	10	9
Block 3	--	11	14	11	7
Block 4	14	8	12	7	8

Find the optimal assignment schedule.

Unit - III

Q5) a) Explain the branch and bound method in integer programming problem. **[6]**

b) Find the solution of following integer LPP. **[10]**

Maximize $z = 3x_1 - x_2$

Subject to constraints

$$2x_1 + x_2 \geq 2$$
$$x_1 + 3x_2 \leq 3$$
$$x_2 \leq 4 \text{ and } x_1, x_2 \text{ are positive integers.}$$

OR

Q6) a) Explain the Gomory's cutting plane method in integer programming problem. **[6]**

b) Define or explain the following terms: **[10]**
   i) Parametric programming
   ii) Dynamic programming
   iii) Non linear programming
   iv) Integer programming
   v) Goal programming

SECTION - II
Unit - IV

Q7) a) Explain the steps involved in Monte-Carlo simulation. **[6]**

b) Find the cost/period of individual replacement policy of an installation of 300 light bulbs. Given that the cost of replacing an individual bulb is Rs. 2. Calculate cost and the number of light bulbs that would fail during each week if the conditional probability of failure per week is as given below: **[10]**

Week number	0	1	2	3	4
Conditional cumulative Probability of failure	0.0	0.10	0.30	0.70	1.0

<center>OR</center>

Q8) a) Explain briefly Geometric programming. **[6]**

b) Bright bakery keeps a stock of a popular brand of cake. Previous experience indicates the daily demand as given here: **[10]**

Daily demand	0	15	25	35	45	50
Probability	0.01	0.15	0.20	0.50	0.12	0.02

Consider the following sequence of random numbers. Using this sequence, simulate the demand for next 10 days. Find out the stock situation if the owner of the bakery decides to make 35 cakes every day.

<center>48   78   09   51   56   77   15   14   68   09</center>

Unit - V

Q9) a) What are the properties of a game? Determine the optimal strategies and the value of the game using graphical method if A_1 & A_2 are strategies of player A and B_1, B_2, B_3, B_4 are of player B. **[8]**

<center>

	B_1	B_2	B_3	B_4
A_1	2	2	3	-2
A_2	4	3	2	6

</center>

b) In the production shop of a company, the break down of the machines is found to be poisson distribution with an average rate of 3 machines per hour. Break down time at one machine costs Rs. 400 per hour to the company. There are two choices before the company for hiring the repairman. One of the repairman is slow but cheep, the other fast but expensive. The slow repairman demands Rs. 200 per hours and will repair the broken down machines exponentially at the rate of 4 per hour. The fast repairman demands Rs. 300 per hour and will repair machines exponentially at an average rate of 6 per hour. Which repairman should be hired? **[8]**

<center>OR</center>

Q10) a) What are pure and mixed strategies? Explain the "best strategy" on the basis of minimax criterion of optimality. **[8]**

b) What are the characteristics of queuing model? Write Kendal's notations for the models I. **[8]**

Unit - VI

Q11) a) Differentiate CPM and PERT. **[8]**

b) The following information of a small project is given in number of weeks for completion. **[10]**

Activity :	1 - 2	2 - 3	2 - 4	3 - 5	4 - 6	5 - 6	5 - 7	6 - 7
Pessimistic time :	6	9	6	8	8	6	5	8
Most likely time :	4	6	4	6	6	4	7	10
Optimistic time :	3	3	2	4	4	2	3	2

Draw the network diagram and calculate variances, the critical path and the expected project length.

OR

Q12) a) Write a short note on: **[8]**
   i)   Resource smoothing   ii)   Crashing of network

b) A small project is composed of activities whose time estimates are listed in the table below. Activities are identified by beginning (i) and ending (j) node numbers: **[10]**

Activity	Estimated duration (in days)		
(i - j)	Optimistic	Most likely	Pessimistic
1 – 2	1	4	7
1 – 3	5	10	17
2 – 4	3	3	3
2 – 6	1	4	7
3 – 4	8	15	26
3 – 5	2	4	8
4 – 5	5	5	5
5 – 6	2	5	8

   i)   Draw the project network
   ii) Find the expected duration and variance of each activity and expected project length.
   iii) What is the probability that it would take 5 days more than the expected duration?

❄❄❄

[3964] - 155

B.E. (Production Sandwich)
RELIABILITY ENGINEERING
(2003 Course) (411085) (Elective - I) (Sem. - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answers to the two sections should be written in separate books.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   Define: **[8]**

   i)   Hazard Rate   ii)   M.T.T.F.

   iii) Failure Density   iv)   Mean failure rate

   Using hypothetical data if necessary.

   b)   What is the relationship between MTTF and reliability.   **[4]**

   c)   Draw and explain a specimen "Bath Tub Curve".   **[4]**

                                   OR

Q2) a)   Define reliability. Explain briefly the reasons for unreliability of Engineering system.   **[6]**

   b)   Following table shows the test results for 100 components tested simultaneously.   **[10]**

Operating Time (Hours)	0	10	20	30	40	50	60	70	80	90	100
No. of Surviving Components	100	90	81	73	66	60	55	50	45	41	37

   Evaluate : Hazard rate, failure density function and reliability and plot these functions against time.

Q3) a) What are the various logic gates commonly used in FMEA diagram? **[6]**

b) Figure 1 Show a FMEA diagram with basic failure rates as 0.002, 0.003 and 0.004 per hour for A, B and C respectively. Find out the failure rate of To assuming mission time of 100 hours. **[10]**
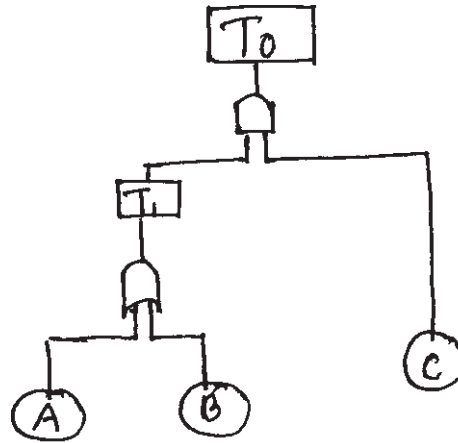
Fig. 1

OR

Q4) a) Explain the 'event tree' method of analysing system reliability, when the sub systems are connected in series. **[6]**

b) In a cellular manufacturing system, a cell consist of 4 identical machines each having a failure rate of 0.001 per hour. Find the reliability of the system for a mission time of 200 hours, assuming that for the survival of the system atleast two machines must operate. **[10]**

Q5) a) Explain the matrix method of evaluating system reliability. **[8]**

b) Evaluate the reliability for system shown in figure 2. **[10]**
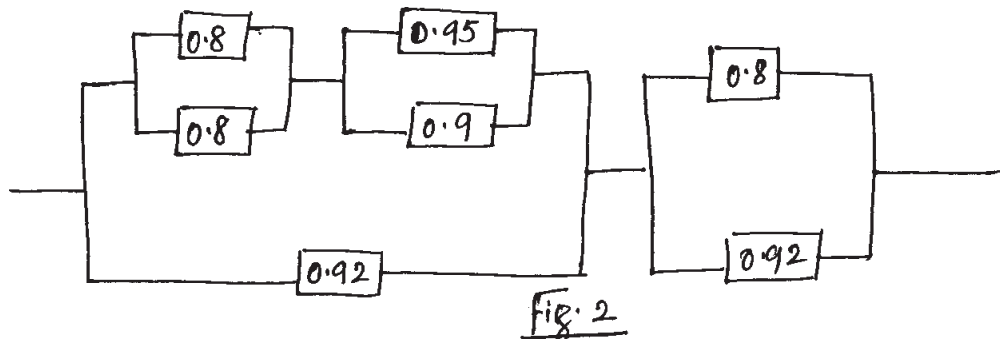
Fig. 2

OR

Q6) a) What do you mean by redundancy? Explain different techniques of incorporating redundancy in a system. **[6]**

b) Using conditional probability method, evaluate the reliability of the system shown in figure 3. **[12]**
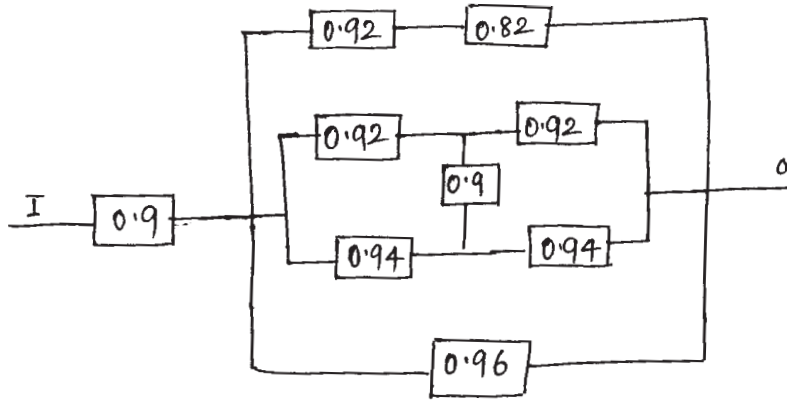
Fig. 3

SECTION - II

Q7) a) What is reliability effort function. Explain its influence on life cycle costing. **[6]**

b) A system consist of 4 subsystems and has a reliability level of 0.98 for a mission time of 12 hours of continuous operation. Sub-systems 1 and 4 are essential for successful operation of the system and subsystems 2 and 3 work for 2 and 3 hours respectively and the importance factor for 2 and 3 can be rated as 95% and 93% respectively. Following additional data is available. Allocate the reliability. **[10]**

Sub system Number	Number of Modules	Importance Factor	Operating Time (Hours)
1	25	1.00	12
2	100	0.95	09
3	70	0.93	10
4	80	1.00	12

OR

Q8) a) Define "Safety Margin" arising out of Load - strength interaction. Compare it with "factor of safety". **[6]**

b) Plot the variation of reliability against time by mean Ranking as well as Median Ranking method, Obtained from data in an accelerated life testing of a system, given below: **[10]**

Failure Numbers	1	2	3	4	5	6	7	8	9	10
MTTF (Hours)	8	10	18	20	15	21	23	25	28	30

Q9) a) What do you understand by "Operational Availability" and "Inherent Availability"? Derive expression for these two. **[8]**

b) An inherent availability of a system is 0.92 when MTBF is 220 hours. What is the maximum value of MTTR? Assuming logistic time for administrative support is 30% of the total down time. Find out operational availability. **[8]**

OR

Q10) a) What is "Risk Priority Number" (RPN)? How it can be determined. **[8]**

b) Compare FMEA and FMECA. Explain the steps and advantages of FMEA in minimising potential failures. **[8]**

Q11) Write short notes on (any 3) **[18]**

a) Accelerated life testing for determining reliability.

b) Predictive Maintenance.

c) Life Cycle Costing.

d) Availability and Maintainability.

e) Redundancy - Active, Passive, Standby.

❄ ❄ ❄

P1084   **[3964] - 156**

B.E. (Production & Ind.)
POWDER METALLURGY
(2003 Course) (411085) (Sem. - I) (Elective - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

    1)   *Answer three questions from section I and three questions from section II.*

    2)   *Answers to the two sections should be written in separate books.*

    3)   *Neat diagrams must be drawn wherever necessary.*

    4)   *Figures to the right indicate full marks.*

    5)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

SECTION - I

Q1) a)   Critically discuss the methods of powder production. What are the methods most suited for composite powders?   **[8]**

    b)   The preparation of the sintered product is influenced by the methods of powder production. Explain, giving specific examples.   **[8]**

OR

Q2) a)   What are the effects of powder characteristics, green density, sintering temperature on the strength & density of P/M parts?   **[8]**

    b)   Describe various methods of determination of the green strength of a powder compact.   **[8]**

Q3) a)   What are the methods used for minimizing the density gradient of the unsintered part? Is it possible to eliminate these variations completely?   **[9]**

    b)   What are the factors that are required to be considered for a die design?   **[9]**

OR

Q4) a) Which are the different die design principles to be followed in P/M manufacturing to Produce a quality product? **[9]**

b) What is the effect of improper mixing of the powders on quality of P/M products? **[5]**

c) What is the role played by lubricant in compaction? **[4]**

Q5) a) Explain, 'It is necessary to have three distinct zones in a continuous sintering furnace'. **[8]**

b) What is liquid phase sintering? Explain its stages. Also discuss its advantages &applications in industry. **[8]**

OR

Q6) a) Describe four important material transport mechanisms of sintering. **[8]**

b) Discuss in brief about the sintering atmosphere &its impact on process performance. **[8]**

SECTION - II

Q7) Write short note on following: **[16]**

a) Polymer blends

b) P/M Forging

c) Applications of Isostatic method

d) Spray deposition

OR

Q8) a) Describe Hot Isostatic pressing method in brief. What are its advantages?

[8]

b) Write an essay on powder roll compaction. **[8]**

Q9) a) Describe with the help of flow sheet diagram the production of tungsten carbide powder, mentioning all important features. **[9]**

b) Discuss the factors which influence the performance of diamond tools. What advantages will you obtain using diamond tools? **[9]**

OR

Q10) a) Describe the technique used in manufacturing diamond tools. Enumerate their fields of applications. **[9]**

b) What is the double sintering process? Why are presintering & heat treatment of green carbide done? Explain. **[9]**

Q11) a) Why Mechanical properties of P/M parts is inferior to those obtained by conventional methods of manufacturing like casting, forging, etc. ?How is it compensated by a no. of other benefits? **[8]**

b) Discuss about the Heat treatments commonly adopted for P/M parts.
[8]

OR

Q12) Write short note on: **[16]**

a) Near net shape of P/M parts.

b) Nano composites.

❄ ❄ ❄

P1090

[3964] - 165

B.E. (Production)
ADVANCED PRODUCTION TECHNOLOGY
(2003 Course) (Elective - II) (Sem. - II) (411090)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

   1)   *Answer three questions from section I and section II.*

   2)   *Answer to the sections should be written in separate books.*

   3)   *Neat diagrams must be drawn wherever necessary.*

SECTION - I
Unit - I

Q1) a)   Describe the benefits of JIT system? **[8]**

      b)   Explain the steps followed in TPS for adapting demand fluctuation. **[8]**

OR

Q2) a)   Describe the various situations involved fine tuning of production through KANBAN. **[8]**

      b)   How production planning and production smoothening is carried out in TPS. **[8]**

Unit - II

Q3) a)   Explain performance rating for conventional and world class manufacturing. **[8]**

      b)   Explain the benchmarking with brief definitions of the keywords in the definition of benchmarking. **[9]**

OR

Q4) a)   Explain with neat sketch various activities involved in SMED. **[9]**

      b)   What is meant by value stream mapping? Explain it. **[8]**

Unit - III

Q5) a)   What are the objectives of productivity measurement. **[8]**

      b)   Explain the concept of management by objectives. **[9]**

OR

Q6) a) Describe the various hard and soft factors of the organisation for productivity improvement. **[9]**

b) Explain with suitable example, productivity is differing from performance. **[8]**

SECTION - II
Unit - IV

Q7) a) What is simulation? Explain the types of simulation. **[8]**

b) Explain the various ways of Representing knowledge. **[9]**

OR

Q8) a) What is Artificial Intelligence? Explain its importance in today's manufacturing era. **[8]**

b) What are the logical and decision making rule in Artificial Intelligence? **[9]**

Unit - V

Q9) a) Explain Design morphology along with its feasibility analysis. **[8]**

b) Explain with suitable example the design synthesis and functional analysis in design. **[8]**

OR

Q10) a) Explain use of geometric and topological information in design. **[6]**

b) Explain in brief the characteristics matrix with suitable example. **[10]**

Unit-VI

Q11) a) Explain the technology management concept applied to manufacturing industries. **[9]**

b) Explain the phases of transfer of technology process. **[8]**

OR

Q12) a) Discuss the levels of development of technology. **[9]**

b) Explain the different function in technology management. **[8]**

❄❄❄

P1092

[3964] - 175

B.E. (Production/SW)
DIE & MOULD DESIGN
(Sem. - I) (2003 Course) (411122) (Elective - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *From section I solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and from section II solve Q.7 or Q. 8, Q.9 or Q.10,   Q.11 or Q.12.*

2) *Answers to the two sections should be written in separate answer books.*

3) *Neat diagrams must be drawn wherever necessary.*

4) *Figures to the right indicate full marks.*

5) *Use of electronic pocket calculator is allowed.*

6) *Assume suitable data, if necessary.*

SECTION - I
Unit - I

Q1) a)   Explain the elastic deformation (problems) in rolling.   **[8]**

b)   Explain Hydrostatic extrusion with neat sketch.   **[4]**

c)   Explain stock preparation in wire drawing.   **[4]**

OR

Q2) a)   What are the different parameter that affect an extrusion pressure? Explain the variation of extrusion pressure with ram travel in Direct and Indirect Extrusion.   **[8]**

b)   Explain stepped cone and multistage wire drawing machine with their relative merits and demerits.   **[8]**

Unit - II

Q3) a)   Explain the principal of metal cutting and effect of clearance in press working.   **[8]**

b)   Defined difference types of dies? Draw neat sketch of compound and combination die.   **[8]**

P.T.O.

Q4) a) What are the different types of die set? Explain it with neat sketch. **[8]**

b) How presses are classified on the basis of frame explain with neat sketch? **[8]**

Unit - III

Q5) Design a blanking die for the component shown in Figure 1.

a) Draw strip layout and find out material utilization assuming strip length 2500mm. **[4]**

b) If press of maximum capacity 7.5 tone is available, what action should be taken to perform blanking operation on the same press? **[4]**

c) Design and draw blanking die. **[4]**

d) Sketch the assembly drawing showing locating elements and other details on it. **[6]**
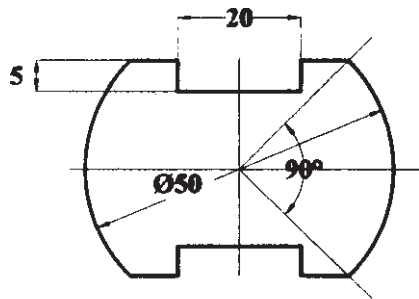
Fig. 1 : Blank of m.s. sheet 1 mm thk with shear stress = 400N/mm²

OR

Q6) Progressive die design.

a) Draw assembly drawing with locating element of a progressive die for the component shown in fig 2. **[6]**

b) Draw strip layout and find out material utilization. **[4]**

c) Find out cutting force at each station and press tonnage. **[4]**

d) Explain type of pilot to be used and how will you hold it. **[4]**
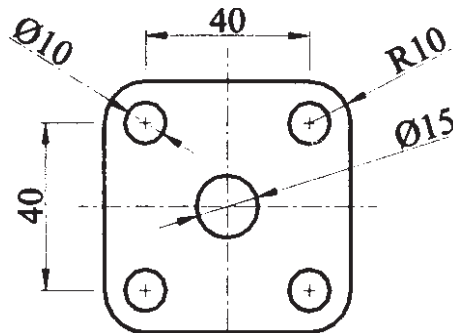
Fig. 2 : Material : 1.2 mm thick shear strength: 280 MPa

Q7) a) Explain the working of screw press with neat sketch and give its advantages and disadvantages. **[8]**

b) What are the applications of upsetting? Explain the rules of upsetting with neat sketch. **[8]**

OR

Q8) Write short note on any three: **[16]**

a) Open die and close die forging.

b) PM forging.

c) Forging cleaning.

d) Forgability.

Unit - V

Q9) a) How injection moulding machines are specified? **[8]**

b) What are the two types of plastics give differences. **[8]**

OR

Q10) Explain with limitations and applications following processes **[16]**

a) Compression moulding.

b) Blow moulding.

c) Injection moulding.

Unit - VI

Q11) Design simple two plate injection mould for the following component. **[18]**
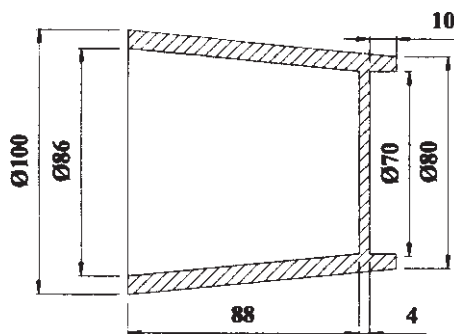
OR

Q12) a) Explain injection mould for thermo set. **[6]**

b) What rectangular edge gate and 50 mm long runner dimensions are required for moulding PVC box the dimension of which is as follows? Length = 150mm; width = 130mm; depth = 50mm.

Given; PVC constant (n) = 0.9; PVC density = 1.39gm/cm^3. **[8]**

c) Explain any one types for ejector plate return system. **[4]**

❄❄❄

P1093   **[3964] - 176**

B.E. (Production S/W)

ADVANCED PRODUCTION TECHNOLOGY

(411122) (2003 Course) (Elective - I) (Sem. - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1)   *Answers to the two sections should be written in separate books.*

2)   *Neat diagrams must be drawn wherever necessary.*

3)   *Figures to the right indicate full marks.*

4)   *All questions are compulsory.*

SECTION - I

Unit - I

Q1) a)   Illustrate a J.I.T. system with the help of neat Block Diagram?   **[10]**

b)   Explain the history behind the Toyota Production System?   **[8]**

OR

Q2) a)   Explain the various KANBAN Rules with their subrules?   **[10]**

b)   Explain the various situations in implementing Kanban.   **[8]**

Unit - II

Q3) a)   Brief in detail the definition of "Benchmarking" and explain the process?

[8]

b)   Explain the Benefits of "Benchmarking Process".   **[8]**

OR

Q4) a)   With the help of neat Block Diagram explain the PDCA cycle?   **[8]**

b)   Explain in detail the 'Single Minute Exchange of Die' process?   **[8]**

Unit - III

Q5) a) What do you mean by productivity term? How is it differ from performance? **[8]**

b) Explain the various ways of measuring "Productivity"? **[8]**

OR

Q6) a) Explain 'Basic Work Content' and 'Added Work Content' in productivity? **[8]**

b) Explain in detail productivity improvement technique? **[8]**

SECTION - II

Unit - IV

Q7) a) Explain in detail the domains of A. I. problem? **[8]**

b) What are the ways of representing knowledge in detail? **[8]**

OR

Q8) a) Explain in detail the simulation study and different steps in that? **[8]**

b) What are different simulation package available now a days with advance features an it? **[8]**

Unit - V

Q9) Explain in brief the Product Design Specifications (PDS) and brief the importance of PDS. **[16]**

OR

Q10) Explain in brief the characteristics matrix with a suitable example? **[16]**

Unit - VI

Q11) Explain the four different Research & Development Strategies? **[18]**

OR

Q12) Explain the Four Phases of "Transfer of Technology process? **[18]**

❅ ❅ ❅

[3964] - 203

P1097

B.E. (Electrical)
INDUSTRIAL DRIVES AND CONTROL
(2003 Course) (403144) (Sem. - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

　　1)　*Answer three questions from section I and three questions from section II.*

　　2)　*Answers to the two sections should be written in separate books.*

　　3)　*Neat diagrams must be drawn wherever necessary.*

　　4)　*Figures to the right indicate full marks.*

　　5)　*Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

　　6)　*Assume suitable data, if necessary.*

SECTION - I

Q1) a)　With a neat sketch of functional block diagram, explain the Electric Drive System.　**[6]**

　　b)　Discuss four - quadrant operation of a motor driving a hoist load.　**[6]**

　　c)　Figure 1C shows plots of speed vs motor and load torques. Comment on the steady state stability of the operating points K_1, K_2, K_3 and K_4.　**[4]**

T_{L1} & T_L : load characteristics

Fig 1c

OR
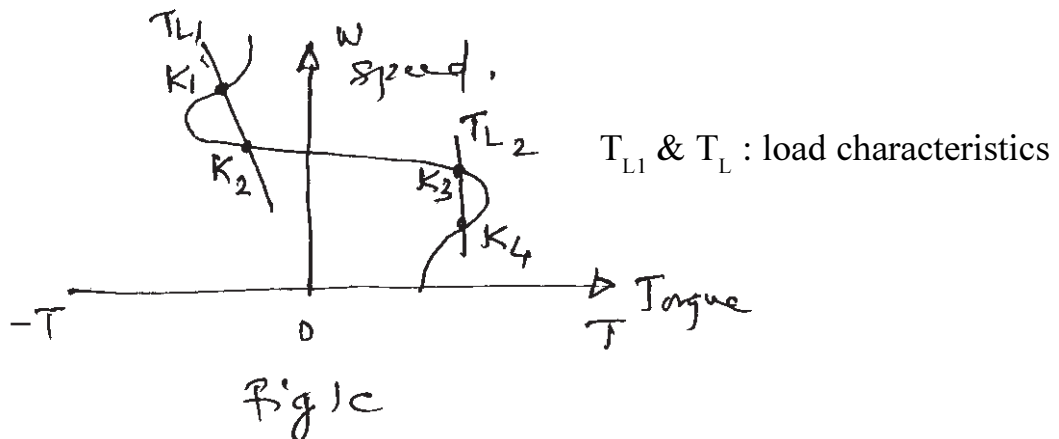
Q2) a) Explain load equalisation in an electric drive. How flywheel helps in load equalisation processes. **[6]**

b) Obtain the equilibrium points and determine their steady - state stability, given: **[6]**

$$T_M = 1 + 2W_m \ \& \ T_L = 3\sqrt{W_m}$$

where T_M : motor torque

T_L : load torque.

c) Describe the conditions for steady state stability of an Electric drive system. **[4]**

Q3) a) With the sketches of speed - torque characteristics and connection diagrams, explain Electric braking methods used for 3-phase induction motor. **[8]**

b) A 220V, 20kW dc shunt motor running at its rated speed of 1200 rpm is to be braked by reverse current braking. The armature resistance is 0.1 ohm and the rated efficiency of the motor is 88%. Calculate: **[8]**

i) The resistance to be connected in series with the armature to limit the initial braking current to twice the rated current.

ii) The initial braking torque.

iii) The torque when the speed of motor falls to 400 rpm.

OR

Q4) a) With the diagram of speed - torque characteristics, explain Electric braking of dc series motor. **[6]**

b) A 3-phase 440 V, 50Hz, 10 pole star connected induction motor has the following parameters $R_1 = 0.15$ ohm, $R_2 = 0.45$ ohm, $X_1 = 0.6$ ohm, $X_2 = 1.8$ ohm, $S_f = 0.05$ and the ratio of effective stator to rotor turns $1/\sqrt{3}$. The motor is to be braked at rated speed and an external resistance of 1.75 ohms per phase (referred to stator) has been inserted into the rotor circuit. Determine the initial braking torque for the following two cases of braking. **[10]**

i) dc rheostatic braking.

ii) reverse current braking.

Q5) a) Draw the neat circuit diagram of 3 phase full converter fed dc drive. Explain its operation with suitable wave forms. **[6]**

b) Draw the neat circuit diagram of chopper fed dc drive. Explain its operation with suitable waveforms. **[6]**

c) A 230V, 960 rpm and 200 A separately excited dc motor is operated in dynamic braking with chopper control with a braking resistance of 2Ω. **[6]**

   i) Calculate duty ratio of chopper for a motor speed of 600 rpm and braking torque of twice the rated value.

   ii) What will be the motor speed for a duty ratio of 0.6 and motor torque equal to twice its rated torque.

<div align="center">OR</div>

Q6) a) Describe relative merits and demerits of four quadrant dc drives employing circulating and non-circulating current dual converter. Draw all necessary sketches. **[8]**

b) A 220V, 1200 rpm, 15A separately excited dc motor has $R_a = 1.8\Omega$ and $L_a = 32mH$. The motor is controlled by a single phase fully-controlled rectifier with an ac source voltage of 230V, 50Hz. Identify the modes and calculate developed torques for **[10]**

   i) $\alpha = 60°$ and speed = 450 rpm.

   ii) $\alpha = 60°$ and speed = 1500 rpm.

<div align="center">

SECTION - II

</div>

Q7) a) With necessary diagrams, explain $\dfrac{V}{f}$ = constant speed control method for induction motor. **[10]**

b) Why current source inverter fed induction motor drive is operated at a constant rated flux. **[6]**

<div align="center">OR</div>

Q8) a) A 3 - phase, 400V, 50Hz, 6 pole, 960 rpm y - connected wound rotor induction motor has the following constants referred to the stator:

   $R_s = 0.5\Omega$, $R'_r = 0.7\Omega$, $X_s = 1.5\Omega$, $X'_s = 1.6\Omega$. The speed of the motor is reduced to 800 rpm at half full load torque by injecting a voltage in phase with the source voltage into the rotor. Calculate the magnitude and the frequency of the injected voltage. Stator to rotor turns ratio is 2.2. **[8]**

b) Explain with functional block diagram, the closed loop control of CSI fed induction motor drive. **[8]**

Q9) a) Explain thermal model of motor for heating and cooling. **[8]**

b) Plot the load curve and select the proper motor for the following intermittent duty: **[8]**

  i) $P_1 = 35$ kW for $t_1 = 3$ sec

  ii) $P_2 = 17$ kW for $t_2 = 20$ sec

  iii) $P_3 = 35$ kW for $t_3 = 2$ sec

  iv) $P_4 = 13$ kW for $t_4 = 15$ sec

Between the operating periods 2 & 3, there is a pause (P = 0) of $t_{c_1} = 37$ sec & at the end of the cycle, there is another pause t_{c_2} of 40 sec. Assume standard duty factor = 0.4.

OR

Q10) a) Explain different methods to reduce the energy loss during starting of induction motor. **[8]**

b) Write short note on "Losses in Electrical drive system and measures for energy conservation in Electrical Drives. **[8]**

Q11) Explain industrial applications of Electrical drives in **[3 × 6 =18]**

a) Cement mills.

b) Sugar mills.

c) Paper mills.

OR

Q12) Explain industrial applications of Electrical drives in **[3 × 6 =18]**

a) Textile mills.

b) Machine tool application.

c) Electric traction.

❄❄❄

P1098

[3964] - 204

B.E. (Electrical)

CONTROL SYSTEM - II

(Sem. - I) (2003 Course) (403145)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1)   *Answers to the two sections should be written in separate books.*

2)   *Neat diagrams must be drawn wherever necessary.*

3)   *Figures to the right indicate full marks.*

4)   *Your answers will be valued as a whole.*

5)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

SECTION - I

Q1) a)   Define: **[8]**

     i)   State

     ii)   State variables

     iii)   State space

     iv)   State equation

b)   Obtain the state model of the given electrical network in the standard form. Choose $i_1(t)$, $i_2(t)$ and $v_c(t)$ as state variables and $e_i(t)$ as input variable. Also choose $e_o(t)$ as output variable. (Refer fig 1(b)).   **[8]**

Fig 1(b)

OR
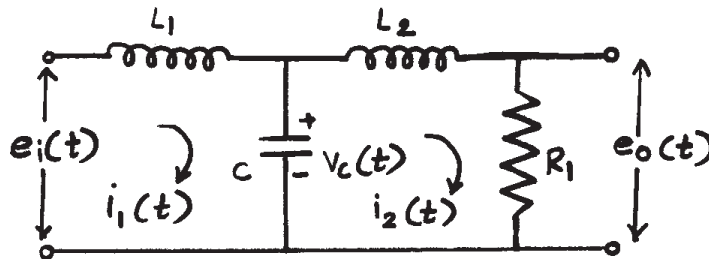
Q2) a) Define and give examples of   **[8]**

  i)   Physical variables

  ii) Phase variables

  iii) Canonical variables

 b) A feedback system is characterized by the closed loop transfer function

$$\frac{Y(s)}{U(s)} = \frac{s^2 + 4s + 9}{s^3 + 3s^2 + 2s + 1}$$

Obtain state space model by direct decomposition method. Draw block diagram also.   **[8]**

Q3) a) Explain the concept of diagonalization and discuss how this is achieved.   **[8]**

 b) Obtain eigen values, eigen vectors and modal matrix for

$$A = \begin{bmatrix} 0 & 1 & -1 \\ -6 & -11 & 6 \\ -6 & -11 & 5 \end{bmatrix} \text{ and prove that } M^{-1} AM = \wedge \text{ diagonal matrix.}$$ **[8]**

<div align="center">OR</div>

Q4) a) Define State Transition Matrix (STM). Explain various methods to obtain it.   **[8]**

 b) Obtain STM for $A = \begin{bmatrix} 0 & -3 \\ 1 & -4 \end{bmatrix}$.   **[8]**

Q5) a) Define controllability and observability of a system. Explain various tests to obtain the same.   **[9]**

 b) Evaluate controllability and observability of the following state model.   **[9]**

$$X' = AX + BY$$
$$Y = CX.$$

where

$$A = \begin{bmatrix} -1 & 0 & -1 \\ 0 & -2 & 0 \\ 0 & 0 & -3 \end{bmatrix} \quad B = \begin{bmatrix} 1 & 0 \\ 1 & 2 \\ 2 & 1 \end{bmatrix} \quad C = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 1 & 5 \end{bmatrix}.$$

<div align="center">OR</div>

Q6) a) What are different methods of evaluating state feedback gain matrix? Explain any one method in detail. **[9]**

b) An observable system is described by

$$X' = \begin{bmatrix} 1 & 2 & 0 \\ 3 & -1 & 1 \\ 0 & 2 & 0 \end{bmatrix} X + \begin{bmatrix} 2 \\ 1 \\ 1 \end{bmatrix} 4$$

$$y = \begin{bmatrix} 0 & 0 & 1 \end{bmatrix} X.$$

Design a state observer so that the eigen values are $-4, -3 \pm j1$. **[9]**

SECTION - II

Q7) a) Discuss characteristics which are unique to nonlinear control systems. **[7]**

b) In a unity feed back control system, a relay with dead zone is connected in cascade with $G(s) = \dfrac{60}{s(s+2)\ (s+4)}$

The relay has the dead zone of ± 1 unit and gives out put of ± 2 units for input signal beyond the dead zone region. Using describing function method, determine amplitude and frequency of limit cycle if it exists. **[10]**

OR

Q8) a) Classify different types of non-linearities. Give an example of each. **[7]**

b) Obtain the describing function for nonlinearity with dead zone and saturation. **[10]**

Q9) a) Explain the direct method of lyapunov to determine the stability of a non-linear control system. **[8]**

b) Explain the terms isoclines and slope markers in connection with phase plane trajectory. Also explain how the phase trajectory is constructed using the method of isocline. **[9]**

OR

Q10) a) Discuss different types of singular points that occur in phase plane method. Sketch the corresponding phase trajectories and identify stable and unstable singular points. **[7]**

b) Explain the concepts **[4]**
   i) Positive definite function.
   ii) Negative definite function.
   iii) Positive semidefinite function.
   iv) Negative semidefinite function.

c) Show that the following quadratic form is positive definite **[6]**
   $V(x) = 10x_1^2 + 4x_2^2 + x_3^2 + 2x_1x_2 - 2x_2x_3 - 4x_1x_3$.

Q11) a) What is 'Performance Index' as used in optimal control theory? Explain
   i) ISE   ii) ITAE

   iii) IAE   iv) ITSE **[8]**

b) Write detailed note on optimal control design by calculus of variation method. **[8]**

OR

Q12) Write a note on:

a) Various types of actuators. **[8]**

b) Various types of sensors. **[8]**

❋ ❋ ❋

P1099

[3964] - 205

B.E. (Electrical)

ROBOTICS & AUTOMATION

(Sem. - I) (2003 Course) (403143) (Elective - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

    1)   *Answers to the two sections should be written in separate books.*

    2)   *Neat diagrams must be drawn wherever necessary.*

    3)   *Figures to the right indicate full marks.*

    4)   *Your answers will be valued as a whole.*

    5)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

    6)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   Write the RIA definition of 'Robot' and explain clearly the operational features of industrial robots, that make them different from fixed automation. **[8]**

     b)   Explain working of any two robot like locomotive mechanisms. **[8]**

OR

Q2) a)   Explain how NC & CNC machines are different than robot. **[8]**

     b)   Compare fixed, flexible and programmable automation. **[8]**

Q3) a)   Explain different types of joints and links used for robots wit the help of neat diagram. **[8]**

     b)   Define and explain the following terms used in robotics. **[8]**

         i)   Work volume.

         ii)   Spatial resolution.

         iii)   Reach.

         iv)   Compliance.

Q4) Write a note on: **[16]**

    a)   Servo controlled robots.   b)   Continuous path robots.

    c)   SCARA robots.   d)   Cartesian robots.

Q5) a)   Explain different methods of rotary to linear conversion. **[10]**

    b)   Write a note on any two mechanical grippers in details. **[8]**

Q6) a)   Explain the method of obtaining dynamic equations for a robotic manipulator by Lagrangian analysis with the help of single prismatic joint.

[10]

    b)   Explain the concept of end effector and how end effectors change for different applications. **[8]**

SECTION - II

Q7) a)   Explain the concept of homogeneous transformation matrix explaining indivisual terms in the matrix. Find also inverse of the transformation matrix in the standard form. **[10]**

    b)   The co-ordinates of the point P on the body are given by $\{1, 2, 3\}^T$. Rotate the body about the z axis by $30°$ and then about the y axis by $30°$. Find the new co-ordinates of the point p w.r.t. the fixed frame. **[8]**

Q8) a)   Define the term 'Forward Kinematic Solution' of robotic manipulator and explain the procedure for obtaining the same. **[8]**

    b)   The link parameter table of 3 axis articulated arm with three revolute joints is given below:

Joint	d_i	a_i	α_i	θ_i
1	d_1	0	90	θ_1
2	0	a_2	0	θ_2
3	0	a_3	0	θ_3

         i)   Draw the diagram showing link and joint parameters.

         ii)   Find forward solution. **[10]**

Q9) a) Explain with the help of neat diagram, the concept of inverse kinematics and explain why the problem of inverse kinematics is difficult to solve.

[8]

b) Explain any two methods to solve inverse kinematics problem. **[8]**

OR

Q10) a) Explain how drives, sensors, method of control and peripheral devices are selected for different industrial applications. **[8]**

b) Write a note on: **[8]**

i) Welding Robot.

ii) Parts handling Robot.

Q11) a) Derive an expression for jacobean matrix for prismatic and revolute joint.

[8]

b) Explain the concept of singularity in jacobean matrix. How these singularities handled. **[8]**

OR

Q12) Write a note on: **[16]**

a) Teach pendant.

b) Structured programming level languages.

c) Hardware level languages.

d) Point to point level languages.

❋ ❋ ❋

P1102

[3964] - 213

B.E. (Electrical)

VLSI DESIGN

(2003 Course) (Elective - II) (Sem. - II) (403150)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answer any three questions from each section.*

2) *Answer 3 questions from section I and 3 questions from section II.*

3) *Answers to the two sections should be written in separate books.*

4) *Neat diagrams must be drawn wherever necessary.*

5) *Figures to the right indicate full marks.*

6) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

7) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Differentiate between Combinational circuits and Sequential circuits. **[5]**

b) Differentiate Moore and Mealy model of Finite State Machines. **[5]**

c) What is the main drawback of Asynchronous counter? Explain with the help of one example and hence give detailed design of Mod 6 Synchronous counter. Also draw its timing diagram. **[8]**

OR

Q2) a) Implement following Gates using Multiplexer **[8]**

   i) AND

   ii) OR

   iii) NOT

   iv) EX-OR

b) What is the difference between Excitation table and Truth table of a gate? Give excitation tables of basic gates. **[4]**

c) Draw State diagram for 1011 detector using Mealy and Moore modelling. **[6]**

Q3) a)   Define the terms w.r.t. VHDL   **[10]**

         i)   Entity

         ii)   Architecture

         iii)   Package

         iv)   Component

         v)   Configuration

    b)   Explain the structure modelling of VHDL architecture with VHDL code. **[6]**

<div align="center">OR</div>

Q4) a)   Explain the EDA tool Design flow.   **[8]**

    b)   Implement 16 : 1 Multiplexer with only two 8 : 1 Multiplexer and one 2 : 1 Mux.
                                                                                    [8]

Q5) a)   What do you understand by a Subprogram? What is Subprogram overloading? Explain with VHDL example.   **[10]**

    b)   What do you mean by Configuration? What is Default Configuration? Explain with VHDL code.   **[6]**

<div align="center">OR</div>

Q6) a)   Explain different Data Types and Data Objects in VHDL.   **[10]**

    b)   What is Package? Give an Electrical example of Package in VHDL code. **[6]**

<div align="center">

SECTION - II

</div>

Q7) a)   Explain the voltage transfer characteristics of CMOS Invertor.   **[8]**

    b)   What is 54xx/74xx series of CMOS? Give standard specifications of CMOS device.   **[8]**

<div align="center">OR</div>

Q8) a)   Define the following terms w.r.t. MOSFET   **[8]**

         i)   Noise Margin

         ii)   Figure of Merit

         iii)   Fan out

         iv)   Voltage Specifications namely V_{IHm}, V_{OHm}, V_{ILM}, V_{OLM},

b) Draw the Symbol,circuit diagram and functional table of **[8]**

    i)   NOT Gate

    ii)   NAND Gate

    iii) NOR Gate using CMOS

Q9) a) Explain the terms Simulation, Synthesis, Place & Route, Boundry Scan.

                  [8]

    b) Differentiate CPLD & FPGA. **[10]**

<div align="center">OR</div>

Q10) a) Explain the Detailed Architecture of CPLD. **[10]**

     b) Differentiate between CPLD and FPGA. **[8]**

Q11) a) Write VHDL code for 8 bit Binary to Integer convertor. **[8]**

     b) Write VHDL code for 64K counter with load and reset inputs. **[8]**

<div align="center">OR</div>

Q12) a) Write VHDL code for 8 bit shift registor. **[8]**

     b) Write VHDL code for 8 × 8 RAM. **[8]**

<div align="center">❉ ❉ ❉</div>

P1114

[3964] - 234

B.E. (Electronics)

ARTIFICIAL INTELLIGENCE

(Elective - II) (2003 Course) (404212) (Sem. - II)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answers to the two sections should be written in separate books.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
5) *Assume suitable data, if necessary.*
6) *All questions are compulsory.*

SECTION - I

Q1) a)   Which are the different search methods used in Artificial Intelligence. Compare the major search methods with suitable examples.   **[10]**

   b)   Write the characteristic features of different problem reduction algorithms used in A.I. Explain A* Algorithm.   **[8]**

OR

Justify the following with suitable illustrations.   **[18]**

a)   Best - first search algorithm is not adequate for searching AND-OR graphs.

b)   If h' is a perfect estimator of h, (the distance of a node to a goal), then A* will immediately converge to the goal with no search.

c)   A* algorithm must work properly on graphs containing cycles.

d)   The AO* algorithm may result in the propagation of the cost change back up through a large number of paths.

Q2) a)   Enlist the various search-based techniques for game playing. Explain characteristics features of each.   **[6]**

   b)   Explain with suitable example the basic minimax algorithm.   **[6]**

   c)   State various modifications to this algorithm to achieve specific goals. **[4]**

OR

a)   Explain alpha-beta cut-offs as applicable to the basic minimax algorithm. **[6]**

b)   What do you understand by 'Waiting for Quiescence'. **[6]**

c)   Explain secondary search and book moves with reference to minimax algorithm. **[4]**

Q3) Explain the following terms as applicable to knowledge Representation. **[16]**

a)   Semantic - net   b)   Frames

c)   Script   d)   Conceptual Dependency

OR

Explain various Truth Maintenance Systems (TMS). Distinguish between them with proper illustrations. **[16]**

SECTION - II

Q4) Figure 1 shows a blocks - world problem known as the Sussman Anomaly. Write a definition of the problem in STRIPS notation and solve it, either by hand or with a planning program. A non-interleaved planner is a planner that, when given two subgoals G1 and G2, produces either a plan for G1 concatenated with a plan for G2, or vice-versa. Explain why a non - interleaved planner cannot solve this problem. **[16]**
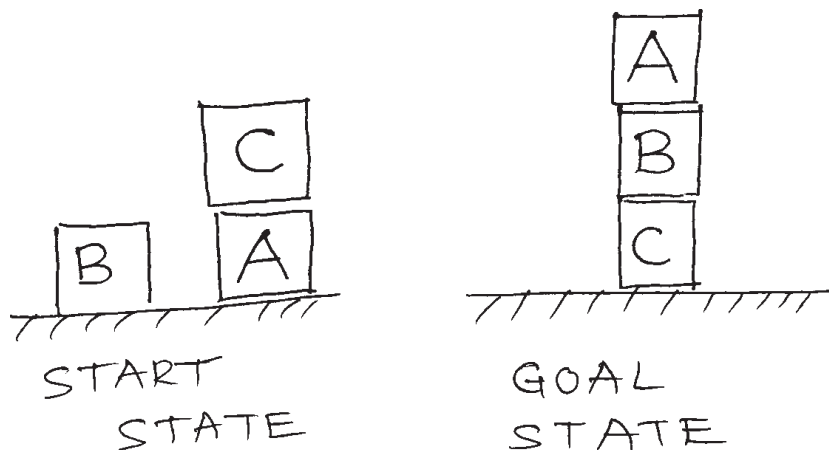
Figure 1: Sussman Anomaly

OR

Consider the problem of swapping the contents of two registers, A and B. Suppose that there is available the single operator ASSIGN (*x*, *ϑ*, *lv*, *ov*) which assigns the value *ϑ,* which is stored in location *lv*, to location *x*, which previously contains value *ov*: **[16]**

ASSIGN (*x*, *ϑ*, *lϑ*, *oϑ*)

P : CONSTANTS (*lϑ*, *ϑ*) ∧

CONSTANTS (x, *oϑ*)

D : CONSTANTS (x, *oϑ*)

A : CONSTANTS (x, *ϑ*)

Assume that there is at least one additional register C, available.

a) Show how STRIPS would solve this.

b) How might you design a program to solve this problem.

Q5) a) Implement the backpropagation learning algorithm for a fully connected three-layer network. Include parameters for layer sizes, learning rate and number of learning epochs. **[8]**

b) Apply Waltz algorithm for labelling the trihedral object shown in Figure 2. **[8]**
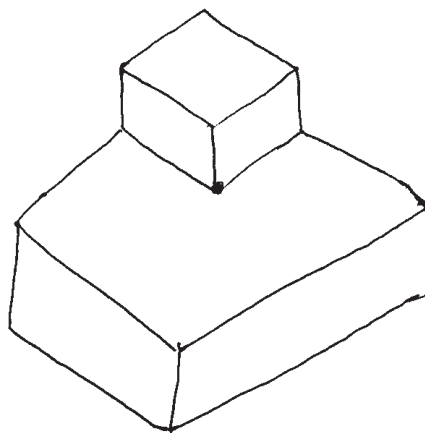
Figure 2: Trihedral Object for Q.NO. 5 (b)

OR

a) Explain with suitable examples the application of neural network in Artificial Intelligence. **[6]**

b) Explain Fuzzy - logic structure of knowledge representation. **[6]**

c) Explain the importance of AI in handwritten word recognition. **[4]**

Q6) Write short notes on [18]

   a)   Syntactic Processing.

   b)   Semantic Analysis.

<div align="center">OR</div>

   a)   Explain with suitable example an Augmented Transition Network. [9]

   b)   Explain with suitable examples Morphological Analysis & Pragmatic Analysis as applicable to Natural language processing. [9]

<div align="center">❆ ❆ ❆</div>

P1115

[3964] - 237

B.E. (Electronics)
DIGITAL IMAGE PROCESSING
(2003 Course) (404212) (Sem. - II) (Elective - II)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answer three questions form section I and Section II.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Assume suitable data, if necessary.*
5) *Figures the the right indicate full marks.*

SECTION - I

Q1) a) What is pinel connectivity? What are their types? Explain with an example? **[8]**

b) Define, Histogram of an image? Plot and explain, the nature of Histogram for the following image's. **[8]**

   i) High Brightness image

   ii) Low Brightness image.

   iii) High Contrast image

   iv) Low Contrast image

OR

Q2) a) Define Brightness and Contrast of an image? Also explain two phenomenas related to the perceived brightness of an image. **[8]**

b) Explain the image formation in human eye, with the help of diagram? What is the difference between lens and human eye? **[8]**

Q3) a) State and explain formulae for computing DCT and IDCT for two dimensional image? Explain, why 8×8 is the standard size for DCT coefficient calculation? **[8]**

b) Write pseudocode for converting RGB image to HSI? **[8]**

OR

Q4) a) For the following 2×2 image, find the DCT coefficient. **[8]**

$$\begin{bmatrix} 256 & 200 \\ 256 & 200 \end{bmatrix}$$

b) What is the need of color model? Compare RGB and HSI color models. **[8]**

Q5) a) What is pseudocoloring? Explain pseudocoloring of a Gray scale image? **[8]**

b) For, three bit image the graylevel distribution is given below. **[10]**

Gray level	G_0	G_1	G_2	G_3	G_4	G_5	G_6	G_7
No.of pixels	12	24	16	24	32	28	48	56

Use Histogram Equalization technique for image enhancement.

Also draw.

i) Original Image Histogram

ii) Histogram after Equalization.

OR

Q6) a) What is the meaning of image enhancement in frequency domain? Explain any one sharpening frequency domain filter? **[9]**

b) Explain the following piecewise linear transformation functions for image enhancement. **[9]**

i) Gray level slicing.

ii) Bit - plane slicing.

iii) Contrast stretching.

SECTION - II

Q7) a) Explain the meaning of objective Fidelity criteria and subjective Fidelity criteria, with reference to image compression? **[6]**

b) What are the different types of Redundancies identified in digital image compression? Explain in detail? **[10]**

Q8) a) An, 8 bit image is given below: **[10]**

16	64	208	160	16
16	64	16	160	16
16	64	16	160	16
16	64	16	160	16
16	64	208	160	16

Calculate Entropy, Efficiency, Huffman code book, compression Ratio, and Redundancy?

b) Draw and explain image compression system block diagram? **[6]**

Q9) a) Explain Gradient and Laplacian operators for edge detection? Derive the mask for Laplacian edge detector? **[8]**

b) Explain opening and closing on Binary images in Morphological image processing? **[8]**

OR

Q10) a) Explain Hough Transform? How it is used for edge linking in an image? **[8]**

b) What is 'Skeleton'? Explain? Also, give the advantages of using skeleton with reference to Image Analysis? **[8]**

Q11) a) What is Remote Sensing? Draw the block diagram of Remote Sensing System and explain in detail? **[10]**

b) Compare Image Enhancement with Image Restoration? **[8]**

OR

Q12) a) Explain 'Wiener Filter' with reference to image Restoration? **[9]**

b) How image processing is used in security system? Explain with the help of Fingerprint Recognition? **[9]**

❄ ❄ ❄

P1150

[3964] - 304

B.E. (Chemical)

PROCESS EQUIPMENT DESIGN - II
(Revised 2003 Course) (409345) (Sem. - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

    1)   *Answers to the two sections should be written in separate books.*

    2)   *Neat diagrams must be drawn wherever necessary.*

    3)   *Figures to the right indicate full marks.*

    4)   *Your answers will be valued as a whole.*

    5)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

    6)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   The reactor is fitted with a flat blade disc turbine agitator 0.6 m diameter, running at 120 rpm. The vessel is baffled and is constructed of stainless steel plate 10 mm thick. **[8]**

         The physical properties of the reactor contents are

         ρ = 850 kg/m^3, viscosity(μ) = 80 mN/m^2.s, thermal conductivity k_f = 400 × 10^{-3} W/m°C, C$_p$ = 2.65 kJ/kg°C.

         Estimate the heat transfer coefficient at the vessel wall and the overall coefficient in the clean condition if the thermal conductivity of stainless steel as 16 W/m°C and the jacket side heat transfer coefficient is 1606 W/m^2 °C.

    b)   Write short notes on: **[10]**

       i)   Criteria for jacket selection in the reactor.

       ii)   Baffling in the agitated vessel.

<center>OR</center>

Q2) a) Determine the power required and design the shaft, blade, Hub and key for the turbine agitator operating in a vessel of 1500 mm in diameter, Data

Internal pressure in vessel = 0.5 N/mm^2

Diameter of agitator = 500 mm, maximum speed = 200 rpm

Agitator flat Blades nos. = 06, width of blade = 75 mm.

Thickness of blade = 8 mm

Overhang of agitator shaft between bearing and agitator = 1300 mm, Baffles at tank wall nos. = 04, liquid in vessel

  i)   Sp.gravity = 1.2   ii)   Viscosity = 600 cp

Shaft material - commercial cold rolled steel permissible shear stress in shaft = 55 N/mm^2, Elastic limit in tension = 246 N/mm^2, modulus of Elasticity = 19.5×10^4 N/mm^2 permissible stresses for key (carbon steel) Shear = 65 N/mm^2, crushing = 130 N/mm^2. Use power no. 4.5 for standard tank configur. **[10]**

b) Write short note with sketches **[8]**

  i)   Power curves in agitation.   ii)   Internal cooling coils in vessel.

Q3) a) A 100 kg batch of granular solids containing 30% moisture is to be dried in a tray dryer to 10.5% of moisture by passing a current of air at 350K tangentially across its surface at a velocity of 1.8 m/s. If the constant rate of drying under these conditions is 0.0007 kg/s.m^2 and the critical moisture content is 15%, calculate the approximate drying time. Assume the drying surface to be 0.03 m^2/kg dry mass. **[10]**

b) Describe classification and selection of dryers. **[6]**

OR

Q4) A flow of 0.35 kg/s of a solid is to be dried from 15% to 0.5% moisture on dry basis. The mean heat capacity of the solids is 2.2 kJ/kg.K and it is proposed that a co-current adiabatic dryers should be used with the solids entering at 400 K with humidity of 0.01kg/kg dry air and maximum allowable mass velocity of the air is 0.95 kg/m^2.s. What diameter and length should be specified for the proposed dryer? **[16]**

Q5) a) Describe the design variables in distillation. **[6]**

b) Feed containing 50 mole% A and 50 mole% B is to be distilled in a fractionating column to get top product containing 99 mole% and bottom product containing 10 mole% A. The relative volatility of the binary mixture is 2.5. The reflux ratio 2 kg mole per kg mole of product is used. The feed enters at its bubble point. Estimate the no.of plates required in rectifying section, stripping section and the total no. of plates. **[10]**

Q6) a) Write short notes on: **[12]**

    i) The smoker equation.

    ii) AIChE method.

   b) Explain typical performance diagram for a sieve plate. **[4]**

SECTION - II

Q7) a) Describe following methods for prediction of height of transfer unit (HTU) in packed bed distillation. **[12]**

    i) Cornell's method

    ii) Onda's method.

   b) Explain packing supports in packed bed with neat sketch. **[6]**

<p align="center">OR</p>

Q8) a) Write short note on liquid distributors in packed bed column with sketches. **[6]**

   b) A feed containing 45% mole volatile component enters a packed bed. The distillate from packed bed contains 95% more volatile component and bottom product contains 10% m.v.c. Relative volatility of the moisture is 3.0. A total condenser is used and tower is operated with reflux ratio of 1.25 times the min. reflux ratio. The H.T.U. for rectifying sections are $H_x = 1.0$, $H_y = 0.5$. The mass transfer coefficient is constant across the column. Determine flow rates, steam consumption and the packing height required to achieve the separation. **[12]**

Q9) a) Design the decanter for the separation of the moisture of organic phase and aqueous phase with the following data.

    i) Organic phase : flow rate = 2883.5 kg/hr, density = 830 kg/m^3, $\mu = 6.5 \times 10^{-3}$ N.s/m^2.

    ii) Aqueous phase : flow rate = 425.4 kg/hr, $\rho = 1050$ kg/m^3, $\mu = 1.1 \times 10^{-3}$ N.s/m^2.

   Droplet diameter = 120 μm and organic phase is continuous phase.**[10]**

   b) Explain the reflux drum with neat sketch **[6]**

OR

Q10) a) Make a preliminary design for a separator to separate a mixture of steam and water. Steam flow rate is 2000kg/hr and water flow rate is 1000kg/hr. Operating pressure is 4 bar, liquid density $\rho_L = 927$ kg/m³, vap.density = 2.2 kg/m³. **[10]**

b) Describe knockout drum with sketch. **[6]**

Q11) a) Write short notes on **[10]**

   i)   Pipe support   ii)   Strength of pipes and tubes.

b) Discuss on condensate piping. **[6]**

OR

Q12) a) Water is flowing through a pipeline at a ratio of 0.025 kg/sec through pipeline to a distance of 2000 m. The impressed head of water is 5 m of H_2O Density of water = 1000 kg/m³, viscosity = 0.001 N.s /m². What should be the diameter of pipeline? **[8]**

b) Explain pipeline design for transportation of crude oil. **[8]**

❄❄❄

[3964] - 394

P1177

B.E. (Biotechnology)

NOVEL SEPARATION TECHNIQUES

(2003 Course) (416284) (Sem. - I)

Time : 3Hours]   *[Max. Marks :100*

Instructions to the candidates:

    1)   *Answer three questions from section I and three questions from section II.*

    2)   *Answers to the two sections should be written in separate answer books.*

    3)   *Neat diagrams must be drawn wherever necessary.*

    4)   *Assume suitable data, if necessary.*

    5)   *Electronic pocket calculator is allowed.*

    6)   *Figures to the right indicate full marks.*

SECTION - I

Q1) a) How is the rheology of fermentation broth important in separation? **[6]**

    b) Explain the four step idealized separation process? **[6]**

    c) Mention and explain the factors that are important while developing a bioseparations process for a specific product. **[6]**

OR

Q2) Explain, discuss and compare the various separation processes involved in bio-butanol. **[18]**

Q3) a) Explain the different methods of quantification in gas chromatography. **[6]**

    b) In order to determine the optimum flow rate of the mobile phase for a 50 cm column containing uniform packing of 30 μm particles of stationary phase trial experiments were conducted using a solute at different flow rates of the eluent. The data obtained for three different linear velocities of the eluent are as follows:

S.No.	u, cm/min	t_R, min	No of theoretical plates	Plate ht (cm/plate)
1	10	7.5	5625	8.88×10^{-3}
2	30	2.5	5917	8.45×10^{-3}
3	50	1.5	4444	1.12×10^{-2}

Determine the optimum flow rate of the mobile phase for the column and calculate the number of theoretical plates for optimum conditions of flow. **[6]**

    c) Explain the application of gel filtration for estimation of molecular weight. **[4]**

Q4) a) Write short note on: **[8]**

     i)   Reversed phase chromatography and normal phase chromatography

     ii)   Gradient elution and isocratic elution

  b) What is chromatography? **[2]**

  c) What are the general problems encountered in liquid chromatography? Provide a solution for each one of them. **[6]**

Q5) a) What is diafiltration? Explain its various modes of operation and discuss the advantages and disadvantages of each one of them. **[6]**

  b) Explain the application of reverse osmosis in separation. **[2]**

  c) Explain the bulk flow mechanism of transportation in porous membrane and derive the mathematical equation for the same. **[5]**

  d) Explain the three steps in Pervaporation. **[3]**

Q6) a) How concentration polarization does decrease the flux? **[4]**

  b) Explain the term: "Effective diffusivity". **[2]**

  c) Determine the resistance in series model for porous membranes and dense membranes. **[6]**

  d) With neat sketch explain the following modules. **[4]**

     i)   Hollow fiber.

     ii)   Spiral wound module inserted into a pressure vessel.

SECTION - II

Q7) a) Write a note on: **[8]**

     i)   Fluorescence spectroscopy

     ii)   Emission spectroscopy

  b Explain the instrumentation and principle of AAS. **[8]**

Q8) Write in detail about: **[16]**

  a) UV-visible spectroscopy

  b) NMR

Q9) a) What is isotherm? Describe the Freundlich isotherm. **[6]**

b) How does TSA and PSA work? Discuss its applications. **[12]**

OR

Q10) a) What is heat of adsorption? **[4]**

b) State and explain Gibb's isotherm. **[10]**

c) Write a note on structure of adsorbents. **[4]**

Q11) a) Explain the process of zone refining in detail. **[6]**

b) What are hyphenated techniques? Discuss one such technique. **[10]**

OR

Q12) a) What is supercritical fluid extraction? Mention one application of SFE. **[4]**

b) Explain the following processes in carbon molecular sieve **[8]**

i) Carbonisation

ii) Surface activation

c) Explain one application of reactive extraction in biotechnology. **[4]**

❄ ❄ ❄

P1222   **[3964] - 141**

B.E. (Mech. S/W)
DESIGN ENGINEERING
(2003 Course) (Sem. - I) (402061)

Time : 4 Hours]   *[Max. Marks :100*

Instructions to the candidates:

   1)   *Answer three questions from section I and three questions from section II .*

   2)   *Answers to the two sections should be written in separate books.*

   3)   *Neat diagrams must be drawn wherever necessary.*

   4)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

   5)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   Derive the expression for beam strength of bevel gear.   **[8]**

     b)   A straight bevel pinion and gear made of alloy steel with ultimate tensile strength of 800 MPa. The number of teeth on pinion is 21. The gear pair is required to transmit 15 kW power from a spindle running at 600 rpm to a machine running at 300 rpm. The starting torque is 110% of the rated torque. The factor of safety is 1.75. The tooth system is 20º fuel depth involute. The gears are manufactured by cutting process & are case hardened to 350 BHN. Find the module and dimensions of gear pair. Standard module values are (mm). 1, 2, 3, 4, 6, 8, 10, 12, 15 **[10]**

OR

Q2) a)   Derive the expression for facewidth of worm gear.   **[6]**

     b)   A worm transmitting 2.2 kW power at 1000 rpm drives a worm gear rotating at 20 rpm. The pitch diameter of the right hand, single start worm is 60 mm. The transverse pitch of the worm gear is 15.7 mm, while the normal pressure angle is 14.5º. The worm is above the worm gear and rotates in clockwise direction as viewed from the right side. Find.   **[12]**

i) The components of tooth force acting on worm & worm gear.

ii) The efficiency of worm gear pair.

iii) The power lost in friction.

iv) Whether or not the drive is self locking and.

v) Designation of worm gear pair.

coefficient of friction $\mu = \dfrac{0.0765}{\sqrt{Vs + 0.4}}$

Vs = sliding velocity in m/s.

Q3) a) State and explain different classes of vessels used in unfired pressure vessels. Also state the welded joints used in those vessels. **[6]**

b) The piston rod of a hydraulic cylinder exerts an operating force of 10 kN. The friction due to piston packing and stuffing box is 10% of the operating force. The pressure in the cylinder is 10 MPa. The cylinder is made of FG 200 and factor of safety is 5. Determine internal diameter and thickness of the cylinder. **[10]**

The flange thickness is 10 mm and a C. I. cover plate is fixed to the cylinder by means of 4, M10 bolts and zinc gasket of 3 mm thickness. The bolts are made of Fe E 400. Determine factor of safety of bolts.

Assume, E_{steel} = 207 GPa,

E_{CI} = 100 GPa

E_{Zinc} = 90 GPa

Assume a preload of 20 kN in each bolt.

<div align="center">OR</div>

Q4) a) State different types of supports used in pressure vessels. (Horizontal & Vertical). Explain about the stresses induced in skirt support. **[8]**

b) A closed vessel is to be designed to withstand an internal pressure of 50 MPa having inside diameter of 430 mm. **[8]**

Yield strength is 300 MPa, ultimate tensile strength = 500 MPa. Poisson's ratio = 0.3, Estimate the wall thickness required by using a factor of safety 1.5 based on yield strength on the basis of

i) Maximum principal stress theory.

ii) Maximum shear stress theory.

iii) Maximum principal strain theory.

iv) Distortion energy theory.

Q5) a) Explain the principles used in design of forging, with respect to draft angle, lateral shifting and inclined parting line. **[6]**

b) A shaft and bore is given a fit of 40 H6 j5. Assuming the dimensions to be normally distributed, find the probability of interference fit between the components. **[10]**

	H6	j5
ϕ 40	+ 0.016	+ 0.006
	+ 0.000	− 0.005

Area from 0 to Z is given below.

Z	2.1	2.2	2.3	2.4	2.5	2.6	2.7
A	0.4821	0.4861	0.4893	0.4918	0.4938	0.4953	0.4965

OR

Q6) a) With examples, suggest methods to improve design while manufacturing components by powder metallurgy. **[6]**

b) A machine member has a yield strength of 250 MPa and a standard deviation of 30 MPa. This member is subjected to a bending stress with a mean of 160 MPa and standard deviation of 15 MPa. Find **[10]**

i) Probability of failure and reliability of member.

ii) Minimum factor of safety.

iii) Average factor of safety.

Assume normal distribution.

SECTION - II

Q7) a) Classify various types of fluctuating stressles & draw sketches. **[6]**

b) A cantilever beam of circular cross section is fixed at one end and is subjected to a completely reversed load of ± 100 N at the free end. The force is perpendicular to the axis of beam. The distance between the fixed and the free end is 400 mm. There is no stress concentration in the beam. The beam is made of steel with an ultimate tensile strength of 1300 MPa. The surface finish factor for the beam is 0.87 and the size factor is 0.85. The reliability factor is 0.868. Determine the diameter of the beam for a life of 47500 cycles. **[12]**

OR

Q8) a) Explain different factors for correcting endurance limit. **[6]**

b) A circular beam of length 600 mm and diameter 50 mm is centrally loaded with a force which varies from F to 3F. The ultimate tensile strength is 690 MPa, & yield strength is 400 MPa. Factor of safety is 1.5. Site factor & surface finish factors are 0.85 & 0.9 respectively. Detemine the value of force by using Soderberg's equation. **[12]**

Q9) A tensile bar of length 200 mm is subjected to a constant tensile force of 5000 N. If the factor of safety is 3, design the bar with the objective of minimising the material cost out of the following materials. **[16]**

Material	$\rho kg/m^3$	Cost Rs/kg	yield strength MPa
Steel	7800	14	400
Al alloy	2800	66	150
Ti alloy	4500	1100	800
Mg Alloy	1800	75	100

OR

Q10) A cantilever beam of circular cross section is subjected to constant vertical force F, and torque T at its free end. The factor safety is Nf. The length and diameter should not exceed Lmax & Dmax. Outline the procedure for the design of beam with the objective of maximising the strain energy absorption capacity. Use maximum shear stress theory of failure. Use any three materials. **[16]**

Q11) a) State and explain design recommendations for Quantitative displays. **[6]**

b) Determine the resistance offered by a single carrying and return idler for the conveyor having following data. **[10]**
Capacity = 400 tph, belt speed = 2m/s,
Mass of belt = 16 kg/m, Mass of idler = 25.1 kg,
Carrying side pitch = 1m, return pitch = 2m,
Coefficient of friction between idler & belt = 0.02
Coefficient of friction between pin & idler = 0.04.
Ratio of pin diameter to idler diameter = 0.5.
Belt inclination = 15°.

OR

Q12) a) State and explain general principles used while design different layouts. **[6]**

b) Explain any five types of idlers with sketch. **[10]**

❆ ❆ ❆

P1275

[3964] - 159

B.E. (Production)

MATERIALS AND FINANCIAL MANAGEMENT

(Sem. - II) (2003 Course) (411087)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

  1) *Answer any three questions from each section.*
  2) *Answers to the two sections should be written in separate books.*
  3) *Neat diagrams must be drawn wherever necessary.*
  4) *Figures to the right indicate full marks.*
  5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
  6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain and state the functions of materials management.   **[6]**

  b) 'S' and 'S' company has to supply 24000 units of a particular item to the customer every year. The manufacturer when fails to supply the required units, the shortage cost is Rs. 2 per unit per month. The inventory carrying cost is Rs. 1 per unit per month and the set up cost per run is Rs. 3500. Determine

   i)   Optimum batch quantity.   **[3]**

   ii)   OPtimum level of inventory at begining of any period.   **[3]**

   iii) Optimum scheduling period.   **[3]**

   iv)   Minimum total expected annual cost.   **[3]**

OR

Q2) a) Explain the importance of Material Management in increasing 'Rate of Return' of an organization with illustration.   **[8]**

  b) 'XYZ' company requires an item 'A' at the rate of 60 per day. Ordering cost is estimated at Rs. 50 per order and inventory carrying cost is 15% of average inventory investment. The supplier of item 'A' offers the discount as follows: **[10]**

P.T.O.

Order Quantity (q)	Unit Price (Rs.)
q ≤ 1999	65
q 2000 ≤ q ≤ 4999	60
5000 ≤ q ≤ 10000	55
q > 10,000	50

Determine the Optimal Order Quantity to purchase and what is the minimum inventory cost.

Q3) a) Explain logistical performance cycle. Differentiate between procurement cycle and physical distribution cycle. **[8]**

b) Explain the concept and stratergies of SCM. **[8]**

OR

Q4) a) Explain logistical information system (LIS). State the principles of LIS. **[8]**

b) Explain transportation management. Explain the factors affecting transportation cost. **[8]**

Q5) a) Explain the phases of 'Value Analysis' with suitable example. **[10]**

b) Explain the methods of disposal of salvable waste. **[6]**

OR

Q6) Write short note on:

a) Use of computers / Internet in Materials Management. **[6]**

b) Disposal of Non - salvable waste. **[5]**

c) Documents for import. **[5]**

SECTION - II

Q7) a) Explain and distinguish between 'Profit maximization' and 'Wealth maximization objectives of the firm. **[6]**

b) Explain and state the advantages and limitations of financial ratios. **[6]**

c) Discuss the problems of a finance manager in the management of finance functions in the Indian context. **[6]**

Q8) a) Explain the different approaches to financial management. **[6]**

b) What are the important decisions of finance functions. **[6]**

c) How does the use of financial leverage affects the break - even - point. Illustrate. **[6]**

Q9) a) Explain the following group incentive scheme.

    i) Scanlon Plan. **[4]**

    ii) Priestman production plan. **[4]**

b) Explain "Annuity method' of depreciation.

Determine the depreciation annuity by annuity charging method after 3 years, when the cost of machine is Rs. 8000 and the scrap value is Rs 4000. Rate of interest is 5%. Also calculate the value of the machine after 2 years. **[8]**

OR

Q10) a) During rapid increase in market prices of materials used in production, which method of pricing results in the most accurate costing of goods manufactured and sold. State the reasons for the choice of methods.

[8]

b) Explain 'Bedaux point system' of incentives. State the advantages. Determine daily earning of the worker if the job is completed in 7 hours. The hourly wage rate is Rs. 15/-. Standard time for a particular job is 8 hours. **[8]**

Q11) a) Explain marginal costing. Explain the utility of marginal costing in decision making. **[8]**

b) The following data is available related to material:

- Quantity of material purchased = 4000 units.

- Value of material purchased = Rs 10000.

- Standard quantity of materials per unit of finished product = 2 kg.

- Standard rate of material = Rs 2 per kg.

- Opening stock of material = 1000 kg.

- Closing stock of material = 2000 kg.

- Finished production during the period = 1000 units.

Determine

      i)   Material Cost variance.   **[3]**

      ii)   Material Usage variance.   **[3]**

      iii) Material Price variance.   **[2]**

(Assume FIFO method)

<div align="center">OR</div>

Q12) a) Explain the following in brief:

    i)   Shut down and sunk cost.   **[2]**

    ii)   Controllable and uncontrollable cost.   **[2]**

    iii) Imputed or Hypothetical cost.   **[2]**

    iv) Differential, Incremental or Decremental cost.   **[2]**

  b) The following information is available related to overheads:

- Budgeted output   → 10,000 units.
- Budgeted overheads   → Rs. 10,000
  - Fixed   → Rs. 6,000
  - Variable   → Rs. 4,000
- Actual overheads   → Rs. 12,000
  - Fixed   → Rs. 6,000
  - Variable   → Rs. 6,000
- Actual output   → 8,000 units

Calculate:

    i)   Overhead cost variance.   **[3]**

    ii)   Variable overhead cost variance.   **[3]**

    iii) Fixed overhead cost variance.   **[2]**

<div align="center">❄ ❄ ❄</div>

[3964] - 202

B.E. (Electircal)

UTILIZATION OF ELECTRICAL ENERGY

(Sem. - I) (2003 Pattern) (403142)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

  1) *Answer any one questions from each unit.*
  2) *Answer three questions from section I and three questions from section II.*
  3) *Answers to the two sections should be written in separate books.*
  4) *Neat diagrams must be drawn wherever necessary.*
  5) *Figures to the right indicate full marks.*
  6) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
  7) *Assume suitable data, if necessary.*

SECTION - I

Unit - I

Q1) a) State different materials used as heating element in resistance heating. State and explain the causes of failure of heating elements in resistance heating. **[10]**

   b) Calculate the KVA and kW drawn from supply and electrical efficiency with following data pertaining to a three phase electric arc furnace. **[8]**

   Current drawn 4500 ampere

   Arc voltage   50 volts

   Resistance of transformer referred to its secondary 0.002 ohm

   Reactance of transformer referred to its secondary 0.004 ohm.

OR

Q2) a) Determine the diameter and length of Nichrome wire to be used as heating element in 10kW 220 v single phase resistance furnace. The temperature rise should not exceed 1000ºC and the charge to be at temperature 500ºC. Assume radiant efficiency as 007, emissivity of element as 0.9 and the resistivity of Nichrome 1:016 michro-ohm-meter. **[8]**

b) Explain the negative resistance characteristic of on arc in arc welding. Also explain, why the workpiece to be welded is always connected to positive terminal of dc supply. **[6]**

c) State differences between direct arc & indirect arc furnance. **[4]**

Unit - II

Q3) a) What is electroplating and what for is it done? Describe various operations involved in electroplating. **[8]**

b) Explain Faraday's laws of electrodeposition. Also explain that what is need of electrodeposition. **[8]**

OR

Q4) a) Draw the neat sketch showing main functional parts of the refrigeration cycle of air conditione. Explain in brief various parts stating their uses. **[8]**

b) Draw the electric circuit diagram of window air conditioner and explain it. **[8]**

Unit - III

Q5) a) Define the terms luminous flux, radiant efficiently, illuminance and luminance. State their units. What is relation between lumens and solid angle? **[8]**

b) Two lamps L_1 and L_2 are hung at a height of 9 meter from the floor level. The distance the lamps is 1 meter. Lamp L_1 is of 500 candle power. If illumination vertically below the lamp is 20 lux, find the candle power of lamp L_2. **[8]**

OR

Q6) a) Explain the terms space height ratio, utilization factor, maintenance factor and waste light factor. **[8]**

b) A small light source with intensity uniform in all the directions is mounted at a height of 8 meter above a horizontal surface. Two points A and B both lie on the surface with point A directly beneath the source. How far

is B from point A if illumination at point B is only $\dfrac{1}{12}$ as great as at point A?

[8]

SECTION - II

Unit - IV

Q7) a) Draw an electrical block diagram of an dedric locomotive showing various components and describe the functions of these components in brief. **[10]**

b) Compare between 25kV single phase ac system of supply and 300 V dc system of supply for track electrification. **[8]**

OR

Q8) a) With neat diagram/diagrams explain feeding post, sectioning and parallelling post and neutral section. **[10]**

b) Describe various current collection systems used in electric traction. **[8]**

Unit - V

Q9) a) Draw the speed time curve for main line service and derive the expression for total distance between the stations in terms of running time, acceleration, retardation and crest speed. Also define the terms crest speed, schedule speed, average speed and schedule time. **[10]**

b) A train is required to run between the two stations 2 k.m. a part at an average speed of 40 kmph. The run is to be made according a simplified quadrilateral speed time curve. If the maximum speed is to be limited to 60 kmph, aceleration to 2 kmphps, coasting retardation to 0.15 kmphps and breaking retardation 3 kmphps. Determine the duration of acceleration, coasting and braking. Prove that sum of these durations is equal to total running time. Draw sketch of speed time curve. **[6]**

OR

Q10) a) Define the term specific energy consumption and derive the expression for it in watt-hours. **[11]**

b) Locomotive weighing 100 tonne can accelerate a 400 tonne train with an acceleration of l kmphps up a gradient of 15 per thousand. Adhesive weight of locomotive is 75% and track resistance is 40 N/tonne with rotational inertia 10%. Calculate the value of coefficient of adhesion. **[5]**

Unit - VI

Q11) a) Explain why d.c. series motors are not suitable for regenerative braking. Also explain the modification required in dc series motor to make it suitable for regenerative braking. **[8]**

b) Two motor of a motor coach are started by series parallel method; the current per motor being 350 ampere, which is kept constant during the starting period of 18 seconds. If the acceleration is uniform, line voltage is 600 volts and resistance of each motor 0.1 ohm. **[8]**

Calculate:

i) Time during which motors are in series.

ii) Loss of energy in rheostat & motors during starting period and

iii) Efficiency of starting.

OR

Q12) a) Explain why dc. series motor is suitable for traction purpose. **[8]**

b) A train weighing 500 tonnes is going down a gradient of 20 in 1000. It is desired to maintain train speed at 40 kmph by regenerative braking. Calculate the power fed into the line. Tractive resistance is 40 N/tonne and allow rotational inertia of 10% and efficiency of conversion of 75%. **[8]**

❄❄❄

[3964] - 282

P1281

B.E. (Printing)

SURFACE PREPARATION - II

(Sem. - I) (2003 Course) (408283)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answers to the two sections should be written separately.*
2) *Draw neat diagram wherever necessary.*

SECTION - I

Q1) a) Explain in detail manufacturing of a Rubber plate.   **[10]**

b) Explain the features of Photopolymer plate.   **[8]**

OR

a) Explain the Design requirements for Flexography.   **[12]**

b) State the benefits of Flexography process.   **[6]**

Q2) a) Write notes on: **[6]**

i) Incorrect proportion of wash-out solvent.

ii) Effect of Back exposure.

b) Calculate % shortening and new negative length for 2.84 mm plate thickness having printed length of 60 cm.   **[10]**

OR

a) Mention the requirements of negative for Flexo Plate.   **[8]**

b) Mention the causes of excessive swelling of relief.   **[8]**

Q3) Explain in detail processing of 2.84 mm Flexo Plate.   **[16]**

OR

a) Explain various Flexo Plate mounting techniques.   **[10]**

b) Write notes on: **[6]**

i) Measuring the Plate thickness.

ii) Orientation of Photopolymer plate.

SECTION - II

Q4) a) Explain the steps for making of a Digital Flexo Plate. **[10]**

    b) Write notes on: **[8]**

      i) Per-chloroethylene and Butanol.

      ii) Inspecting the Wash-out Solvent.

<div align="center">OR</div>

How standardization of a Flexo Plate is achieved? **[18]**

Q5) a) Explain in detail Etching process for Gravure. **[10]**

    b) Write notes on: **[6]**

      i) Application of Gravure Process.

      ii) Copper, the dominant carrier for Gravure.

<div align="center">OR</div>

    a) Explain in detail making of electronic engraved Gravure cylinder. **[10]**

    b) Write notes on: **[6]**

      i) Aspect Ratio of Gravure Cells.

      ii) Minimum Plating Technology.

Q6) a) Explain in detail the reuse of Gravure cylinder for next job. **[10]**

    b) Write notes on: **[6]**

      i) Purpose of Nickel and Chrome in Gravure cylinder making.

      ii) Chrome cracks.

<div align="center">OR</div>

Explain in detail effect of variables on Gravure printability. **[16]**

<div align="center">❄ ❄ ❄</div>

P1283

[3964] - 288

B.E. (Printing)

TECHNOLOGY OF GRAVURE AND FLEXOGRAPHY

(408288) (2003 Course) (Sem. - II)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answers to the two sections should be written separately.*
2) *Draw neat diagram wherever necessary.*

SECTION - I

Q1) a) Explain in detail sections of a Flexo Press. **[10]**

b) Explain the benefits of Flexo Process. **[8]**

OR

a) Explain the unit configurations of a Gravure Press. **[10]**

b) Mention the checks to be performed before printing a Gravure job. **[8]**

Q2) a) Explain the effect of Speed and Pressure on Gravure print quality. **[8]**

b) Explain the impact of Doctor Blade on print quality. **[8]**

OR

a) Write notes on: **[8]**

i) Positive angle doctor blade.

ii) Vinyl based inks.

b) Explain closed loop inking system for a Gravure Process. **[8]**

Q3) Explain in detail auto register system for a Gravure press. **[16]**

OR

State Causes and Remedies of the following: **[16]**

a) Misregister.

b) Cell clogging.

c) Uneven ink transfer on the substrate.

d) Wrinkles.

P.T.O.

SECTION - II

Q4) Explain in detail the role of fountain roller in flexography.   **[18]**

<div align="center">OR</div>

Explain the effect of Anilox cell structures on printability.   **[18]**

Q5) a)   Explain in detail the impact of shore hardness on Gravure printability.
                                                                                       [8]

   b)   Explain the types of Impression System on a Gravure Press.   **[8]**

<div align="center">OR</div>

Explain in detail pressurization system for Impression roller.   **[16]**

Q6) Explain a Flexo press optimization process.   **[16]**

<div align="center">OR</div>

How consistency is achieved on a Gravure press. Explain.   **[16]**

<div align="center">❄ ❄ ❄</div>

P1284

[3964] - 262

B.E. (Instrumentation & Control)
PROJECT ENGINEERING & MANAGEMENT
(1997 & 2003 Course) (Sem. - I) (406262)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

    1)   *Answers to the two sections should be written in separate answer books .*

    2)   *Neat diagrams must be drawn wherever necessary.*

    3)   *Figures to the right indicate full marks.*

    4)   *Assume suitable data, if necessary.*

    5)   *All questions are compulsory.*

SECTION - I

Q1) a)   Define Project? What are Desired Properties of a Good Project?   **[10]**

      b)   What are the important criteria's for Project assessment?   **[7]**

<div align="center">OR</div>

Q2) a)   Name the following symbols.   **[5]**
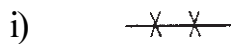
      b)   What are Characteristics of an Effective Project Manager?   **[4]**

      c)   Identify following Tags: **[4]**

          i)   FQRC-100   ii)   PDRC-20

          iii)   WDIC-100   iv)   ZDRT-10

      d)   Draw the Symbol for: **[4]**

          i)   Angle valve.

          ii)   Pilot Operated Relief Valve.

          iii)   Orifice Plate in Quick Change Fitting.

          iv)   Weir.

Q3) a) Draw & Explain Level Transmitter Specification Sheet. **[10]**

b) Draw a typical Pressure & Temperature Sheet. **[7]**

OR

Q4) a) Draw & Explain Control Valve Specification Sheet. **[10]**

b) Draw & Explain A Sample Material Balance Sheet. **[7]**

Q5) a) Give the Detail Classification for Cables used in Plant Instrumentation. Suggest the Type of Cable used for Analog Signal, Digital Signal. Justify your answer. **[10]**

b) What is BOM & MBOM? What is their use in Project Engineering? **[6]**

OR

Q6) a) Explain in Brief: **[6]**

i) Project Statement

ii) Cable Trays

b) i) Draw a simple Pressure control loop with minimum basic components & using ISA symbols. **[4]**

ii) Develop Loop wiring diagram for the same. **[6]**

SECTION - II

Q7) a) Explain in Brief: **[4]**

i) Front availability.

ii) Cold Commissioning.

b) What is CAT? Where it is Conducted? Enlist various test activities involved in CAT? **[8]**

c) Prepare a sample CAT test report simple system you know. **[5]**

OR

Q8) a) Prepare a Sample Purchase order for the Loop drawn in Question No. 6b. **[9]**

b) Draw & Explain typical Installation Details of Thermocouples. **[8]**

Q9) a) Give the Detail Classification for Cables used in Plant Instrumentation. Suggest the Type of Cable used for Analog Signal, Digital Signal. Justify your answer. **[10]**

b) Explain how G.A. & Plant Layout Diagrams are useful in Cable Scheduling. **[7]**

OR

Q10) a) Explain Flat Face Panels with dimensional Details. **[9]**

b) Explain in detail: **[8]**

　i)　Control Room Lighting.

　ii)　Communication System in plant.

Q11) a) What is WBS? State its importance. **[3]**

b) Explain in Brief Salary Overheads & Its importance in Project Cost Estimation. **[6]**

c) Write Short Note on PERT & CPM **[7]**

OR

Q12) a) What is Crashing of Projects? What are the important reasons for crashing Projects? **[8]**

b) What are different methods of Measuring Project Performance? Explain S-curve method in Detail. **[8]**

❄ ❄ ❄

P1286   **[3964] - 314**

B.E. (Chemical)

PROCESS MODELING & SIMULATION

(Sem. - II) (2003 Course)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1)   *Answer any three questions from each section.*

2)   *Answers to the two sections should be written in separate books.*

3)   *Neat diagrams must be drawn wherever necessary.*

4)   *Figures to the right indicate full marks.*

5)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

6)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   What is the key difference between independent variable and dependent variable?

   b)   Write the general forms of mass, energy & momentum balance equations based on the conservation of law.

   c)   When is a system at steady state?   **[18]**

                                    OR

Q2) a)   What is the difference between state variable & the output variable of a process?

   b)   What do you mean by differential - algebraic equation system?

   c)   What is the main difference between lumped parameter model and the distributed parameter model?   **[18]**

Q3) Write the component continuity equations describing the CSTR with your notations,

   a)   Simultaneous reactions - first order, isothermal $A \xrightarrow{k1} B$ $A \xrightarrow{k2} C$.

   b)   Reversible first order isothermal $A \underset{k2}{\overset{k1}{\rightleftharpoons}} B$. **[16]**

OR

Q4) a)   Write the energy equation for CSTR in which consecutive first order reactions occur with exothermic heats of reactions λ_1 & λ_2

$$A \xrightarrow[\lambda 1]{k1} B \xrightarrow[\lambda 2]{k2} C.$$
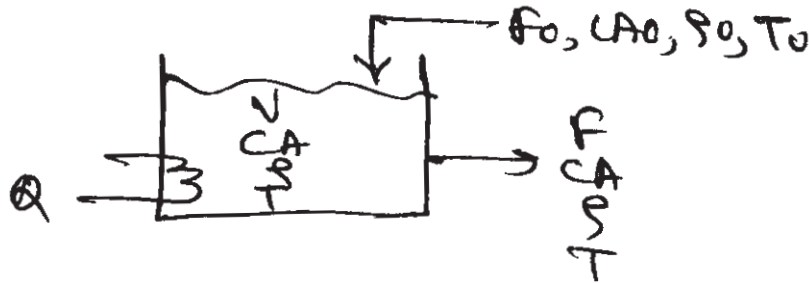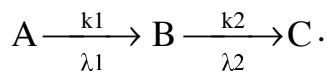
   b)   Water is flowing into a stirred tank at 150 kg/hr and methanol is being added at 30 kg/hr. The resulting solution is leaving the tank at 120 kg/hr. Because of effective stirring, the concentration of the outlet solution is the same as that within the tank. There are 100 kg of fresh water in the tank at the start of the operation, and the rates of input & output remain constant thereafter. Calculate the outlet concentration (mass fraction of methanol) after 1hr. **[16]**

Q5) Develop a model for direct heated counter current rotary dryer. **[16]**

OR

Q6) Develop a model equation for a double pipe heat exchanger where in the resistance to heat transfer from a condensing fluid to inner can be represented by convective heat transfer coefficient on both side of heat transfer wall. **[16]**

SECTION - II

Q7) Derive the governing balance equation for counter current stage absorber.

[16]

OR

Q8) Develop a model for continuous binary distillation column. **[16]**

Q9) A slurry reactor shown below is used to carry out catalytic reaction. This reactor is well stirred tank with catalyst particles dispersed throughout. The rate of such reactions is usually zero order. The reaction rate is however, a function of the system temperature $r = a + bT + cT^2$.

Develop a analytical solution to the temperature response of the tank when there is step change in the steam temperature Ts. **[18]**
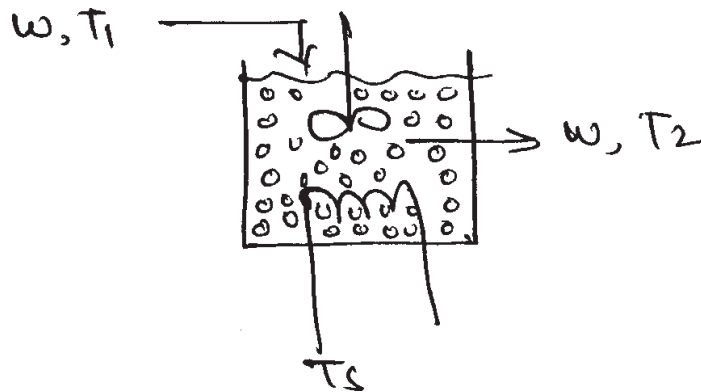
OR

Q10) Develop model equations for Trickel Bed reactor. Draw a neat figure and use the proper notations. **[18]**

Q11) a) What is simulation? Explain with suitable example.

b) What are the approaches for simulation. Explain each with example.**[16]**

OR

Q12) a) Use Runge Kutta method to solve

$$10\frac{dy}{dx} = x^2 + y^2 .$$

$y(0) = 1$ for $x = 0\ (0.1)\ 0.4$.

b) Calculate density of Van-der-walls carbon dioxide at 10 atm. Pressure and 300 k. Use Newton-Raphson method. **[16]**

Data : $R = 0.082054$ L atm./mole.k

$a = 3.592$ L^2 atm / $mole^2$

$b = 0.04267$ L/mole

❄❄❄

[3964] - 322

P1287

B.E. (Petroleum Engineering)
PETROLEUM EXPLORATION
(2003 Course) (Sem. - I) (412382)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

   1)   *Answers to the two sections should be written in separate books.*

   2)   *Answer any two questions each from section I and section II.*

   3)   *Neat diagrams should be drawn wherever necessary.*

   4)   *Use of cm scale graph paper is allowed.*

   5)   *Assume additional data, if required.*

SECTION - I

Q1) a)   Explain the term gravity anomaly. With the help of a neat diagram explain the construction and working of <u>any one</u> type of a gravimeter. Give details of the corrections used in gravity survey data.   **[15]**

     b)   Following is a data recorded during a Wenner spread lateral traverse arrangement in a sedimentary basin to delineate a sandstone - mudstone - sandstone sequence. Draw a graph of electrode spacing against apparent resistivity. Identify the mudstone on the curve and estimate the thickness of mudstone. Justify your answer. (use cm scale graph paper).   **[10]**

Electrode spacing in m	Apparent resistivity in Ωm	Electrode spacing in m	Apparent resistivity in Ωm
0.69	86	10.00	950
1.0	99	14.68	500
1.47	120	21.54	350
2.15	455	31.62	210
3.16	765	46.42	140
4.64	925	68.13	80
6.81	1300	100.00	50

Q2) a) Details of a gravity survey conducted in a sedimentary basin are given below. The distance between stations is 50 m. Draw the anomaly curve for the following data obtained during the survey. Calculate value of Δg using half anomaly width technique. Give possible correlations of the causative body. **[10]**

Station number	Value of Δg	Station number	Value of Δg
01	0.1800	06	0.6890
02	0.2200	07	0.4800
03	0.3800	08	0.3900
04	0.4600	09	0.2400
05	0.6900	10	0.1900

b) Explain the working principle of a proton-precession magnetometer with suitable diagram. **[10]**

c) Write a note on Techniques to remove regional effects in magnetic anomaly maps. **[5]**

Q3) a) How are isotope surveys useful in geochemical exploration of petroleum? **[9]**

b) Answer <u>any two</u> of the following: **[16]**

   i) What are the different modes of transport of hydrocarbons from the seal of the reservoir to the surface in case of micro seepages?

   ii) What are the possible weathering processes of petroleum seepages?

   iii) Describe in brief the field procedure adopted for geochemical surveys.

OR

Q4) a) How is geochemical method effectively used as an exploration tool in new areas? **[10]**

b) Draw and explain Schlumberger arrangement of electrical resistivity survey. **[10]**

c) The given diagram shows a trace of interval velocities along with the compaction trend with increasing depth. **[5]**
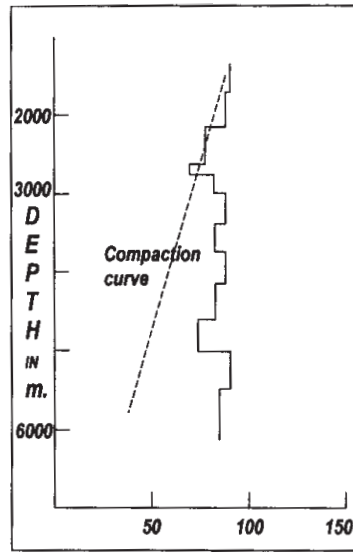
Log interval transit time, μ sec / foot

What may be the conclusion derived from curve? Give your comments.

SECTION - II

Q5) a) How is depth of a reflecting layer calculated in seismic reflection survey assuming horizontal reflector and dipping reflector? **[10]**

b) What are "Seismic facies"? How are they mapped? **[10]**

c) What is a possibility of occurrence of commercial reservoir for the following data? **[5]**

Explain the risk involved

EVENT	PROBABILITY
Existence of source rock	0.85
Sufficient level of maturity of source rock	0.75
Migration path to reservoir	0.50
Reservoir rock with porosity and permeability	0.50
Existence and persistence of seal	0.75

OR

Q6) a) The table given below shows recorded time for the direct, reflected, and critical P waves versus distance from shot point for a certain seismic survey. **[10]**

x (m)	T_d (ms)	T_r (ms)	T_c (ms)
0			
50	29	115	
100	56	124	
150	83	139	139
200	111	157	155
250	139	178	171
300	167	200	187
350	195	224	203
400	222	248	219
450	250	274	236
500	278	299	252
550	306	325	268
600	333	351	284
650	361	378	300
700	389	404	316

Plot the data on the graph and find

i) The wave velocity in two layers of rock,

ii) The depth to the horizontal interface.

b) Explain with the help of suitable diagrams how is reflection data used as a tool for stratigraphic and structural studies? **[15]**

Q7) a) The figure shown below is a model of the response of a lenticular reservoir with a gas cap, surrounded by shale. Water filled porosity in the reservoir reduces the average velocity so that a contrast is produced at the shale/reservoir interface. Over the gas cap, velocity is further lowered further, increasing the contrast with the overlying shale and producing a seismic reflection survey of reversed polarity. **[10]**

What is this phenomenon?

Sand Porosity 10 %
Sand Velocity, Vm = 14000 ft / sec
Water Velocity, Vw = 5000 ft / sec
Velocity in Gas, Vg = 1000 ft / sec
Shale Velocity, Vs = 8000 ft / sec
Velocity in Oil, Vo = 4200 ft / sec
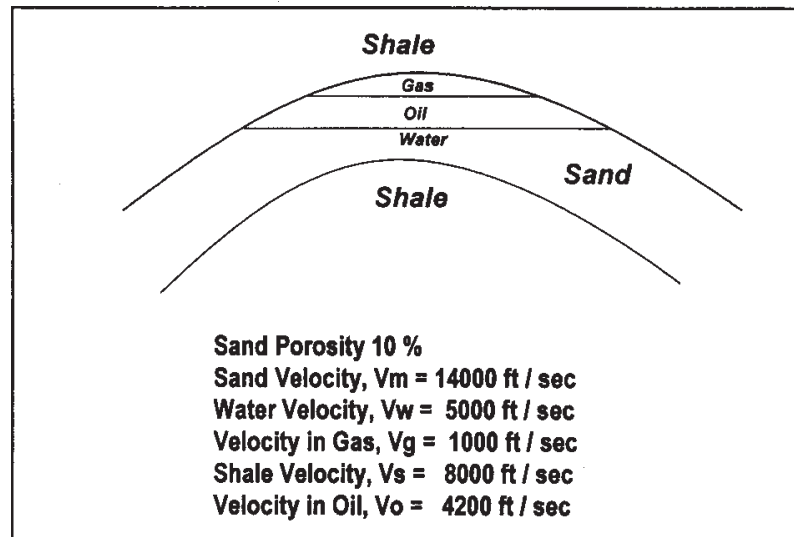
Calculate

i) The reflection coefficient at the gas cap, Rsg.

ii) The reflection coefficient at the interface between shale and wet sand Rsw.

iii) The reflection coefficient at the gas water boundary, Rgw.

b) How one may proceed for exploration of hydrocarbons taking into consideration basin classification and history of occurrence of hydrocarbons? **[15]**

OR

Q8) a) What is NELP? What are the likely areas of exploration in India in future? How is risk discussed / addressed while exploring in frontier basins? **[15]**

b) Answer the following: **[10]**

i) How is deterministic approach in reserves estimation different than probabilistic approach?

ii) How does the asymmetry of folding control the area of reservoir during calculation of volumetric reserves?

❆ ❆ ❆

P1288

[3964] - 323

B.E. (Petroleum)
FORMATION EVALUATION
(2003 Course) (412383) (Sem. - I)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answers to the questions of both the sections should be written in separate answer books.*
2) *All questions are compulsory.*
3) *Draw neat diagrams wherever necessary.*

SECTION - I

Q1) What is a log? What are the types of geophysical logging? How geophysical logging is useful in various stages of exploration and exploitation of oil reserves? **[15]**

OR

What are the different neutron interactions with rocks? Describe the theory and two tools commonly used in nuclear radiation logging. **[15]**

Q2) Explain important electrical logging methods with the help of neat sketches. **[15]**

Q3) Write notes on any four of the following: **[20]**

a) Logs used to measure geometry of borehole,

b) MWD

c) Geochemical logs,

d) Bore hole environment,

e) Difficulties faced during logging of deviated wells,

f) Temperature log.

SECTION - II

Q4) Outline the procedure for determination of water saturation using logs. **[20]**

OR

Write notes on any three of the following: **[20]**

a) NMR logs

b) Detection of over pressures,

c) Perforation,

d) Production Logging Tool, (PLT).

e) Acoustic logs,

f) Cross Plots.

Q5) Explain various methods used to evaluate quality of cementation. **[15]**

OR

Write short notes on any three of the following: **[15]**

a) Methods used for downhole sampling of fluids,

b) Shaly sand evaluation,

c) Use of core analysis in formation evaluation,

d) Image logs and their applications.

Q6) How will you recognize various depositional environments using log patterns. Draw sketches to explain. **[15]**

❋ ❋ ❋

P1291   **[3964] - 332**

B.E. (Petrochemical Engineering)
PETROCHEMICAL PROCESSES
(Sem. - I) (2003 Course) (412402)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

    1)   *Answer any three questions from section I and three questions from section II.*

    2)   *Answers to the two sections should be written in separate books.*

    3)   *Neat diagrams must be drawn wherever necessary.*

    4)   *Figures to the right indicate full marks.*

SECTION - I

Q1) a)   Describe with flowsheet the oxidation process for conversion of cumene to acetone. **[12]**

    b)   Mention end uses of butadiene, isopropanol and isoprene **[6]**

Q2) a)   Describe with flowsheet the Mitsubishi Gas Chemical Process for direct extraction of m-xylene. **[12]**

    b)   Mention health and handling precautions for acrylonitrile. **[4]**

Q3) a)   Describe with flowsheet the process for conversion of toluene to benzene by hydrodealkylation. **[12]**

    b)   Explain the role of steam in steam cracking of naphtha. **[4]**

Q4) a)   Describe with flowsheet the BASF process for manufacture of isoprene from steam cracked C_5 cut. **[12]**

    b)   Write a note on autothermal reactor. **[4]**

SECTION - II

Q5) a) Describe with flowsheet the oxidation process for manufacture of formaldehyde from methanol. **[12]**

b) Mention health and handling precautions for acetone: **[4]**

c) Mention end uses of ethylene glycol. **[2]**

Q6) a) Describe with flow sheet the low pressure Ziegler process for manufacture of polyethylene from ethylene. **[12]**

b) Mention different techniques of polymerization with examples. **[4]**

Q7) a) Describe the process of steam reforming for production of hydrogen. **[12]**

b) Write a note on xylene isomerization. **[4]**

Q8) a) Write notes on: **[8]**

   i) Thermoplastics and Thermosets.

   ii) Gas Hydrate as novel energy source.

b) Explain the process for preparation of nylon 66. **[8]**

❄ ❄ ❄

P1294

[3964] - 341

B.E. (Polymer)

POLYMER STRUCTURE & PROPERTY RELATIONSHIP

(409361) (Sem. - I)(2003 Course) (Backlog)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1)   Answers to section - I and section - II should be written in separate answer books .

2)   Solve three questions from section - I and three questions from section - II.

3)   Neat diagrams should be drawn whenever necessary.

4)   Figures to the right indicate full marks.

5)   Assume suitable data, if necessary.

6)   Use of electronic pocket calculator is allowed.

SECTION - I

Q1) a)   Write a short note on "Impurities from Polymerization Reaction" that affect polymer properties.   **[10]**

b)   Why PP has higher melting point than PE?   **[4]**

c)   Explain in brief importance of side groups defining polymer properties.
                                                                     [4]

OR

Q2) a)   Write a short note on "Monomeric Additives" that affect polymer properties.   **[10]**

b)   Why poly (p-phenylene terephthalamide) i.e. PPTA (Kevlar®) is more rigid compared to poly (hexamethylene adipamide) i.e. Nylon66? **[4]**

c)   Comment on C-O-C bond in polyesters.   **[4]**

Q3) a)   PTFE is preferred in non-stick applications. Justify.   **[4]**

b)   With suitable examples explain the effect of polymeric structure on mechanical properties of polymers.   **[6]**

c)   The functional groups present in polymeric structure affects adhesion properties. True or False. Justify your answer with suitable examples.
                                                                     [6]

Q4) a) Referring to polyvinyl alcohol and polyvinyl acetate, discuss the effect of side groups (hydroxyl and acetate) on polymer properties. **[4]**

b) With suitable examples explain the effect of polymeric structure on thermal properties of polymers. **[6]**

c) Explain the effect of various bonds and their strengths on morphology of polymers. **[6]**

Q5) a) Thermoplastic polymeric samples "A" and "B" have same average molecular weight and chemical composition. Sample "A" has narrow MWD while sample "B" has broad MWD. Which one is easy to process? Why? **[4]**

b) Enlist various additives used in polymers. With suitable examples explain how fillers affect various properties of polymers. **[8]**

c) Write a short note on Factors affecting Electrical Properties of polymer. **[4]**

OR

Q6) a) Explain how molecular weight (MW) and molecular weight distribution (MWD) affect polymer properties. **[8]**

b) With suitable examples explain the role of plasticizers in PVC processing and its properties. **[4]**

c) What do you understand by Electrical Resistivity and Dielectric Constant of polymers. **[4]**

SECTION - II

Q7) a) What do you understand by molecular flexibility and freedom of rotation? Explain how molecular flexibility affects thermal properties of polymers. **[8]**

b) Write a short note on "Fringed Micelle Theory". **[6]**

c) Biaxially oriented polypropylene film has more strength compared to monoaxially oriented propylene film. Why? **[4]**

OR

Q8) a) Write a short note on "Intermolecular orders" in polymers. **[8]**

b) Explain 1ˢᵗ and 2ⁿᵈ order transitions in polymers. **[6]**

c) Isotactic polypropylene has better thermal and mechanical properties compared to atactic or syndiotactic polypropylene. Why? **[4]**

Q9) a) Explain how thermodynamic forces affect crystallization. **[8]**

b) How do the processing conditions affect the crystallinity? Discuss it at fast and slow heating and cooling rates. **[8]**

OR

Q10) a) Kinetic forces affect crystallization. True or False. Justify your answer. **[8]**

b) Explain the role of crystallinity on the following processes: injection molding, Extrusion of film, thermoforming. **[8]**

Q11) a) Explain how hydrogen bonding affects polymer properties. Give suitable examples. **[8]**

b) Is cross-linking a primary covalent bond or secondary van der Waals bond? How does it affect the mechanical and thermal properties of polymers? **[8]**

OR

Q12) a) Write a short note on "Intermolecular bonding" in polymers. **[8]**

b) Explain the role of dipole interaction in defining polymer properties. **[8]**

❆ ❆ ❆

P1296

[3964] - 351

B.E. (Polymer Engg.)

INDUSTRIAL MANAGEMENT AND PROCESS ECONOMICS

(2003 Course) (Sem. - II) (409370)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Section I : Attempt Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6*
   Section II : Attempt Q.7 or Q. 8, Q.9 or Q.10, Q.11 or Q.12.
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of electronic pocket calculator is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What are the principles of good plant layout? Explain.   **[8]**

b) The following information is obtained from the accounts of XYZ Limited.

[9]

Direct Material cost	-	Rs. 10,000
Direct Wages	-	Rs. 6,000
Direct expenses	-	Rs. 200
Factory overheads	-	Rs. 3000
Administration overheads	-	Rs. 1000
Selling and Distribution overheads	-	Rs. 1800
Sales	-	Rs. 25000

i) Prepare a statement of cost and profit under absorption method showing prime cost, works cost, total cost and profit.

ii) If factory overhead is 80% variable, administration overhead is 20% variable and selling and distribution overheads is 40% variable, prepare statement of cost and profit under marginal method of costing.

OR

Q2) a) Explain **[9]**

    i)   P/V Ratio   ii)   Margin of safety

Following details are available from ABC company.

	Sales (Rs.)	Profit (Rs.)
Period I	2,00,000	20,000
Period II	3,00,000	40,000

Find out Break even sales.

    b)   A company produces a single article and sells at Rs. 10 each. The marginal cost of production is Rs. 6 each and total fixed cost of the concern is Rs. 400 per annum. **[8]**

Construct a break - even chart and show:

    i)   Break - even point.

    ii)   Margin of safety at sales Rs. 1500.

    iii)   Angle of incidence.

Q3) a) Explain the factors which determine the working capital needs of a firm. **[6]**

    b)   Original cost of a machine is Rs. 80,000 and its book value is Rs. 50,000. Assuming the normal tax rate to be 50% and capital gain tax to be 40%, find the net cash inflow if the machine can be sold for **[6]**

    i)   Rs. 60,000   ii)   Rs. 90,000

    c)   Explain "Discounting Techniques" for evaluation of cash inflow and cash outflow. **[5]**

OR

Q4) a) Explain the difference between equity shares and debentures. **[6]**

    b)   A project involves the investment of Rs. 5,00,000 which yields profits as stated below: **[6]**

Years	Profit (Rs.)
1	25,000
2	37,500
3	62,500
4	65,000
5	40,000

At the end of 5 years, the machineries in the project can be sold for Rs. 40,000. Find the accounting rate of return.

    c)   Explain Net Present value method for calculating cash inflow. **[5]**

Q5) a) What are the main causes of Depreciation? **[5]**

b) The original investment for an asset was Rs. 14,000 and the asset was assumed to have a service life of 12 years with Rs. 2000 average value at the end of service life. After the asset has been in use for 5 years, the remaining service life and final salvage value are estimated of 10 years and Rs. 1000 respectively. What is the depreciation cost during sixth year of the total life using straight line method. **[6]**

c) Describe the aims of budgeting. **[5]**

OR

Q6) a) For Depreciation, explain the difference between production unit method and production hour method. **[5]**

b) Describe the types of budgets. **[5]**

c) The cost of a machine is Rs. 1,00,000. The life of the machine is 10 years and its estimated scrap value is Rs. 50,000. Estimated number of units produced during the life of machine is 50,000. If in a particular year, the machine produces 6,000 units, find the depreciation using joint factor rate method. **[6]**

SECTION - II

Q7) a) Solve the following LP problem using simplex method. **[9]**

Maximize $z = 3x_1 + 6x_2 + 2x_3$

Subject to $\quad 3x_1 + 4x_2 + x_3 \le 2$

$\qquad\qquad x_1 + 3x_2 + 2x_3 \le 1$

and $\qquad x_1, x_2, x_3 \ge 0.$

b) Find the sequence that minimizes the total elapsed time required to complete the following tasks. **[8]**

Processing times in hours						
No. of tasks	1	2	3	4	5	6
Machine A	4	8	3	6	7	5
Machine B	6	3	7	2	8	4

Calculate the minimum elapsed time corresponding to optimal sequencing. Calculate the total idle time for the machines in this period.

OR

Q8) a) Solve the following transportation problem in which cell entries represent unit costs. **[8]**

	To			Available
	2	7	4	5
From	3	3	1	8
	5	4	7	7
	1	6	2	14
Required	7	9	18	

b) Five men are available to do five different jobs. From past records, the time (in hours) that each man takes to do each job is known and given in the following table: **[9]**

		Job				
		I	II	III	IV	V
	A	2	9	2	7	1
	B	6	8	7	6	1
Man	C	4	6	5	3	1
	D	4	2	7	3	1
	E	5	3	9	5	1

Find the assignment of men to jobs that will minimize the total time taken.

Q9) a) A project has the following time schedule: **[9]**

Activity	Time in months	Activity	Time in months
(1 – 2)	2	(4 – 6)	3
(1 – 3)	2	(5 – 8)	1
(1 – 4)	1	(6 – 9)	5
(2 – 5)	4	(7 – 8)	4
(3 – 6)	8	(8 – 9)	3
(3 – 7)	5		

Construct PERT network and compute

i) Total float for each activity

ii) Critical path and its duration.

b) A manufacturing company has just developed new product. On the basis of past experience, a product such as this will either be successful, with an expected gross return of Rs. 1,00,000, or unsuccessful, with an expected gross return of Rs. 20,000. Similar products manufactured by the company have a record of being successful about 50% of the time. The production and marketing costs of the new product are expected to be Rs. 50,000.

The company is considering whether to market this new product or to drop it. Before making its decision, however, a test marketing effort can be conducted at a cost of Rs. 10,000. Based on the past experience, test marketing results have been favourable about 70% of time. Furthermore, products favourably tested have been successful 80% of the time. However, when the test marketing result has been unfavourable, the product has only been successful 30% of the time. What course of action should the company persue? **[8]**

OR

Q10) a) A departmental store with a backery section is faced with the problem of how many cakes to buy in order to meet the day's demand. The departmental store prefers not to sell day old cakes in competition, left over cakes are, therefore, a complete loss. On the other hand, if a customer desires a cake and all of them have been sold, the customer will buy elsewhere and the sales will be lost. The store has therefore, collected information on the past sales based on selected 100 day period as shown in the table below: **[9]**

Sales per day :	15	16	17	18
Number of days :	20	40	30	10
Probability :	0.20	0.40	0.30	0.10

Construct the conditional profit and the opportunity loss tables. What is the optimal number of cakes that should be bought each day.

A cake costs Rs. 2 and sells for Rs. 2.50.

b) Find the saddle point (or points) and hence solve the following game. **[8]**

$$
\begin{array}{c}
\quad\quad\quad\quad\quad B \\
\quad\quad\quad\text{I} \quad \text{II} \quad \text{III} \quad \text{IV} \quad \text{V} \\
A \quad
\begin{array}{c} \text{I} \\ \text{II} \\ \text{III} \\ \text{IV} \end{array}
\begin{bmatrix}
9 & 3 & 1 & 8 & 0 \\
6 & 5 & 4 & 6 & 7 \\
2 & 4 & 4 & 3 & 8 \\
5 & 6 & 2 & 2 & 1
\end{bmatrix}
\end{array}
$$

Q11) a) An aircraft company uses rivets at an approximate rate of Rs. 2500 kg. per year. Each unit costs Rs. 30 per kg. and the company personnel estimate that it costs Rs. 130 to place an order. The carrying cost of inventory is 10% per year. How frequently should order be placed? Also determine optimal size of each order. **[7]**

b) A company uses annually 24000 units of a raw material which costs Rs.1.25 per unit. Placing each order costs Rs. 22.5 and the carrying cost is 5.4% per year of the average inventory. Find the economic order quantity and the total inventory cost.

Suppose the company works for 300 days a year. If the procurement time is 12 days and safety stock is 400 units, find the re-order point, the minimum, maximum and average inventory. **[9]**

OR

Q12) a) The monthly demand for a product is 200 units, the cost of storage is 2% of the unit cost and the cost of ordering is Rs. 350. Find the optimal order quantity for a product for which the price breaks are as follows. **[8]**

Quantity :	$0 \leq q_1 < 500$	$500 \leq q_2 < 750$	$750 \leq q_3$
Unit cost Rs. :	10.00	9.25	8.75

b) What is ABC analysis? Explain the usage of ABC analysis to various functional area. **[8]**

❄ ❄ ❄

P1303

[3964] - 399

B.E. (Biotechnology)
ANALYTICAL BIOTECHNOLOGY
(2003 Course) (416287) (Sem. - II)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

    1)   *Answer three questions from section I and three questions from section II.*

    2)   *Answers to the two sections should be written in separate answer books.*

    3)   *Neat diagrams should be drawn whenever necessary.*

    4)   *Figures to the right indicate full marks.*

SECTION - I

Q1) Write notes on: **[18]**

    a)   Use of molecular beacons in RT PCR.

    b)   Maxam Gilbert method of DNA sequencing.

OR

Q2) Write principle and describe using flow chart for the techniques.   **[18]**

    a)   Microarrays.

    b)   Southern blotting.

Q3) With the help of a diagram, show mode of action.   **[16]**

    a)   Calf Intestine Phosphatase and

    b)   DNA Polymarase

OR

Q4) What do you understand by the term Class II restriction enzymes? Why are they used as molecular cutters in recombinant DNA technology? What are the subtypes of Class II restriction enzymes? Give one example of each?   **[16]**

Q5) Give an account of any two of the following in detail. Draw a diagram showing structure, state the biology and unique features of each of them. **[16]**

a) Plasmid vector.

b) Mammalian cell Vector.

c) Expression vector.

d) λ life cycle.

SECTION - II

Q6) What is α-complementation? How is it used to screen recombinant cells? Explain with the help of a diagram. **[18]**

OR

Q7) What do you understand by the term DNA library? What are the two types of libraries? Compare the feature of these libraries. **[18]**

Q8) What is natural transformation? Discuss in detail. **[16]**

OR

Q9) Write notes on: **[16]**

a) Natural conjugation

b) Transfection of mammalian cells

Q10) Explain **[16]**

a) RFLP

b) AFLP

OR

Q11) What is Gene therapy? Discuss in detail. **[16]**

❄ ❄ ❄

[3964] - 400

P1304

B.E. (Biotechnology)

BIOINFORMATICS AND REGULATIONS

(2003 Course) (416288) (Sem. - II)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

1) *Answer three questions from section I and three questions from section II.*
2) *Answers to the two sections should be written in separate answer books.*
3) *Neat diagrams must be drawn whenever necessary.*
4) *Figures to the right indicate full marks.*
5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   Explain how the techniques used in genetic engineering are useful in the data generation in bioinformatics.   **[5]**

b)   What is E-Value? State the formula for E-value and its significance.   **[5]**

c)   What are the differences between FASTA and BLAST?   **[8]**

OR

Q2) What is dynamic programming algorithm? How the heuristic methods are different from DP algorithm? Compare FASTA, BLAST and DP algorithm.

[18]

Q3) a)   Describe any two of the primary protein database in brief.   **[8]**

b)   What are protein structure visualization tools? Describe RasMol and Deep View in brief.   **[8]**

OR

Q4) What are structural protein databases? Describe PDB, CATH and SCOP in detail.   **[16]**

Q5) Write a note on: **[16]**

a)   CLUSTAL-W.

b)   BLOSUM.

<center>OR</center>

Q6) Explain in detail: **[16]**

    a)   Multiple sequence alignment.

    b)   Nucleotide databases.

<center>**SECTION - II**</center>

Q7) What is Dot Plot analysis? Explain with suitable example. **[18]**

<center>OR</center>

Q8) Explain how bioinformatics analysis can help pharmaceutical industries in designing drugs. **[18]**

Q9) a)   What is GMP? What are current GMP and what is the role of DCGI in the regulation of products in biotechnology? **[8]**

    b)   Explain various regulatory requirements that govern product development in biotechnology? **[8]**

<center>OR</center>

Q10) Narrate briefly the path or procedure you will follow for developing and marketing vaccine from conceptualization to commercialization. **[16]**

Q11) Give an account of interrelationship between GMP, QC, and QA. Narrate ten commandments of GMP. **[16]**

<center>OR</center>

Q12) Write short notes on: **[16]**

    a)   Benefits of patenting.

    b)   Toxicity testing.

    c)   Trademark and its purpose.

    d)   Clinical trials.

<center>❋ ❋ ❋</center>

P1334

[3964] - 338

B.E. (Petrochemical)

REFINERY PROCESS DESIGN

(2003 Course) (412407) (Sem. - II)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

   1)   *Answer any three questions from each section.*

   2)   *Answers to the two sections should be written in separate answer books.*

   3)   *Figures to the right indicate full marks.*

   4)   *Use of steam tables and electronic calculator is allowed.*

   5)   *Assume suitable data where ever necessary.*

SECTION - I

Q1) a) How will you choose operating pressure of distillation column by knowing incoming cooling water temperature and permissible rise in its temperature? Assume total condensation of a known vapor composition. **[8]**

    b) Ethane -ethylene mixture (99 mol% ethylene) is passing through a line at -20 C and 19.5 bar. Report on the possible state of the mixture as superheated vapor, vapor - liquid mixture or subcooled liquid. Justify your statement. **[10]**

Q2) Describe Thiele Geddes method for design of tower for distillation of a multi component mixture. **[16]**

Q3) What are Packie Charts? Discuss how they can be used for the rating of Atmospheric Distillation Unit. **[16]**

Q4) Write notes:

    a) Importance of fouling factor in rating of heat exchanger. **[5]**

    b) Choice of shell and tube heat exchanger configuration. **[5]**

    c) Use of process simulator. **[6]**

SECTION - II

Q5) Differentiate between rating and design problems. Give a detailed procedure for designing of a heat exchanger in a refinery. **[16]**

Q6) Define heat exchanger network synthesis problem. Discuss how it can be solved using pinch analysis. **[18]**

Q7) Discuss how minimum L/G ratio is decided in absorption column design. With help of Perry's guidelines, discuss in detail how an absorption tower for multicomponent absorption can be designed for a concentrated hydrocarbon gas mixture. **[16]**

Q8) Write a detailed note on fired heaters with reference to the following points

  a) Heat duty and fuel gas calculations **[4]**

  b) Main Constructional Features **[6]**

  c) Where the fired heaters are employed in a refinery **[6]**

❄ ❄ ❄

[3964] - 370

P1339

B.E. (Computer Engineering)

ADVANCED COMPUTER ARCHITECTURE AND COMPUTING

(Sem. - II) (2003 Course) (410449)

Time : 3 Hours]   *[Max. Marks :100*

Instructions to the candidates:

  1) *Answers to the two sections should be written in separate answer books.*
  2) *Assume suitable data wherever necessary.*
  3) *Neat diagrams must be drawn wherever necessary.*

SECTION - I

Q1) a)   Explain the architecture of Itanium Processor in detail.   **[10]**

  b)   Explain Instruction level and Thread level parallelism.   **[8]**

                                       OR

Q2) a)   Discuss the various performance measures and metrics used for performance evaluation?   **[10]**

  b)   Which are the classification schemes for Parallel Computers? Explain any two schemes elaborately.   **[8]**

Q3) a)   List and explain pipeline hazards briefly.   **[6]**

  b)   A certain pipeline with the four stages S1 , S2, S3, and S4 is characterized by the following reservation table,   **[10]**

  i)   Determine the latencies in the forbidden list F and the collision vector C.

  ii)   Determine the minimum constant latency L by checking the forbidden list.

  iii)   Draw the state diagram for this pipeline and determine MAL.

                                       OR

Q4) a) Explain the architecture of Ultra Sparc processor. **[10]**

b) Write a detail note on register tagging technique. **[6]**

Q5) a) Explain pipeline chaining with example. **[6]**

b) Explain static and dynamic network topologies used in interconnection networks with proper examples. **[10]**

OR

Q6) a) Explain the algorithm to compute Fast Fourier Transform for SIMD architecture. **[10]**

b) Write a note on desirable features of Parallel Languages in detail. **[6]**

SECTION II

Q7) a) Write notes on Time shared bus, Crossbar switch, and Multiport Memory Model. **[12]**

b) What is COW architecture? Explain with diagram. **[6]**

OR

Q8) a) Give a typical architecture for MPP. Explain in detail. **[10]**

b) Comment on desirable Processor characteristics of Multiprocessor architecture. **[8]**

Q9) a) What is Latency Hiding Technique? Elaborate with example. **[8]**

b) What is Data Parallel Programming? Explain in detail. **[8]**

OR

Q10) a) Explain any von Neumann-based multithreaded architecture elaborately. **[8]**

b) What is Synchronous and Asynchronous Message passing in parallel programming? **[8]**

Q11) a) What is Parallel Virtual Machine? Explain in detail. **[8]**

b) What are the major features of Fortran-90 to be qualified as Parallel Programming Language? **[8]**

OR

Q12) a) Discuss the issues in Multiprocessor Operating System in detail. **[10]**

b) Write a note on Grid Computing in detail. **[6]**

❄ ❄ ❄

P1051

[3964] - 103
B.E. (Civil)
QUANTITY SURVEYING CONTRACTS & TENDERS
(2003 Course) (Sem. - I) (401003)

Time : 4 Hours]   *[Max. Marks:100*

Instructions to the candidates:

   1)   *Answer Q1 or Q2, Q3, or Q4, Q5 or Q6 from Setion - I and Q7 or Q8, Q9, or Q10, Q11 or Q12 from Section II.*

   2)   *Answers to the two sections should be written in separate books.*

   3)   *Neat diagrams must be drawn wherever necessary.*

   4)   *Figures to the right indicate full marks.*

   5)   *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

   6)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   Explain the uses of Block estimate and detailed estimate with examples.**[4]**

     b)   State the various units in which items are measured with an example for each. **[4]**

     c)   Explain the different data and information necessary to prepare a detailed estimate. **[4]**

     d)   Explain the plinth area method and volumetric content method for preparing a block estimate **[6]**

<div align="center">OR</div>

Q2) a)   Differentiate between an estimate and estimation with an example. Explain the terms; revised estimate and supplementary estimate. **[4]**

     b)   With an example, explain the statement "without proper knowledge of quantity surveying, a contractor cannot submit his tender, in a competitive manner". **[4]**

     c)   With examples, explain the basic principles deciding the units. **[4]**

     d)   Explain service unit method and building cost index method of preparing block estimates. **[6]**

Q3) a) With an example, explain how T and L junctions are accounted for in the centre - line method. **[4]**

b) With an example, explain the application of the rules for deduction in plaster when the opening area is **[6]**

     i) less than 0.5 sq.m

     ii) between 0.5 sq.m to 3sq.m

     iii) greater than 3 sq.m

c) Explain the importance of drafting brief specifications in a BOQ. Draff a brief specification for enecuting the item of internal plaster to a brick masonary. **[6]**

<div align="center">OR</div>

Q4) a) Explain the importance of the Bill of materials in quantity surveying. Work out the materials required to provide and lay plain cement concrete equivalent to M 20 mix. Include necessary, reasonable allowances. **[7]**

b) A square wall of 3.0 m length, has a thickness of 30 cms. Determine,

     i) Brickwork quantity in C.M (1 : 6) using longwall - short wall method. **[3]**

     ii) RCC slab, M (1 : 1 : 2), item quantity, including a projection of 30 cms width from all sides. In this item, determine

         1) Concrete item quantity for 15 cm thick slab

         2) Formwork quantity

         3) Steel reinforcement quantity considering 0.8% steel.

The wall has an opening of 1m×1m. Assume suitable linter size and bearing on wall. Height of wall is 3.5 metre. **[6]**

Q5) a) Draft a detailed specification for providing and laying R.C.C $\left(1 : 1\frac{1}{2} : 3\right)$, with formwork and withoutsteel reinforcement for the construction of a column footing. **[8]**

b) Determine the item rate /m³ for executing the above item inclusive of formwork and exclusive of steel reinforcement. **[8]**

<div align="center">OR</div>

Q6) a) Draft a detailed specification for providing and constructing U.C.R masonary in C.M (1 : 8), with pointing in cement to the joints, for a wall 300 mm thick. **[8]**

b) Prepare the item rate /m³ for providing and constructing brick masonary using standard I.S bricks for a wall 300 mm thick, in C.M (1 : 4), with cement pointing to the joints. **[8]**

SECTION - II

Q7) a) Discuss, with examples, the various factors affecting value of a property consisting of land and building. **[6]**

b) Explain any 2 methods of working out the depriciation in brief. **[6]**

c) Explain in detail the rental method of valuation. **[6]**

OR

Q8) a) Explain any 3types of value with proper examples. **[6]**

b) Explain with examples, following terms
   i) deferred value of land
   ii) dual rate year's purchase
   iii) Reproduction cost of building **[6]**

c) Explain the various outgoings that are considered in the rental method of valuation. **[6]**

Q9) a) Explain administrative approval and technical sanction processess with examples. **[6]**

b) List out any 6 important instructions given to a tenderer. **[6]**

c) Explain tender validity period and its importance. **[4]**

OR

Q10) a) Differentiate between piece-work agreement and Rate list with an example. **[4]**

b) Explain the basic points with respect to which any tender is scrutinized by the client. **[6]**

c) Draft a brief tender notice to execute the construction work of a concrete road of estimated cost of 30 lakhs to be completed in one year under JNNURM Scheme. **[6]**

Q11) a) Explain in brief, the nature of any 4 types of contracts. **[8]**

b) Explain the importance of contract conditions and differentiate between general conditions and particular conditions. **[4]**

c) Explain
   i) Mobilization Advance
   ii) Secured Advance **[4]**

OR

Q12) a) Discuss advantages and limitations of BOT types of contracts. **[6]**

b) Explain in brief the FIDIC document. **[4]**

c) Explain in brief,
   i) Ring contract
   ii) Voidable contract
   iii) Termination by breach **[6]**

✪✡✪✡

P1054

[3964] - 108
B.E. (Civil)
STRUCTURAL DESIGN OF BRIDGES
(2003 Course) (Elective - I) (401005) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:
  1) *From Section - I answer Q.1 or Q.2; Q.3 or Q.4 and from Section - II answer Q.5 or Q.6; Q.7 or Q.8.*
  2) *Answers to the two sections should be written in separate answer books.*
  3) *Figures to the right indicate full marks.*
  4) *IS 456, IS 800, IS 1343 and Steel table are allowed in the examination.*
  5) *Neat diagrams should be drawn wherever necessary.*
  6) *If necessary, assume suitable data and indicate clearly.*
  7) *Use of electronic pocket calculator is allowed.*

SECTION - I

Q1) a) Explain any three loads considered in the design of a highway bridge. **[9]**

   b) Explain with neat sketches the various types of highway bridges. **[8]**

   c) Explain with neat sketches slab culverts, pipe culverts and box girder bridges. **[8]**

OR

Q2) a) What are IRC loadings? Explain in brief the various classes of loadings. **[9]**

   b) Explain Pigeaud's method for the analysis of slabs. **[8]**

   c) What are bridge bearings? Explain the procedure of design of elastomeric bearing. **[8]**

Q3) Design the R.C. deck slab for the R.C. T-Beam deck slab bridge shown in Fig. 3 with the following details. **[25]**

   a) Thickness of railings - 100 mm.

   b) Thickness of footpath - 150 mm.

   c) Thickness of wearing coat - 80 mm.

   d) Span of main girder - 14.0 m.

   e) Spacing of main girders - 3.0 m c/c.

P.T.O.

f) Spacing of cross-beams - 4.0 m c/c.

g) Live load - IRC Class AA Tracked Vehicle.

h) Materials - M30 grade of concrete and Fe 415 grade of steel Adopt $m_1 = 0.045$ and $m_2 = 0.018$.
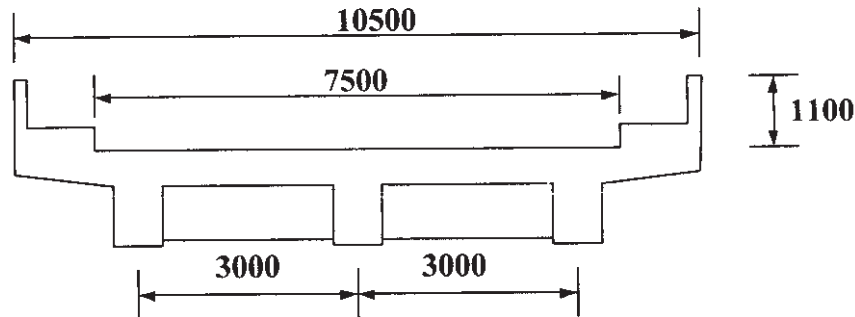
Fig. 3

OR

Q4) For the R.C. T-Beam deck slab bridge given in Q.3, design the central post-tensioned prestressed girder. Use M45 grade of concrete and high tension strands of 7 ply 15.2 mm diameter having an ultimate tensile strength of 1500 N/mm². Use Fe415 steel for supplementary reinforcement. Consider loss ratio as 0.85. **[25]**

SECTION - II

Q5) a) Explain with neat sketches through-type truss girder railway steel bridges with neat sketches. **[8]**

b) Explain IRS loadings on a railway steel bridge. **[10]**

c) Explain with neat sketches railway steel bridges. **[7]**

OR

Q6) a) Explain bracing systems in a railway bridge with neat sketches. **[7]**

b) Design a rocker bearing for a 28 m span truss girder railway bridge with the following data. **[18]**

The reaction due to dead load, live load and impact load is 1100 kN. The vertical reaction due to overturning effect of wind at each end of the girder is 90 kN. The lateral load due to wind effect at each bearing is 50 kN. The tractive force and braking force are 981 kN and 686 kN respectively.

Q7) Design the members U_3 - U_4 and U_3 - L_4 of the through type railway bridge shown in Fig. 7 with the following details. **[25]**

a) Weight of stock rail - 0.60 kN/m

b) Weight of check rail - 0.40 kN/m

c) Timber sleepers of size - $(0.25 \times 0.25 \times 2.5)$ m @ 0.45 m c/c.

d) Unit weight of timber - 7.5 kN/m^3.

e) Spacing of truss - 6.5 m c/c.

f) The bridge supports a udl of 2950 kN.
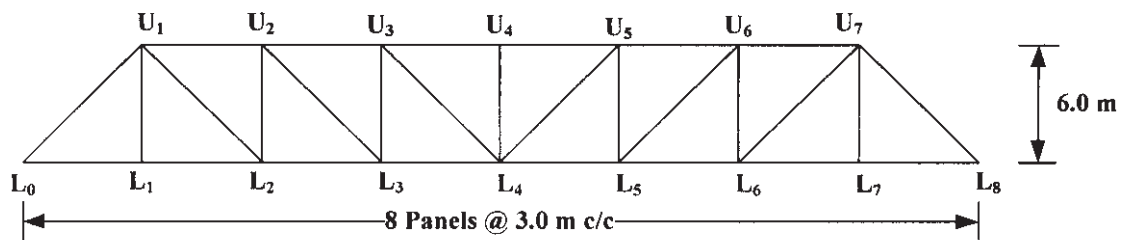
Fig. 7

OR

Q8) For the railway bridge shown in Fig. 7, design the top and bottom lateral bracing with the given data. **[25]**

The rails are 750 mm above the centre-line of bottom chord. The chord members are 450 mm deep and 450 mm wide. The end posts are 450 mm deep and 450 mm wide. The web members are 400 mm deep and 240 mm wide.

❖ ❖ ❖ ❖

P1056

[3964] - 111
B.E. (Civil)
GEOINFORMATICS
(2003 Course) (Elective - I) (401005) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*
Instructions to the candidates:
  1) Answer any 3 questions from each section.
  2) Answers to the two sections should be written in separate books.
  3) Neat diagrams must be drawn wherever necessary.
  4) Figures to the right indicate full marks.
  5) Assume suitable data, if necessary.

SECTION - I

Q1) a) Explain the typical EMS. State the characteristics of different frequencies.
                                                               [12]

   b) Define resolution and explain any 2 types.   **[6]**

OR

Q2) a) What are the elements of visual Image Interpretation? Explain their significance and factors influencing them.   **[12]**

   b) Explain interaction of EMR with Earth's Surface.   **[6]**

Q3) a) What is image enhancement? Explain its various techniques.   **[12]**

   b) Write a note on :   **[4]**
      i)   Image Rectification.
      ii) Geo referencing.

OR

Q4) a) Explain the term "Histogram Equalization". Elaborate the Linear and Non Linear contrast stretch enhancement.   **[12]**

   b) Explain Supervised Classification.   **[4]**

Q5) a) Explain with neat sketches the working of GPS in association with :

  i) GPS Space Segments. **[12]**

  ii) GPS Control Segments and

  iii) User Segments.

 b) What are applications of GPS in Civil Engineering? **[4]**

<p align="center">OR</p>

Q6) a) What are the different types of errors in GPS observations and explain how to minimize it? **[12]**

 b) Write a note on Codes used in GPS. **[4]**

<p align="center">**SECTION - II**</p>

Q7) a) What are the different types of Map Projection Systems? Explain the needs of different types of Map Projection. **[12]**

 b) Explain : **[6]**

  i) Digital Elevation Model.

  ii) Vector and Raster Model.

<p align="center">OR</p>

Q8) a) What is GIS? Explain in detail its components. **[12]**

 b) Write a note on : **[6]**

  i) Attributes.

  ii) Data types in DBMS.

Q9) a) Explain any one GIS software's and write a detail account on its Modules. **[12]**

 b) What are the components of DBMS. **[4]**

<p align="center">OR</p>

*Q10)*a) What is RDBMS? Explain the Normal form with one example. **[12]**

 b) Write a Note on Primary Key and Foreign Key. **[4]**

*Q11)*Explain application of Geo Informatics in following areas :   **[16]**

   a)   Geotechnical Engineering.

   b)   Integrated Resource Development and Management.

<div align="center">OR</div>

*Q12)*Explain application of Geo Informatics with working flow charts in following areas :   **[16]**

   a)   Survey and Investigations.

   b)   Infrastructure Development.

<div align="center">❖ ❖ ❖ ❖</div>

P1057

[3964]-112

B.E. (Civil)
ADVANCED CONCRETE TECHNOLOGY
(Sem. - II) (2003 Course) (Elective - II) (401007)

Time : 3 Hours]   *[Max. Marks : 100*
Instructions to the candidates:
  1) *Answer any 3 questions from each section.*
  2) *Answers to the two sections should be written in separate answer books.*
  3) *Neat diagrams must be drawn wherever necessary.*
  4) *Figures to the right indicate full marks.*
  5) *Your answers will be valued as a whole.*
  6) *Use of electronic pocket calculator and IS code is allowed.*
  7) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain the wet and dry manufacturing process of portland pozolana Cement. Draw the flow diagrams.   **[8]**

b) Explain the different shapes of aggregate in which they are available for concrete construction. Also explain the effect of texture of aggregate on the flexural and compressive strength of concrete.   **[8]**

OR

Q2) a) Explain the process of heat of hydration along with the water requirement for the same. Draw the illustrative diagrams to explain.   **[8]**

b) Explain the alkali aggregate reaction. State the factors promoting / this reaction and also explain how to control the alkali aggregate reaction.

[8]

Q3) a) Explain the manufacturing process bleeding and segregation of concrete.

[8]

b) Explain the process of placing the concrete for the construction under the water and for the construction using slip form techniques.   **[8]**

OR

Q4) a) Explain the transportation of wet concrete from ready mix plant to the site and from site to the place of concrete elements.   **[8]**

b) Explain the high strength concrete and ultra high strength concrete. **[8]**

Q5) a) Design the cement concrete mix, M20 by IS method for following data. 28 day compressive strength = 20 MPa, Maximum size of CA = 20 mm(angular), CA confirm to table 2, IS 386 - 1970 and FA confirm to Zone - III of table 4, IS 385 - 1970 Compaction factor = 0.9, degree of workability = good, type of exposure = mild, water absorption for Course Aggregate (CA) and Fine Aggregate (FA) = 0.5 and 1%, Free moisture content of CA and FA = 0 and 2%.

Specific gravity of CA and FA = 2.6, Specific gravity of cement = 3.15,

Compressive strength of cement at 7 days satisfy the requirement of IS 269 - 1989. **[10]**

b) State the different methods of curing of concrete. Explain the relationship between normal and accelerated curing with the help of neat graphs and charts. **[8]**

OR

Q6) a) Describe design process of pumpable concrete considering the compressive strength, Maximum size of course and fine aggregate (CA and FA), Compaction factor, slump, degree of workability, type of exposure, minimum and maximum content of CA and FA, cement, water cement ratio. **[10]**

b) Enlist the different methods of non destructive testing of different RCC elements and explain any one in detail. **[8]**

SECTION - II

Q7) a) Explain the historical development of fiber reinforced concrete. **[8]**

b) Explain the major parameter affecting fiber interaction with homogeneous uncracked matrix with axial stress and shear stress. **[8]**

OR

Q8) a) State and explain the different types of fibers. Explain their properties in detail. **[8]**

b) Explain procedure how to find the fracture resistance of concrete. Also explain how to improve it. **[8]**

Q9) a) Describe with comparison the Steel and Glass fiber reinforced concrete. **[8]**

b) Enlist the different light weight material used for civil construction and state the physical properties of any one in detail. **[8]**

OR

Q10) a) Explain the fracture resistance curve formulation with cement based composites. **[8]**

b) Explain the different reasons and principals underlying in use of strong fibers in a brittle matrix., Write a note on SIFCON development, **[8]**

Q11) a) Explain in detail the industrial Precast concrete element you seen with reference to following. Material of construction, Analysis and design principles. Manufacturing process with flow chart, Testing methodology and Quality control. **[10]**

b) With schematic diagram and flow chart, explain the construction of RCC chimney by slip form construction technique. **[8]**

OR

Q12) a) Explain the construction of building using the techniques of Precast concrete construction. Draw the sketches of connection at important joints. **[10]**

b) Explain the different techniques of repairs of RCC column affected during earthquake. **[8]**

◆◆◆

P1059

[3964]-116

B.E. (Civil)
Construction Management
(2003 Course)(Elective - II) (401007) (Sem. - II)

Time : 3 Hours]　　　　　　　　　　　　　　　　　　　*[Max. Marks : 100*

Instructions to the candidates:

　　1)　Answers to the two Sections should be written in separate books.

　　2)　Neat diagrams must be drawn wherever necessary.

　　3)　Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

　　4)　Assume suitable data, if necessary.

　　5)　Q. No. 7 is compulsory.

SECTION - I

Q1) a) Explain the role of construction industry in the economic development of India. **[6]**

　　b) Explain in detail, role of CIDC in construction sector. **[6]**

　　c) In what sense ethics is important for a construction manager? **[6]**

OR

Q2) a) For a successful project, state the importance of coordination between contractor and client. **[6]**

　　b) Explain the authorities associated with a construction manager. **[6]**

　　c) Write a brief note on : Staffing. **[6]**

Q3) a) Explain in brief following inventory techniques **[8]**

　　　i)　HML analysis.

　　　ii)　VED analysis.

　　　iii)　SDE analysis.

　　　iv)　ABC analysis.

　　b) Explain the saw tooth graph of materials on site. Show safety stock, reorder point, lead time and other relevant information on it. **[8]**

OR

Q4) a) Explain in detail Music 3D rule. **[8]**

　　b) Explain role of material manager on site. **[8]**

Q5) a) Explain the importance of feasibility analysis for making decisions. Explain the financial & technical feasibility analysis. **[10]**

b) What is meant by working Capital? State the importance of working capital for construction industry. **[6]**

OR

Q6) a) State the points covered under Environmental impact Assessment for a tunnel site. **[8]**

b) What are the financial sources for raising funds? Explain at least two in brief. **[8]**

SECTION - II

Q7) a) Explain the term "Disaster". What are various disasters occurring usually? Write a brief note on Tsunami that took place in japan recently. **[10]**

b) What are the on site and off site emergency planning for cyclones? **[8]**

Q8) a) What are advantages of training? Describe any one method of training in detail. **[8]**

b) Explain in detail the "Indian Arbitration Act". **[8]**

OR

Q9) a) Design a training programe for fresh site engineers for a segmental bridge Construction project. **[8]**

b) Explain Child Labour act in detail. **[8]**

Q10) a) Explain the guidelines described by CIDC for risk management. **[8]**

b) What are the advantages of using computer as MIS tool? **[8]**

OR

Q11) a) As a material manager, you have to apply MIS on site. Explain in detail, how you can do it with the help of flow chart. (Apply MIS for all the activities of material management). **[10]**

b) Write a detailed note on RAMP handbook. **[6]**

◆◆◆◆

P1060

[3964]-118

B.E. (Civil Engineering)
ADVANCED ENGINEERING GEOLOGY WITH ROCK MECHANICS
(Sem - II) (2003 Course) (Elective - II) (401007)

Time : 3 Hours]   *[Max. Marks : 100*
Instructions to the candidates:
   1) Answer any three questions from each section.
   2) Answer to the two Sections should be written in separate books.
   3) Figures to the right indicate full marks.
   4) Neat diagrams should be drawn wherever necessary.

SECTION - I

Q1) Write notes on :

   a) Field characters of dykes.   **[6]**

   b) Types of Volcanic Breccias   **[4]**

   c) Engineering significance of Precambrian metamorphic rocks occurring in Maharashtra state.   **[8]**

                                    OR

   a) Regional distribution of Deccan trap basalt   **[6]**

   b) Field Characters of basalt flows   **[4]**

   c) Engineering significance of older sedimentary occurring in Maharashtra state.   **[8]**

Q2) a) Tail channel erosion in Ghod and Panshet dam areas.   **[7]**

   b) Treatment to be given to a dyke crossing dam alignment. Give case histories   **[9]**

                                    OR

   a) Origin of Tachylitic Basalt.   **[4]**

   b) Discuss with suitable examples, suitability of Compact and Amygdaloidal Basalt from dam foundation point of view.   **[12]**

Q3) a) Write brief notes on Rock Structure Rating Concept of Wickeham. **[8]**

   b) Explain various physical properties of rock masses.   **[8]**

                                    OR

a) **List only** various methods of geophysical surveys. [3]

b) Write notes on Barton's system of classification of rock masses. [5]

c) Bieniawski's Geomechanical Classification. [8]

SECTION - II

Q4) a) Tunnelling through Amygdaloidal Basalt with suitable examples. [8]

b) The parameters deciding Safe Bearing Capacity (S.B.C.) for bridge foundation. [6]

c) Stand up time of rock mass during tunnelling. [4]

OR

a) Can we locate a bridge partly on dyke and partly on weathered Basalts. [6]

b) Significance of Fractures from tunnelling point of view with suitable examples. [12]

Q5) Write short notes on :

a) Chances of getting ground water along flow contacts. [4]

b) Scarcity of Sand in Deccan trap area. [4]

c) Water bearing characters of Amygdaloidal Basalt. [4]

d) Residual soils of Maharashtra state. [4]

OR

Write short notes on :

a) Multi aquifer system. [4]

b) Water bearing characters of Dykes. [4]

c) Granular disintegration. [4]

d) Influence of climate on Soil formation. [4]

Q6) Write short notes on :

a) Problem with made grounds in cities. [5]

b) Suitability of Deccan trap basalt as a construction material. [7]

c) Active Faults. [4]

OR

Write short notes on :

a) Use of dyke rock as a construction material [4]

b) Will dam building activity cause a major earthquake? Give suitable examples. [7]

c) Faults and their civil engineering significance. [5]

♦♦♦♦

P1061

[3964]-119

B.E. (Civil)

DAMS AND HYDRAULIC STRUCTURES

(2003 Course) (401008) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

    1)   *Answer any three questions from each section.*

    2)   *Answer three questions from section-I and three questions from section-II.*

    3)   *Answers to the two sections should be written in separate books.*

    4)   *Neat diagrams must be drawn wherever necessary.*

    5)   *Figures to the right indicate full marks.*

    6)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

    7)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What factors affect the selection of site for a dam? Discuss them briefly.
[10]

    b) What is a arch dam? Discuss the choice of an arch dam. **[6]**

OR

Q2) a) Explain necessity and methods of strengthening of dams. **[8]**

    b) Write short notes on : **[8]**

       i)   Economic height of a dam.

       ii) Silting of reservoirs.

Q3) Check the stability of a gravity dam for reservoir full condition, considering weight of the dam, water pressure and full triangular uplift pressure.

A gravity dam, 75m height, top width 7.5m, bottom width 55.40m. The face exposed to water has a slope of 1H:10V after a vertical distance of 30m from the top. The freeboard is 3m. The d/s face has a slope of 0.7H; IV after a vertical distance of 13m from top.

Take specific weight of concrete = 24kN/m³.

Coefficient of friction (μ) = 0.7

Shear strength of concrete = 1400kN/m² **[16]**

OR

Q4) a) What are the key levels in the reservoir planning? How are they fixed?**[8]**

b) Explain how do you account for earthquake effects in the design of a gravity dam based on dynamic response approach. **[8]**

Q5) a) What is a spillway? What are the various components of a spillway? Enumerate various types of spillway. Explain various types of syphon spillway, along with its functioning. **[10]**

b) What are earthen dams and under what circumstances are they preferred? List different types of earthen dams and different methods of construction of earthen dams what are the criteria for safe design of earth dams? **[8]**

OR

Q6) a) What are the various causes of failure of earth dam? Explain seepage failure and various methods adopted for controlling seepage through the body of the dam. **[10]**

b) Design a suitable section for the overflow portion of a gravity dam having the d/s face sloping at a slope of 0.8H : lV. Other data is as follows. Design discharge for the spillway = 5000 cumecs.

Maximum reservoir level   = 202 m

River bed level   = 180 m

Effective length of spillway   = 400 m

Determine RL of crest of spillway and design d/s profile. Take coefficient of discharge C = 2.1. **[8]**

SECTION - II

Q7) a) What is a headworks? What are the types of headworks? State their functions. Sketch the layout of a typical diversion headwork. State the factors governing selection of site for diversion headworks. **[10]**

b) A weir on a permeable foundation has a floor of negligible thickness, is 20 m long in the direction of flow. At d/s end, a 5 m deep pile is provided. The effective head of water is 4 m. Calculate exit gradient. If the foundation material is fine sand, check whether the weir is safe against piping. **[6]**

OR

Q8) a) Discuss the main causes of failure of weirs founded on pervious foundation. Explain Bligh's creep theory. **[8]**

b) Explain Khosla's theory of design of weirs on permeable foundation.**[8]**

Q9) a) What is meant by canal lining? What are its advantages? **[8]**

b) Design the channel section for following data :

discharge q = 10 cumec.

Silt factors f = 1.0

Side slope = 0.5 H : 1V **[8]**

OR

Q10) a) $ Draw neat sketches of **[9]**

i) Aqueduct.
ii) Super Passage.
iii) Level Crossing.

b) What are the different ways in which canals can be aligned. Name various types of canals which are required to be constructed in a canal system.**[7]**

Q11) a) What are the different types of hydropower plants? Describe any one with a neat sketch. **[10]**

b) Write short notes on : **[8]**

i) Pitched Island-river training works.
ii) Objectives and methods of river training works.

OR

Q12) a) How do you assess water power potential of a hydro electric scheme.**[9]**

b) Write short note on : **[9]**

Groyne - functions, types, factors which influence choice and design of groynes. Draw neat sketches wherever necessary.

ⵝⵝⵝⵝ

P1063

[3964]-120 A

B.E. (Civil)

FOUNDATION ENGINEERING

(2003 Course) (401010) (Theory) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) *Answers three questions from section-I and three questions from section-II.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Your answers will be valued as whole.*
6) *Use of pocket calculator is allowed.*
7) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain with sketches the terms : **[6]**

   i) Inside clearance.
   ii) Outside clearance.
   iii) Area Ratio.

   Comment upon its usefulness.

   b) State and explain the factors on which the extent of exploration of soil depends. **[6]**

   c) Explain the difference between : **[6]**

   i) SPT Test and DCPT.
   ii) SPT and Static cone penetration test.

OR

Q2) a) Explain in brief : **[6]**

   i) Augur boring.
   ii) Wash boring.
   iii) Percussion boring.

   b) What is N value of standard penetration test? Explain the various corrections to be applied to the observed value of N. **[6]**

   c) What are the factors that affect the sample disturbance? How are these effects minimised? **[6]**

P.T.O.

Q3) a) Define preconsolidation pressure and explain with a sketch how would you determine the same. **[4]**

b) Define the following terms with proper rotations : **[6]**
   i) Coefficient of volume compressibility.
   ii) Coefficient of compressibility.
   iii) Sample thickness and its relation with void ratio.

c) A layer of soft saturated clay, 4m thick, lies under a newly constructed building. The effective pressure due to overlying strater on the clay layer is 300kN/m², and the new construction increases the effictive over-burden by 120kN/m². If the compression index of the clay is 0.45, compute the settlement, assuming the natural water content of the clay layer to be 43%, and the specific gravity of its soil grains as 2.7. **[6]**

OR

Q4) a) With a neat sketch explain laboratory consolidation test and list the various consolidation parameters of soil obtained from test data. **[7]**

b) A saturated clay layer of 5m thickness takes 1.5 years for 50% primary consolidation, when drained on both sides. Its coefficient of volume change (m_v) is 1.5×10^{-3} m²/kN. Determine the coefficient of consolidation (C_v) in m²/yr and the coefficient of permeability (in m/yr). Assume $r_w = 10$kN/m³. **[6]**

c) Define the terms normal consolidation, over consolidation and preconsolidation pressure. **[3]**

Q5) a) What do you know about floating effect in raft foundations? Discuss its applications. **[4]**

b) Explain with sketches effect of submergence of foundation due to rise of water table. **[6]**

c) A circular footing is resting on a shift saturated clay with $q_u = 250$ kN/m². The depth of foundation is 2m. Determine the diameter of the footing if the column load is 600kN. Assume a factor of safety as 2.5. The bulk unit weight of soil is 20kN/m³. **[6]**

OR

Q6) a) Explain Terzaghi's bearing capacity equation with all the terms in it with help of a sketch. **[4]**

b) Explain in brief the plate load test and how the test results are used to find the bearing capacity of soil. **[6]**

c) A square footing, 1.8m × 1.8m, is placed over loose sand of density 16kN/m³ and at a depth of 0.8m. The angle of shearing resistance is 30°. Take N_c = 30.14, N_q = 18.40 and N_r = 15.10. Determine the total load that can be carried by the footing. **[6]**

SECTION - II

Q7) a) Explain classification of piles based on material used, method of construction and mode of transfer of load. **[6]**

b) Explain negative skin friction. Describe the circumstances under which it develops. Write effect of negative skin friction on pile foundation and measures to reduce it. **[6]**

c) A square pile group of 9 piles passes through a recently filled up material of 4.5m depth. The diameter of the pile is 30cm and pile spacing is 90cm center to center. If the unconfined compression strength of the cohesive material is 60kN/m² and unit weight is 15kN/m³, compute the negative skin friction of the pile group. **[6]**

OR

Q8) a) Explain with sketches, various difficulties likely to be faced and the remedial measures to counteract the same during sinking of well foundation. **[6]**

b) Compare with sketches in tabular form open and pneumatic caisson in respect of **[6]**

i) Component parts.
ii) Method of formation.
iii) Use.

c) Write short notes on caisson disease and sand Island method. **[6]**

Q9) a) State and explain five important recommendations for building foundation in Black cotton soil. **[6]**

b) Define : **[4]**

i) Swelling pressure.
ii) Free Swell
iii) Differential free swell and state how would you measure any one of them.

c) State various precautions that you will take during : **[6]**

i) Boring of under ream pile.
ii) During concreting of pile.

OR

Q10) a) Sketch the mode of deflection, distribution of lateral pressure diagrams for various types of sheet piles. **[6]**

b) For cantilever sheet pile, using approximate method work out depth of embedment. **[6]**

c) With examples, explain the application of sheet pile walls. **[4]**

Q11) Write detailed notes on any four of following : **[16]**

a) Types of earthquakes.

b) Liquifaction.

c) Types of Geosynthetics.

d) Geotextile in embankment.

e) Geotextile in drains.

f) Seismic waves.

OR

Q12) a) Explain with diagram five effects of liquifaction on built environment.**[5]**

b) Explain with sketches important functions of geosynthetics. **[5]**

c) Explain with sketches component of nailed soil wall and its construction. **[6]**

☒☒☒☒

P1065

[3964]-122

B.E. (Mech. & M/SW)
DYNAMICS OF MACHINERY
(Sem. - I) (2003 Course) (402042)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Answer 3 questions from Section I and 3 questions from Section II.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Unit - I

Q1) a) Explain the terms - steering, pitching and rolling in a ship. Discuss their gyroscopic effects. **[6]**

b) A disc supported between two bearings on a shaft of negligible weight has a mass of 80 kg and radius of gyration of 300 mm. The distances of the disc from the bearings are 300 mm to the right from the left hand bearing and 450 mm to the left from the right hand bearing. The bearing are supported by thin vertical cords. When the disc rotates at 100 rad/sec in the clockwise direction looking from the left hand bearing, the cord supporting the left handside bearing breaks. Find the angular velocity of procession at the instant the cord is cut and discuss the motion of the disc. **[10]**

OR

Q2) a) Explain the effect of gyroscopic couple on a swinging table fan. **[4]**

b) The rotor of a marine turbine has a moment of inertia of 750 kg.m^2 and rotates at 3000 rpm clockwise when viewed from oft. If the ship pitches with angular simple harmonic motion having a periodic time of 16 seconds and an amplitude of 0.1 radians. Find (i) the maximum angular velocity of the rotor axis. (ii) the maximum value of the gyroscopic couple. (iii) the gyroscopic effect as the bow dips. **[12]**

Unit - II

Q3) a) Differentiate between static and dynamic balancing. Why there is a need of accurate dynamic balancing of high speed machines? **[6]**

b) The axes of a three cylinder air compressor are at 120° to one another and their connecting rods are coupled to a single crank. The length of each connecting rod is 240 mm and the stroke is 160 mm. The reciprocating parts have a mass of 2.4 kg per cylinder. Determine the primary and secondary forces if the engine runs at 2000 rpm. **[10]**

OR

Q4) a) A shaft carries four rotating masses A, B, C and D in this order along its axis. The mass A may be assumed concentrated at a radius of 120 mm, B at 150 mm, C at 140 mm and D at 180 mm. The masses A, C and D are 15 kg, 10 kg and 8 kg respectively. The planes of revolution of A and B are 150 mm apart and of B and C are 180 mm apart. The angle between A and C is 90°. If the shaft is in complete dynamic balance determine.

i) the angles between the radii of A, B and D.
ii) the distances between the planes of revolution of C and D and
iii) the mass B. **[12]**

b) Explain partially primary balancing in a reciprocating engine. **[4]**

Unit - III

Q5) a) A semi-circular disc of radius r and mass m is pivoted freely about its center. Find the natural frequency. **[8]**

b) The mass of a spring-mass-dashpot system is given an initial velocity (from the equilibrium position) of $A\omega_n$ where ω_n is the undamped natural frequency of the system. Find the equation of motion for the system, for the cases when

i) $\xi = 2$
ii) $\xi = 1$.

Plot displacement - time graphs for the two cases. **[10]**

OR

Q6) a) What is logarithmic decrement. Derive the relation for same. **[8]**

b) Define the following terms : **[2]**

i) Free vibrations
ii) Forced vibrations
iii) Natural frequency
iv) Damping.

c) A horizontal spring mass system with coulomb damping has a mass of 5 kg attached to a spring of stiffness 980 N/m. If the coefficient of friction is 0.25, calculate **[8]**
   i)   the frequency of free oscillations.
   ii) the no. of cycles corresponding to 50% reduction in amplitude if the initial amplitude is 5 cm and
   iii) the time taken to achieve this 50% reduction.

SECTION - II

Unit - IV

Q7) a) The body of a 600 kg vehicle is connected to the wheels through a suspension system that is modeled as a spring of stiffness 5×10^5 N/m parallel with a viscous damper of damping coefficient 3000 N-sec/m. The wheels are assumed to be rigid and follow the road contour which is approximated as a sine wave of amplitude 0.01 meter and a wavelength of 20 meters. If the vehicle travels at a constant speed of 60 km/hr, what is the amplitude of the vehicle? What is the critical speed of the vehicle? **[12]**

b) Write the equation of motion for forced vibrations of a spring-mass-dashpot system with the forcing function to be $F_0 \sin\omega t$. (Use standard notations). Draw the force polygon representing the different forces in the equation for the following cases: (i) $\omega \ll \omega_n$ (ii) $\omega = \omega_n$ (iii) $\omega \gg \omega_n$ and show the phase lag between the forcing function and the displacement vector. **[4]**

c) What is zero frequency deflection? **[2]**

OR

Q8) a) A single cylinder vertical petrol engine of total mass 400 kg is mounted upon a steel chassis frame and causes a vertical static deflection of 4 mm. The reciprocating parts of the engine have a mass of 20 kg and move through a vertical stroke of 150 mm with approximately an SHM. A dashpot is provided with damping resistance of 1600 N-sec/m. Determine :
   i)   The speed of the driving shaft at which the resonance will occur and
   ii) The amplitude of steady state vibrations when the driving shaft of the engine rotates at 800 rpm. **[10]**

b) Write the equation for motion transmissibility. Draw the graph of transmissibility Vs frequency ratio (to show its nature) for

    i)   an undamped system
    ii)   for damping ratio 0.2 and
    iii) for damping ratio 0.6. **[4]**

c) What is the magnification factor in the following cases?

    i)   Forced damped vibrations with a sinusoidal excitation force $F_0 \sin\omega t$.
    ii)   Forced damped vibrations with excitation force created due to a rotating unbalance $m_0 e \omega^2$. **[4]**

Unit - V

Q9) a) Two rotors A and B are attached to the ends of a shaft 500 mm long. The mass of the rotor A is 30.58 kg and its radius of gyration is 300 mm. The corresponding values for rotor B are 50.96 kg and 450 mm respectively. The shaft is 70 mm diameter for the first 250 mm, 120 mm diameter for the next 100 mm length and 100 mm diameter for the remaining length. Modulus of rigidity of the shaft material is 0.8×10^5 MPa. Find the position of the node and the frequency of the torsional vibrations. **[12]**

b) Define degrees of freedom of a vibrating system. Give two examples of a two degree freedom system. **[4]**

OR

Q10) a) Two pendulums with lengths l_1 and l_2 with attached masses m_1 and m_2 are joined by a spring of stiffness k, and are suspended as shown in the fig. no. - 1. Assuming that the rods and spring do not have any mass and that the rods are stiff, find the natural frequencies and mode shapes of vibration for the system. **[14]**
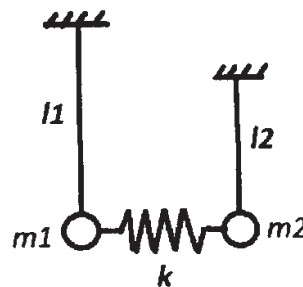
fig no - 1
Q no - (10 a)

b) What is the physical significance of the node in a two rotor system? **[2]**

Unit - VI

Q11) a) Write a short note on FFT analyzer. **[6]**

b) Give two points of comparison between a vibrometer and an accelerometer. **[4]**

c) An undamped seismic instrument is used to find the magnitude of vibration of a machine tool structure. It gives a reading of relative displacement of 0.8 μm. The natural frequency of the instrument is 5 Hz. The machine tool structure is subjected to an excitation at a frequency of 2 Hz. Find the magnitude of the acceleration of the vibrating machine tool structure. **[6]**

OR

Q12) a) A rotor has a mass of 10 kg and is mounted midway on a 20 mm diameter horizontal shaft supported at its ends by two ball bearings. The bearings are one meter apart. The shaft rotates at 2000 rpm. If the center of mass of rotor is 0.02 mm away from the geometric axis of the rotor due to certain manufacturing defect, find the amplitude of the steady state vibration and the dynamic force transmitted to the bearing. Also calculate the maximum bending stress in the shaft (Assume E = 200 GPa for shaft material). **[12]**

b) Explain the importance of critical speed of shafts. **[4]**

✳ ✳ ✳

P1066

[3964] - 123
B.E. (Mechanical)
MECHATRONICS
(2003 Course) (402043) (Sem. - I)

Time : 3 Hours]   *[Max. Marks:100*
Instructions to the candidates:

    1)   *All questions are compulsory.*

    2)   *Answers to the two sections should be written in separate answer books.*

    3)   *Neat diagrams must be drawn at appropriate places.*

    4)   *Use of electronic pocket calculator is allowed.*

    5)   *Assume suitable data, if required.*

SECTION - I

Q1) a) Explain the scope of Mechatronics with the help of suitable examples.**[8]**

    b) Discuss the advantages of mechatronics system over the other type of systems. **[8]**

OR

Q2) a) Compare the different types of flow measuring devices. **[8]**

    b) Explain the following term in relation with measuring devices. **[8]**

        i) Sensitivity

        ii) Hysterisis

        iii) Threshold

        iv) Stability

Q3) a) Discuss the characteristics curve of LVDT. Also state its various applications. **[8]**

    b) Derive for strain gauge factor. (G). **[8]**

OR

Q4) a) State various methods for temperature compensation in strain gauges. Explain any one in detail. **[8]**

b) Compare RTD with thermocouples. State their different areas of application. **[8]**

Q5) a) Explain the significance of mathematical modelling of systems. **[6]**

b) Construct a methematical model for a system : thermometer kept in hot liquid. **[6]**

c) Discuss basic building blocks of electrical system. **[6]**

OR

Q6) a) Explain the importance of Transfer function. **[6]**

b) Write a note on fluid system. **[6]**

c) Explain feed forward control system with the help of suitable example. **[6]**

SECTION - II

Q7) a) Write a short note on PID controllor. **[6]**

b) What do you mean by stability of system? **[6]**

c) Discuss ON-OFF control action. **[4]**

OR

Q8) a) Explain the working principle of proximity switches. State their applications. **[6]**

b) Discuss the dynamic response of first order system to step input. **[6]**

c) Explain in brief 'Bode Plots'. **[4]**

Q9) a) Discuss the specifications of Op-Amp. **[8]**

b) Derive for the output for an op-amp as integrator. **[8]**

OR

Q10) a) Explain the use of timing diagram. Draw the same for decade counter. **[8]**

b) State various types of A/D converters. Explain any one in detail. **[8]**

Q11) a) Draw block diagram of PLC. Explain the function of each block in detail. **[10]**

b) Explain the methods used for Input-output processing by PLC. **[8]**

OR

Q12) a) Explain the use of counters & timers in PLC. **[6]**

b) Write a short note on ladder diagram in PLCs. **[6]**

c) Discuss Microcontrollers with their application. **[6]**

✪✩✪✩

P1071

[3964]-133

B.E. (Mechanical)

INDUSTRIAL FLUID POWER

(2003 Course) (402049) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) *Answer three questions from each section.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of electronic pocket calculator is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Discuss petroleum based and fire resistant fluids. **[6]**

   b) Differentiate static and dynamic seals. Sketch any four types of dynamic seals and explain their applications. **[6]**

   c) Compare characteristics of hydraulic and pneumatic systems with mechanical systems. **[6]**

OR

Q2) a) Explain types of contamination. How contamination can be avoided in hydraulic system. **[6]**

   b) State types of filters and where they are located in hydraulic system. **[6]**

   c) Explain with a sketch quick connecting and disconnecting type of coupling used in hydraulic system. **[6]**

Q3) a) Sketch an unbalanced vane pump and explain its working. Why the pump is called unbalanced? **[6]**

   b) What are the functions of different parts of a typical reservoir assembly? **[6]**

   c) Name the important considerations when selecting a pump for a particular fluid power application. **[4]**

OR

Q4) a) Explain with sketches spring loaded and gas charged accumulators. Explain their advantages and disadvantages. **[8]**

b) A positive displacement pump has geometric displacement of 81.95cm³. It delivers 75.84 lpm of oil, while operating at 1000rpm at a pressure of 6.9MPa. The input torque of the prime mover is 101.25Nm. Determine :

   i) Overall efficiency of the pump.

   ii) Theoretical torque required to operate the pump. **[8]**

Q5) a) Explain in detail the different methods to actuate direction control valves. **[8]**

b) Compare meter-in, meter-out and bleed-off flow controlling methods used in hydraulic system. **[8]**

OR

Q6) a) How does an unloading valve differ from a sequence valve in mechanical construction. **[8]**

b) Explain with a neat sketch the working of a pressure compensated flow control valve. **[8]**

SECTION - II

Q7) a) What are different mountings of a cylinder? **[6]**

b) A mass of 2000kg is to be accelerated horizontally upto velocity '1'm/s from rest over a distance of 50mm. The co-efficient of friction between the load and guide is 0.16. Calculate the bore of the cylinder required to accelerate the load if the maximum allowable pressure at the full bore end is 100 bars. Assume the back pressure at the anular end of the cylinder as zero and seal friction to be equivalent to a pressure drop of 5 bars. Explain how acceleration is there. **[10]**

OR

Q8) a) Explain with a suitable circuit the use of a dual pump in a press operation. **[8]**

b) Draw a regenerative circuit used in a hydraulic system. Discuss.

   i) When the speed of the extension stroke will be equal to the retraction stroke of the cylinder.

   ii) When the speed of the extension stroke will be greater than the retraction stroke of the cylinder. **[8]**

Q9) a) What is the selection criteria of compressor used in pneumatic systems. **[4]**

b) Why is pneumatic control system termed as low cost automation. **[6]**

c) Draw a neat sketch of a 'Regulator' used in pneumatic system. Explain its working and purpose in the system. **[6]**

OR

Q10) a) Explain with a sketch a typical air motor. Explain its application in pneumatic system. **[6]**

b) Analyze the circuit shown in Fig.1 **[10]**

Fig No 1
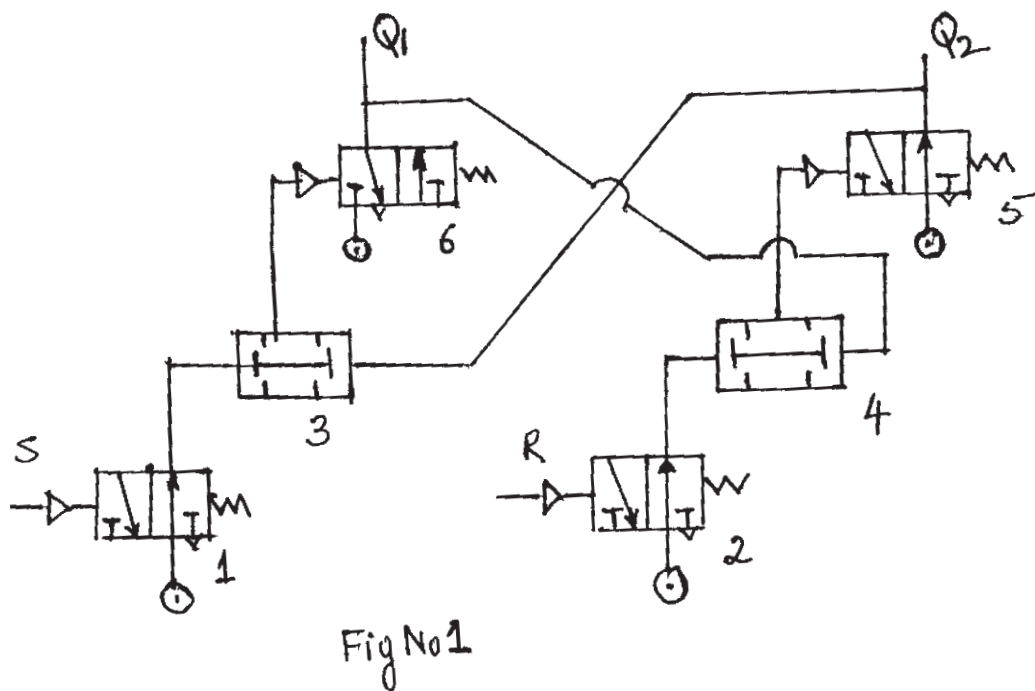
Q11) a) Explain Travel step diagram used in pneumatic system with an example. **[6]**

b) Sequential operations of two pneumatic cylinders are required as follows : **[12]**

i) Cylinder 'A' extends.
ii) Cylinder 'B' extends.
iii) Cylinder 'B' retracts.
iv) Cylinder 'A' retracts.

Develop a pneumatic circuit using starting valve, pilot operated 4/2 direction control valve and cam/roller operated valves to maintain the above sequence. Do not use solenoid-operated valves.

OR

Q12) a) Explain the importance of specification and performance curves of fluid power components. **[6]**

b) Draw a circuit for the following condition. **[12]**

The piston rod of a cylinder 'A' is to advance only if a workpiece is inserted in the workpiece retainer, a guard has been lowered and operator presses the push button valve. Upon the release of the push button or if the guard is no longer in the lower position, the cylinder 'A' is to retract to the initial position.

☒☒☒☒

P1072

[3964]-137

B.E. (Mechanical Engineering)
RAPID PROTOTYPING
(402050) (2003 Course) (Elective - II) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*
Instructions to the candidates:
1) *Solve any 3 questions from each Section.*
2) *Answers to the two Sections should be written in the separate answer books.*
3) *Figures to the right indicate full marks.*
4) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Define "model". Explain various types of model classes.   **[6]**

b) What is concurrent Engineering. Explain the principle of concurrent Engineering.   **[4]**

c) Explain benefits of RP to :   **[6]**
   i) Product Designer.
   ii) Tool Designer and Manufacturing Engineer.
   iii) Marketeer.

Q2) a) Define and explain the following terms.   **[6]**
   i) RP
   ii) RT
   iii) RM

b) Explain classical steps in product development according to VDI.   **[6]**

c) What are the basic requirements of CAD systems for RP?   **[4]**

Q3) a) Explain SLS (3D systems | DTM) w.r.t.   **[6]**
   i) Principle of layer generation.
   ii) Materials used.
   iii) Data format & operating software.
   iv) Post processing.
   v) Follow up process.
   vi) Range of applications.

b) Explain the principle of layer generation of stereolithography machine by objet - polyjet. With a neat sketch.   **[6]**

c) Compare FDM(stratasys) with MJM (3D systems).   **[4]**

P.T.O.

Q4) a) Explain the following terms in SLA **[6]**

    i) Starweave.

    ii) Quick cast.

    iii) Border, Hatch, Skin.

  b) Explain data flow in RP with a detailed flow chart. **[6]**

  c) Compare STL file format with SLC file format. **[4]**

Q5) Write short notes (Any 3): **[18]**

  a) LOM

  b) RP and CNC

  c) Processes for projecting geometric layer information on layer.

  d) Neutral interfaces.

  e) RPS (Z - corporation).

SECTION - II

Q6) a) Explain "Applications - RP materials" relationship. **[4]**

  b) Explain applications of RP parts in design. **[6]**

  c) Explain use of RP parts made by SL process in production tooling. **[6]**

Q7) a) Explain vacuum casting process using soft silicon rubber mold with neat sketch. **[8]**

  b) Explain importance of RP in biomedical & tissue engineering. **[8]**

Q8) a) Suggest and justify the most suitable RP technology for the following parts. **[8]**

    i) Air inlet housing of Air craft engine.

    ii) Pendant (jewellery).

    iii) Dinner plate (Tablewave).

    iv) Building model for demonstration.

  b) Explain laser Generation process with neat sketch & also its applications. **[8]**

Q9) a) Explain with a flow chart, the economic analysis for the use of RP. **[8]**

b) Explain the trends in **[8]**

    i) RP materials.

    ii) RP processes.

Q10) Write short notes (Any 3): **[18]**

    a) Metal sprying in RP.

    b) DSPC - soligen.

    c) Operative aspects in RP.

    d) Photo polymerization in SL.

    e) Tylored Implants.

◆◆◆

P1073

[3964]-139

B.E. (Mechanical)

AUTOMOBILE ENGINEERING

(402050) (2003 Course) (Elective - II) (Sem. - II)

Time : 3 Hours] [*Max. Marks : 100*

Instructions to the candidates:

1) *Answer 3 questions from Section I and 3 questions from Section II.*
2) *Answers to the two Sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) How does all wheel drive help in a cross country performance of a vehicle? Explain the requirement of third differential in a four wheeled all wheel drive vehicle. **[10]**

b) Explain characteristics and advantages of diaphragm spring over the coil springs for application in the automobile clutch. **[8]**

OR

Q2) a) Draw a neat simple sketch of an automobile indicating major components of it and explain the main functions of each. **[10]**

b) What are the requirements of clutch? Explain the basic principle of the friction type clutch with neat sketch and evolve the factors which affect the torque transmitted by a clutch. **[8]**

Q3) a) Explain with neat sketch working of epicyclic gear box. **[8]**

b) Discuss the necessity of gear box in automobile. **[8]**

OR

Q4) a) Explain the automotive overdrive system in transmission. **[6]**

b) Find power of fiat car of mass 12 kN including four passengers and lauggage. Engine is running in top gear at 5000 rpm, size of wheel tyre is 0.5 m, crown wheel pinion ratio is 4.3 and frontal area of body is 2.2 m². Take coefficient of rolling friction and air resistance as 0.014 and 0.045 N/m² kmph² respectively. **[10]**

Q5) a) List the components of a automobile suspension system and explain the function of each one. **[8]**

b) Describe the construction and working of shock absorber with the help of neat sketches. **[8]**

OR

Q6) a) Explain the independent front suspension arrangement with the help of a neat sketch. **[8]**

b) Discuss advantages and disadvantages of hydrogas type of suspension unit over conventional type of suspension. **[8]**

SECTION - II

Q7) a) Explain effect of the following as the directional stability of the vehicle. **[10]**

    i) Camber angle.

    ii) Caster angle.

    iii) Scrub radius.

    iv) Toe in.

b) Compare crossply, radial ply and tube less tyres. **[6]**

OR

Q8) a) What are the requirements of a good steering system? What do you understand by terms: over steer, under steer, cornering power and slip angle. **[10]**

b) Discuss the importance of wheel balancing. **[6]**

Q9) Write short note on any three of the following: **[18]**

a) Hotchkiss drive.

b) Differential assembly and function

c) Final drive.

d) Torque tube drive.

OR

Q10) a) What is rear axle? What are its different types? Sketch and explain any one in detail. **[9]**

b) Discuss the importance of slip joint and universal joint in propeller shaft of automobile. **[9]**

Q11) a) How does 'Folo - Thru' Bendix drive differ in construction and operation from the standard Bendix drive. **[8]**

b) Discuss the vacuum servo - assisted braking system with the help of a neat sketch. **[8]**

OR

Q12) Write short note on: **[16]**

a) Preventive and break down maintenance.

b) Trouble shooting of steering system.

c) Hand brake.

d) Latest trends in automobile safety.

◆◆◆◆

P1075

[3964] - 143
B.E. (Mech. S/W)
REFRIGERATION AND AIR CONDITIONING
(2003 Course) (Sem. - I) (402063) (Elective - I)

Time : 3 Hours] [*Max. Marks : 100*

Instructions to the candidates:

1) Answers three questions from Section - I and three questions from Section - II.
2) Answers to the two sections should be written in separate books.
3) Neat diagrams must be drawn wherever necessary.
4) Figures to the right indicate full marks.
5) Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and   steam tables is allowed.
6) Assume suitable data, if necessary.

SECTION - I
Unit - I

Q1) a) Define 'one tonne refrigeration'. **[3]**

b) Write a note on 'steam jet refrigeration'. **[6]**

c) Derive an expression for cop of Bell-colemn cycle. **[7]**

OR

Q2) a) Explain 'Simple Air Cooling System' with a neat sketch and T-S diagram. **[8]**

b) A boot strap air refrigeration system is used for an aeroplane to take 10 tonnes of refrigeration load. The ambient air conditions are 15°C and 0.9 bar. This air is rammed isentropically to a pressure of 1.1 bar. the pressure of air bled off the main compressor is 3.5 bar and this is further compressed in secondary compressor to a pressure of 4.5 bar. The isentropic efficiency of both compressors is 90% and that of cooling turbine is 85%. The effectiveness of both the heat exchangers is 0.6. If the cabin is to be maintained at 25°C and the pressure in the cabin is 1 bar, **[8]**

Find :

i) Mass of air passing through the cabin in kg/hr.

ii) Power required for the refrigeration system. and

iii) COP of the system.

Take $\gamma = 1.4$ and $C_p = 1$ kJ/kg K.

Unit - II

Q3) a) Discuss the effect of operating parameters on performance of VCR cycle. **[8]**

b) An ice plant produces 30 tons of ice at 0°C per day from water at 0°C. The condensation and evaporation takes place at 20°C and –20°C. respectively. Assume simple saturation cycle and Cp at vapour = 1.1 kJ/kg K. Determine : **[8]**

i) Rate of circulation of refrigerant in kg/s.

ii) Theoretical COP and

iii) Compressor work if actual COP is 80% of the theoretical

Take latent heat of fusion of ice = 335 kJ/kg.

Use following properties of refrigerant

Saturation temperature °C	hf kJ/kg	hg kJ/kg	sf kJ/kgK	sg kJ/kgK
20	275.0	1462	1.043	5.094
–20	89.6	1419	0.368	5.623

OR

Q4) a) How refrigerants are classified? **[4]**

b) Explain GWP, ODP, TEWI. **[6]**

c) Write a note on c desirable properties of refrigerants. **[6]**

Unit - III

Q5) a) Explain Electrolux refrigeration system with a neat sketch. **[6]**

b) What are the different methods used for intercooling the refrigerant vapours in multistage compression? **[4]**

c) In a refrigerant 22 system, the capacity is 150 kW at a temperature of –30°C. The vapour from the evaporator is compressed to condensor pressure using a two stage compression with intercooling at 5 bar. The condensor pressure is 15 bar. Calculate the power required by the system and cop. Also find the cop and power required if single stage compression is used. **[8]**

OR

Q6) a) Compare : VAR and VCR. **[5]**

b) Explain cascade system with a neat sketch and p-h diagram. **[7]**

c) In an absorption plant if the temperature of generator, evaporator and absorber are 110°C, –10°C and 35°C respectively calculate the maximum possible cop of the plant. **[6]**
Calculate the percentage change in cop in the following two cases occuring independently.
  i) Generator temperature increases by 30°C.
  ii) Evaporator temperature rises by 10°C.

SECTION - II
Unit - IV

Q7) a) Define the following terms : **[8]**
  i) DBT,   ii) WBT,
  iii) DPT,   iv) Specific humidity
  v) Degree of saturation,   vi) Relative Humidity,
  vii) Bypass factor of coil and viii) Psychrometry.

b) Two kg of air at 40°C DBT and 50% RH is mixed with 3 kg of air at 20°C DBT and 100% RH. Calculate the resultant condition of the air after mixing. **[8]**

OR

Q8) a) Write a short note on 'Thermodynamics of human body'. What is effective temperature? **[8]**

b) Explain the factors that affect human comfort. Show comfort zone on the hand drawn psychrometric chart. **[8]**

Unit - V

Q9) a) Differentiate clearly between unitary and central air conditioning system. **[6]**

b) An air conditioned room is maintained at 21°C DBT and 50% RH. It has a sensible heat and latent heat gain of 125610 kJ/hr and 31402 kJ/hr. Respectively. The characteristics of the cooling coil is such that the chilled air leaves the coil at 80% RH. One third of the total chilled air supplied to the room is fresh air taken in and is mixed with the return air before the cooling coil. If the DBT and WBT of fresh air taken in are 32°C and 27°C respectively, find : **[10]**
  i) DBT of chilled air,
  ii) Quantity of chilled air passing per minute and
  iii) Capacity of refrigerating machine.

<div align="center">OR</div>

*Q10)*a) What different types of evaporators are used in refrigeration systems? Explain with neat sketches. **[9]**

b) Explain with neat sketch the working of thermostatic expansion value. Where it is used? **[7]**

<div align="center">

Unit - VI

</div>

*Q11)*a) What different methods are used for determining the duct sizes? mention the advantages of each. **[6]**

b) Find the sizes of various circular in the system as shown in fig(3). Determine the power required to drive the blower. The velocity in AB should not exceed 420 m/min. Use equal friction loss method. **[12]**
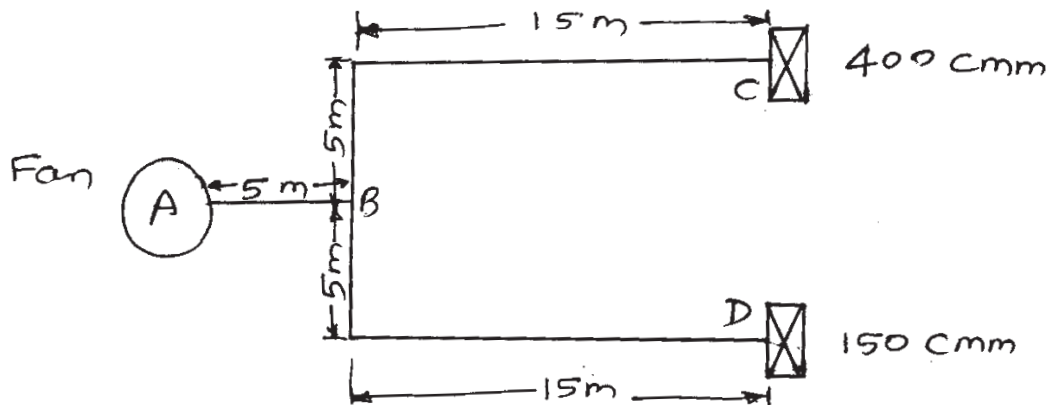
Fig.(3)   Q. 11 (b)

<div align="center">OR</div>

*Q12)*a) Explain few applications of low temperature refrigeration. **[6]**

b) Explain with a neat sketch linde system for liquification of air. **[6]**

c) What are the difficulties experienced in the production of low temperatures with the single or multistage vapour compression refrigeration systems? **[6]**
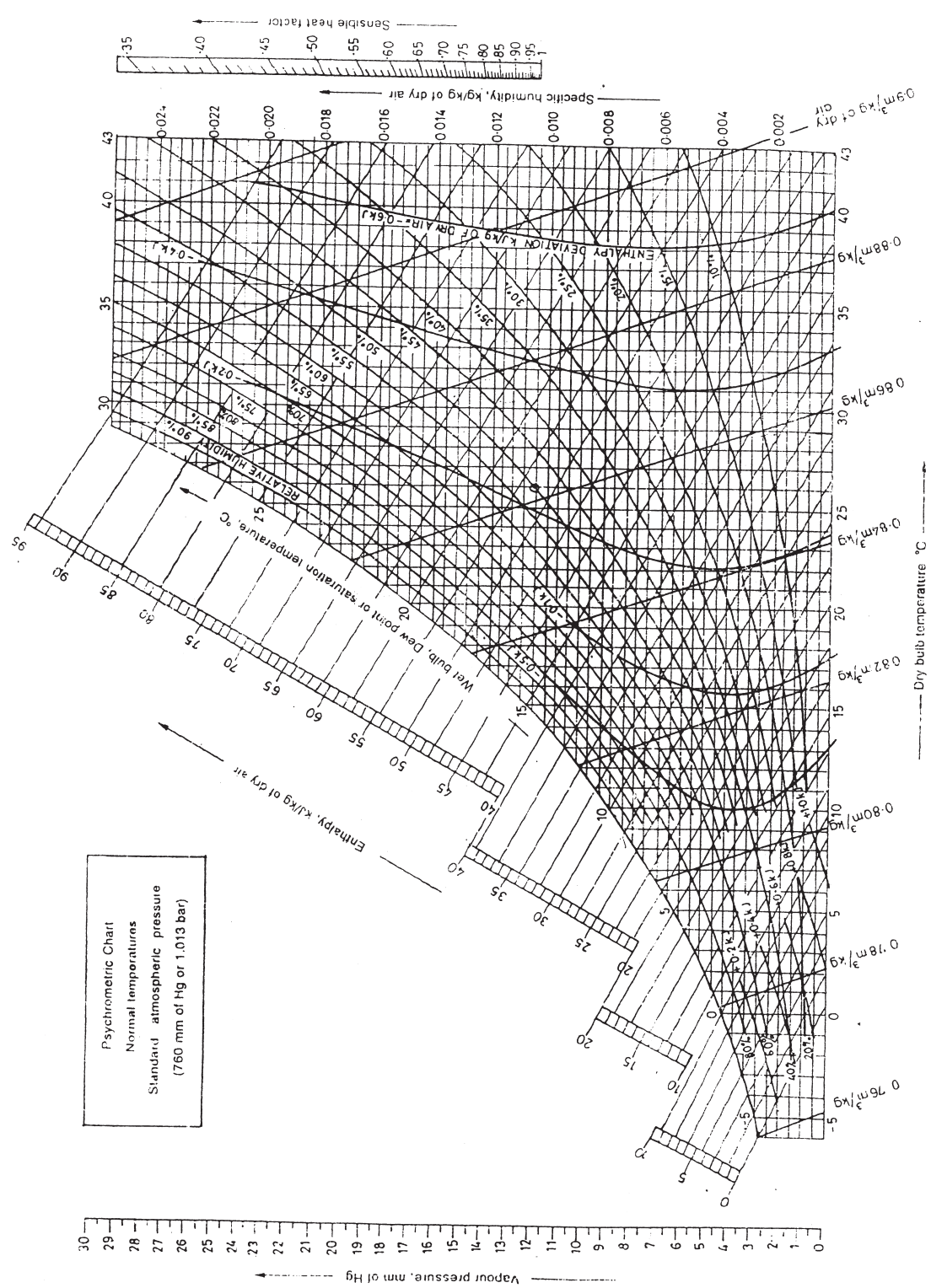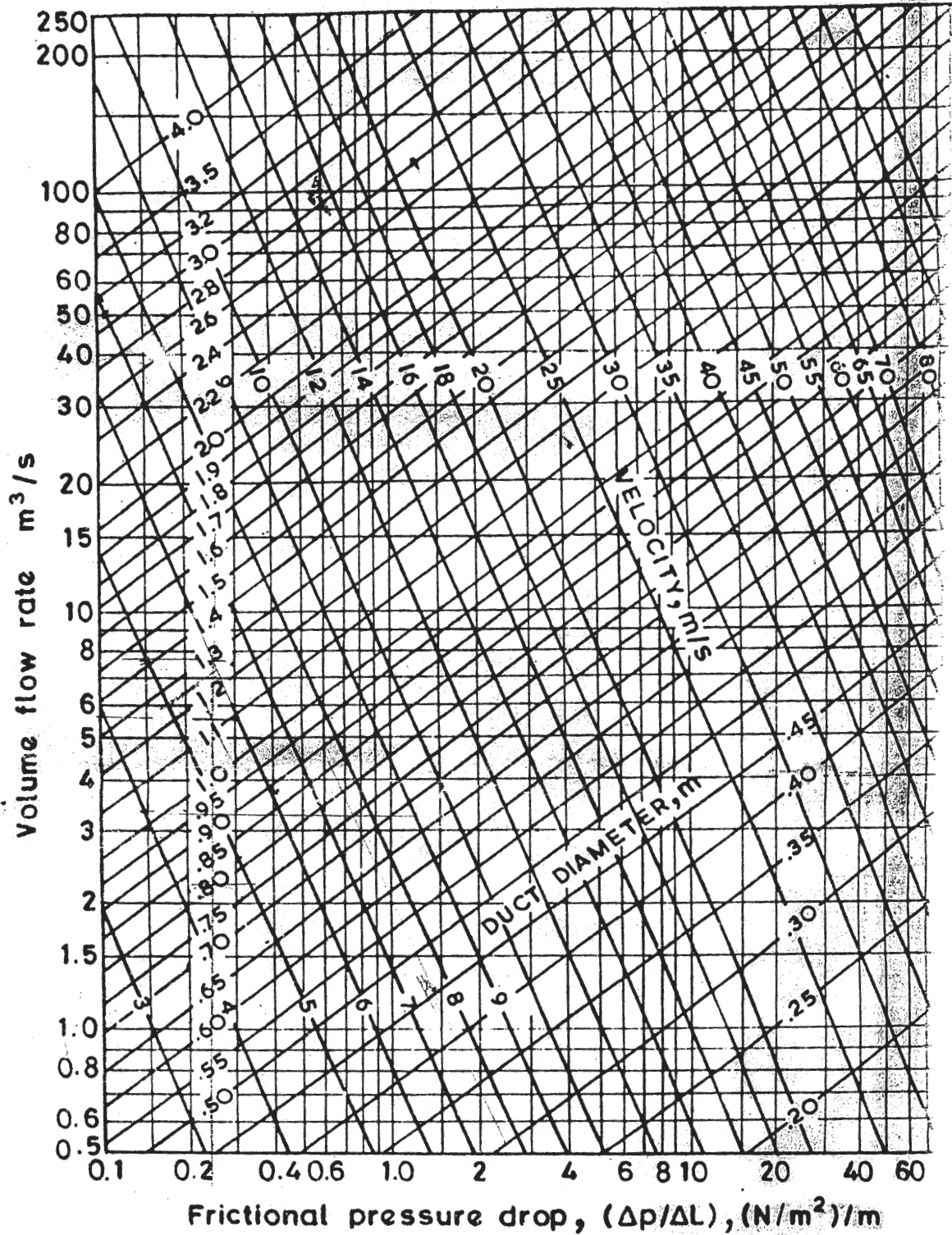
Chart II

p-h chart

Refrigerant R- 22

p-h chart for refrigerant R-22

Specific enthalpy kJ/kg

Absolute pressure (P) bar

Fig.(1) Q.5(c)

Fig. (?)' ق. ٩ (٩)
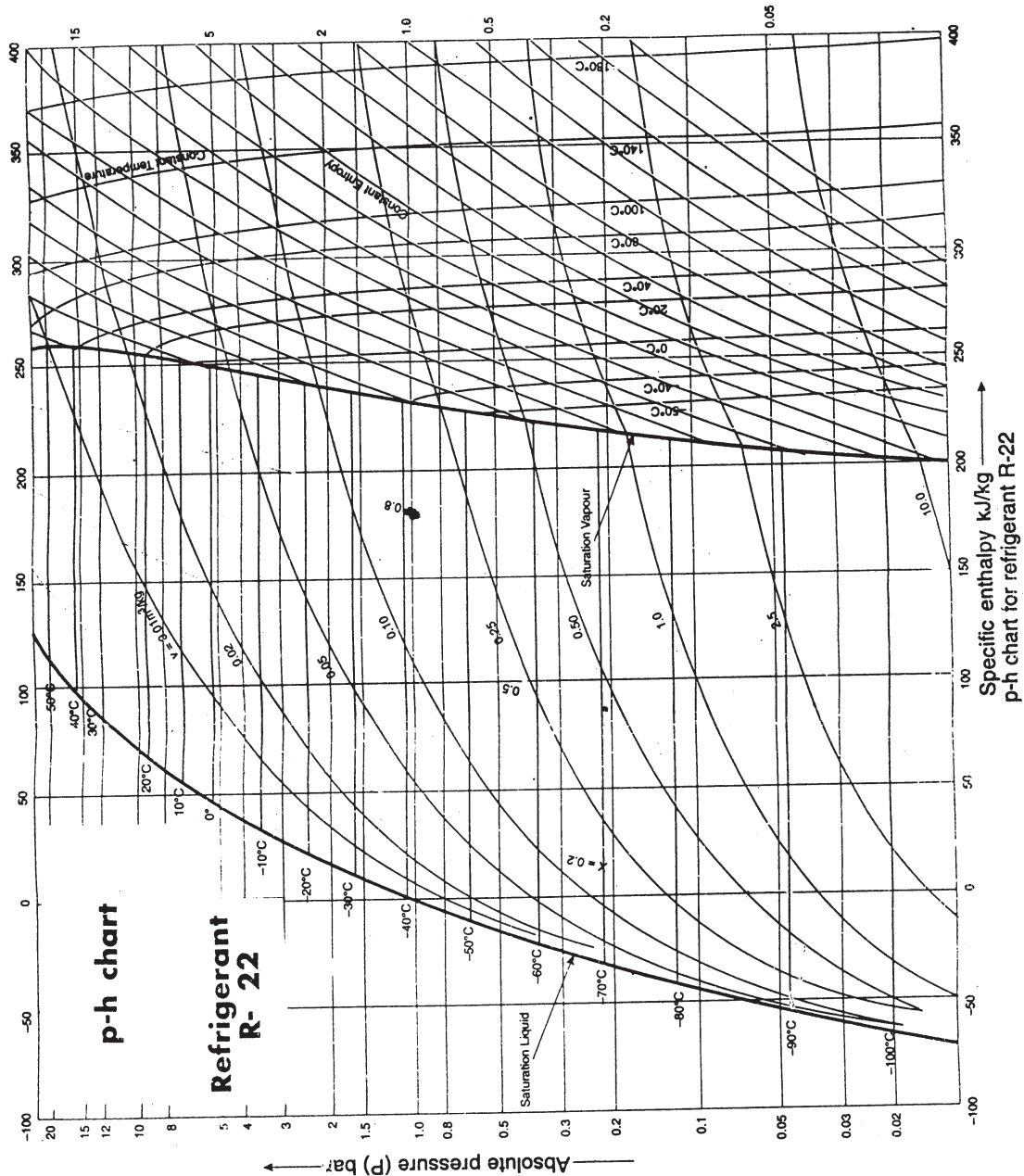
Duct friction chart for high volume flow rate

Fig. C4   9. 11 (b)

❖❖❖❖

P1076

[3964] - 146

B.E. (Mech. S/W)

AUTOMOBILE ENGINEERING

(2003 Course) (Elective - I) (402063) (Sem. - I)

Time : 3 Hours] [*Max. Marks : 100*

Instructions to the candidates:

1) *Answer three questions from Section - I and three questions from Section - II.*

2) *Answers to the two sections should be written in separate books.*

3) *Neat diagrams must be drawn wherever necessary.*

4) *Figures to the right indicate full marks.*

5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Compare the merits and demerits of the frameless construction with those of the conventional framed construction chassis. **[6]**

b) Explain with sketch the following layouts **[10]**

i) Four wheel drive.

ii) Rear engine and rear wheel drive.

What are the advantages and disadvantages of above layouts.

OR

Q2) a) Discuss hydraulic operated clutch in detail with sketch. **[8]**

b) What are the essential properties required of a clutch facing material?**[4]**

c) Compare dry and wet types of friction clutches. **[4]**

Q3) a) Discuss with sketch the construction and working of constant mesh gear box. **[8]**

b) Discuss the difference between fluid coupling and torque convertor with sketch. **[8]**

OR

Q4) a) A passenger car travelling at 80.45 km/hr is accelerated up a gradient of 1 in 20. The gross vehicle weight is 11026.4N. It has a frontal area of 1.858 sq.mtr. and the air resistance coefficient may be assumed as 0.0167. The rolling resistance is 221.7N. At the above speed, the engine develops 58.88 kW corresponding to an engine speed of 4000 RPM. Rear axle ratio is 5 :1, transmission efficiency = 95%. **[12]**
Calculate :
i) The total tractive resistance.
ii) The tractive effort available at the wheels.
iii) The acceleration while ascending the above gradient.

b) Explain the following terms : **[4]**
i) Tractive effort.
ii) Draw bar pull.

Q5) a) Explain in detail the function and construction of a leaf spring with neat sketch. **[8]**

b) Draw a schematic diagram showing the layout of air suspension system and explain its working with advantages / disadvantages. **[10]**

OR

Q6) Write short notes on any three : **[18]**
a) Lubrication of gear box.
b) Preventive maintenance and breakdown maintenance in automobiles.
c) Torsion bar.
d) Helper spring.
e) Shock absorber.

SECTION - II

Q7) a) Define camber angle, what is the function of camber in a vehicle? Explain. **[6]**

b) Discuss the various tyre troubles, likely to be encountered during running of the vehicle, their causes and remedies. **[6]**

c) Explain requirement of wheel alignment in automobiles. **[4]**

OR

Q8) a) With suitable sketch briefly explain the different types of wheel rims used in automobiles. **[6]**

b) Explain the following : **[6]**

   i) Tilting steering wheel.

   ii) Collapsible steering column.

c) List out common steering troubles, their possible causes and remedies.**[4]**

Q9) a) Differentiate between the cross type and ball and trunnion type universal joints. **[6]**

b) Give the principal and working of differential. **[6]**

c) What are double reduction axle? Why it is used in automobiles? Explain in brief. **[4]**

OR

*Q10)*a) How can the gear ratio of a final drive be determined? **[6]**

b) Explain briefly the construction of the propeller shaft. **[6]**

c) What is constant velocity joint used in automobiles? Explain. **[4]**

*Q11)*a) Describe with neat sketch, the working of floating piston type disc brake. State advantages & disadvantages of it. **[6]**

b) Describe the principle of electronic ignition system with neat sketch.**[6]**

c) Explain with neat sketch charging system used in automobiles. **[6]**

OR

*Q12)*Write short note on the following (any three) : **[18]**

a) Spark plug.

b) Anti-skid braking system.

c) Fault diagnosis of ignition system.

d) Distributor unit.

e) Servo-braking system.

❖ ❖ ❖ ❖

P1077

[3964] - 147

B.E. (Mech. S/W)

COMPUTATIONAL FLUID DYNAMICS

(2003 Course) (Elective - I) (402063) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

 1) *Attempt all questions.*
 2) *Choice is indicated between questions.*
 3) *Marks are indicated on the right side.*
 4) *All questions carry equal marks.*
 5) *Use of calculator allowed.*
 6) *Draw neat sketches wherever necessary.*
 7) *Any missing data may suitable be assumed.*

Q1) a) For a moving fluid element, develop an expression for the substantial derivative of velocity and explain its physical meaning. **[8]**

 b) For a moving viscous fluid element of the shape of a rectangular parallelpiped of size dx × dy × dz sketch all the types of forces acting for the x direction only and write down the x direction force balance, naming the different forces. **[12]**

OR

Q2) a) For a control volume moving with the fluid develop an expression for the divergence of the velocity and explain its physical meaning. **[8]**

 b) Derive the continuity equation in differential conservative form for a 3-D, unsteady, compressible flow. **[12]**

Q3) a) What types of fluid flows are governed by the partial differential equations of the following types? **[8]**

 i)   Hyperbolic.

 ii) Parabolic and

 iii) Elliptic.

 Give practical examples.

P.T.O.

b) Classify the following equations according to whether they are hyperbolic, parabolic and elliptic. Physically what phenomenon is associated with these equations? The rotations have usual meaning. **[12]**

i) $\dfrac{\partial T}{\partial t} = \alpha \dfrac{\partial^2 T}{\partial x^2}$.

ii) $\dfrac{\partial^2 \phi}{\partial x^2} + \dfrac{\partial^2 \phi}{\partial y^2} = 0$.

iii) $\dfrac{\partial u}{\partial t} + c \dfrac{\partial u}{\partial x} = 0$

OR

Q4) a) Differentiate clearly between explicit and implicit approaches used in numerical methods, their relative merits and demerits. **[6]**

b) Express the equation : **[14]**

$\dfrac{\partial T}{\partial t} = \alpha \dfrac{\partial^2 T}{\partial x^2}$ in

i) Explicit form of difference equation.

ii) Crank-Nicolson form of difference equation write down the necessary steps involved.

Q5) a) Explain : **[4]**

i) Discretization error.

ii) Round off error.

b) Explain : **[6]**

i) Courant number.

ii) CFL Criterion for stability.

c) For a one dimensional unsteady conduction equation, for stability, show that $\alpha \dfrac{\Delta t}{(\Delta x)^2} \leq \dfrac{1}{2}$, with the usual notation. **[10]**

OR

Q6) a) Illustrate the MacCormack Technique to get the value of density at a grid point at a time step t + Δt for inviscid unsteady flow. **[10]**

b) Explain briefly : **[10]**

   i) Artificial Viscosity.

   ii) Numerical Dissipation.

   iii) Numerical Disperson.

Q7) a) Why the standard relaxation method is not suitable for incompressible Navier-stokes equations? **[4]**

b) Explain briefly the philosopy of the pressure correction method. **[6]**

c) Sketch a staggered grid, write down the SIMPLE algorithm and mention its uses. **[10]**

OR

Q8) a) Develop the continuity and momentum equations for unsteady, quasi-one-dimensional flow in a convergent divergent nozzle. **[12]**

b) Illustrate briefly the philosopy of upwind differencing taking the example of the first order wave equation : **[8]**

$$\frac{\partial u}{\partial t} + c\frac{\partial u}{\partial x} = 0$$

Q9) Write short notes on (any four) : **[20]**

a) Methods to speed up convergence.

b) Finite volume method.

c) Formation of shock waves.

d) Conservation and Non-conservation form of governing equations.

e) Thomas algorithm.

f) Shooting Method.

❖ ❖ ❖ ❖

P1078

[3964]-149

B.E. (Mechanical Sandwich)
COSTING AND COST CONTROL
(Elective - II) (2003 Course) (402065) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1)   Answer Three questions from Section I and Three questions from Section II.

2)   Answers to the two sections should be written in separate books.

3)   Figures to the right indicate full marks.

4)   Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

5)   Assume suitable data, if necessary.

SECTION - I

Unit - I

Q1) a) Prepare a cost sheet from the following data to find out profit and cost per unit during the month of November, 2003.   **[10]**

Particulars	Cost
Raw material consumed	Rs. 2,00,000
Direct wages.	Rs. 80,000
Factory overheads	Rs. 20,000
Direct expenses	Rs. 50,000
Office overheads	10% of factory cost.
Selling overheads	Rs. 5 per unit.
Units produced	4,000 units.
Units sold	3,600 units.
Selling price	Rs. 120 per unit.

b) Explain with examples following cost elements :-   **[8]**

i)   Production overheads.

ii) Selling overheads.

iii) Distribution overhead.

OR

Q2) a) Explain the following terms in costing :- **[8]**

      i) Absorption.

      ii) Apportionment.

      iii) Period cost.

      iv) Product cost.

b) A manufacturing company has shown the following expenses as establishment expenses in its account record: **[10]**

                                            (Rs. in thousand)

1.	Depreciation of building	180
2	Rent and insurance of ware houses	62
3.	Advertisement	30
4.	Directors remuneration	50
5.	Trade magazine	14
6.	Printing and stationary	10
7.	Office salaries	600
8.	Warehouse lighting	10
9.	Agents commission	15
10.	Depreciation on office furniture	12

From the above information find out the total cost of

      i) Selling expenses.

      ii) Distribution expenses.

      iii) Administration expenses.

Unit - II

Q3) a) Distinguish between **[8]**

      i) Controllable and uncontrollable cost.

      ii) Direct material cost and indirect material cost.

b) Explain the following terms: **[8]**

      i) Direct labour cost.

      ii) Indirect labour cost.

      iii) Cost control.

      iv) Cost reduction.

Q4) a) Explain the following: [10]

    i) Prime cost.

    ii) Work cost.

    iii) Cost of production.

    iv) Cost of sales.

  b) Explain the fixed cost and variable cost. [6]

Unit - III

Q5) a) The following figures are extracted from the accounts of Harem mfg. co. for the month of July. [12]

Indirect material:	Rs.
Production dept. P1	280
Production dept. P2	140
Service dept. (tool room) S1	170
Service dept. (Maintenance) S2	350
Service dept. (stores) S3	160
Indirect wages:	
Production dept. P1	324
Production dept. P2	312
Service dept. (tool room) S1	296
Service dept. (Maintenance) S2	190
Service dept. (stores) S3	218
Power and light	3,000
Supervision charges	2,200
Rent and rates	500
Insurance on assets	60

Depreciation 12% of capital value of assets per annum.

    i) From the above information and the following departmental data prepare overhead recovery rates for the production dept. P1 and P2 on the basis of direct labour hours. The expenses of service departments must be apportioned straight to the production departments.

Departmental data :-

Items/Departments	P1	P2	S1	S2	S3
Area (Sq.m)	400	200	100	200	100
Capital values of assets(Rs.)	8,000	4,000	7,000	5,000	6,000
Kilowatt hours	4,000	3,000	1,000	1,000	1,000
Number of employees	150	100	75	100	125
Direct labour hours	5,000	5,000			
Number of requisitions	1,000	300			

ii) Find the cost of job A and job B from the following information.

	Job A	Job B
Direct material cost	100	100
Direct wages	10	10
Hours in dept. P1	9	3
Hours in dept. P2		39

b) Define depreciation and explain any two methods to calculate the same.

[4]

OR

Q6) a) i) Prepare a production budget of AB company based on the sales shown and the following estimated stocks at the beginning and end of the future budget period:-

Product	Estimated stock Jan. 1 units	Dec. 31 units	Sales units
A	1000	1000	12,000
B	1000	2000	10,000

ii) Prepare a material budget for the same company based on the above estimated production budget. The production orders of the products show the following consumption :-

Consumption for a batch of 1000 units of -

Materials	Product A (kg)	Product B(kg)	Material price/kg
11	50	80	60
13	10	5	60
16	--	30	10
17	6	10	50
18	4	4	25
Total (kg)	70	129	

iii) Prepare a purchase budget for the same company based on the above estimated material budget and the estimated opening and closing stocks of materials.

Estimated stocks of materials for budget period.

Stock	11	13	16	17	18
			kg		
On 1st Jan	180	25	90	22	12
On 31st Dec	200	50	60	40	20

[10]

b) What is over and under absorption of overheads? What are the reasons that may lead to over or under absorption of overheads? **[6]**

SECTION - II

Unit - IV

Q7) a) Define joint and by - product. What is the distinction between them? Elaborate with examples. **[8]**

b) Discuss the method of accounting of by - product in cost accounts. **[8]**

OR

Q8) a) What is process costing? State the fundamental principles of process costing. **[8]**

b) Discuss the method of accounting of joint product in cost accounts. **[8]**

Unit - V

Q9) a) Indus traders and Indus Corporation sell the same products in same type of market. Their budgeted profit and loss account for the ending 2008 are as follows:

	Indus traders		Indus corporation	
	Rs.	Rs.	Rs.	Rs.
Sales		3,00,000		3,00,000
Variable cost	2,40,000		2,00,000	
Fixed costs	30,000	(2,70,000)	70,000	(2,70,000)
Net profit		30,000		30,000

You are required to

i) Calculate the break even points of each business.

ii) Calculate the sale volume at which each of the business will earn Rs. 10,000 profit. **[10]**

b) What is the use of CVP analysis? Also explain the term contribution and margin of safety. **[8]**

OR

Q10) a) You are given the following data for the coming year for a factory.

Budgeted output   80,000 units

Fixed expenses   Rs. 4,00,000

Variable expenses per unit   Rs. 10

Selling price per unit   Rs. 20

Draw a break even chart showing the break even point. If the selling price be reduced to Rs. 18 per unit, what will be the break even point.

[10]

b) What are the underlying assumptions in break even chart and state the factors which would cause the break even point to change? **[8]**

Q11) a) Define and explain standard cost and standard costing. Also write down the advantages and disadvantages of the standard casting. **[8]**

b) What is activity based costing? Why is it needed? **[8]**

Q12) a) Write down the advantages and disadvantages of marginal costing. **[8]**

b) What is the difference between **[8]**

    i) Budgetary control and standard control.

    ii) Standard and estimating costing.

◆◆◆◆

P1080

[3964]-152

B.E. (Production /Production S/W)
MACHINE TOOL DESIGN
(Sem. - I) (2003 Course) (411082)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

   1)   Attempt one question from each unit in Section - I and Section - II.

   2)   Answer to the sections should be written on separate answer books.

   3)   Figures to the right indicate full marks.

   4)   Assume suitable data, if necessary.

SECTION - I
Unit - I

Q1) a) Related to gear box   **[8]**

     i)   Establish condition of reversibility.

     ii)   Explain deviation diagram.

  b) Draw structural diagram and ray diagram applied for Six and Eight speed gear box.   **[8]**

  c) Discuss the uses of preferred number series for obtaining a wide range of stepped speed in a machine tool gear box.   **[4]**

OR

Q2) a) A nine speed gear box is to be designed for the minimum speed is 90 rpm and Maximum speed is 1000 rpm. It is to be driven by an induction motor rotating at 1440 rpm. Draw a suitable ray diagram, speed structural diagram, speed flow diagram and gear box layout.   **[14]**

  b) Draw a neat sketch and explain speed reducing mechanism of back gear drive.   **[6]**

Unit - II

Q3) a) Describe the main functions of machine tool structures. Draw the sketches of different types of cross sections used for machine tools beds and columns.   **[8]**

  b) Show the different arrangements of ribs and stiffeners in box type structure of machine tool. Which type of stiffness arrangement provides significant improvement in bending and torsional stiffness of box type structure.**[7]**

Q4) a) What are the broad considerations for design of element of machine tool such as housing, bases, table. **[8]**

b) Derive the expression for the optimum design criterion for selection of machine tool beds and other elements based on strength and rigidity.**[7]**

Unit - III

Q5) a) Explain why two sets of guide ways are provides for lathe bed. Explain any one method of clearance adjustment for slides. **[7]**

b) What is the significance of power screw in machine tools? What are the important factors to be considered while designing. **[8]**
   i) Sliding friction power screw.
   ii) Rolling friction power screw.

OR

Q6) a) A ball lead screw having a semicircular profile has the following dimension. **[8]**

Ball circle radius   = 15 mm
Pitch   = 6 mm
Diameter of a Ball   = 3.5 mm
Assume ratio of ball radius to groove radius = 1.05
Young Modulus   E = 2.1×10^4 N/mm²
Hertz contact stress σ_c = 2300 MPa
Number of circuit before recirculating = 4
(If A/B = 0.040 for that Mσ = 1.5 depend on A/B)
Find axial load carried by screw, axial contact deformation.

b) Show that the rigidity of the hydro dynamically lubricated slides is always less than that of hydrostatic slide way. **[7]**

SECTION - II

Unit - IV

Q7) a) What is the function of spindle unit of a machine tool? Discuss the importance of following in spindle design- **[10]**
   i) Diameter of front bearing journal.
   ii) Additional spindle support.
   iii) Location of bearing and drive element.
   iv) Balancing.

b) Find out an expression for maximum load on a ball in antifriction bearing. **[5]**

c) How is optimum spacing between spindle supports determined. **[5]**

OR

Q8) a) Sketch a typical lathe spindle unit using antifriction bearing. Explain how the axial and radial loads are resisted. **[10]**

b) Discuss common requirements of spindle supports and draw sketches of spindle ends of milling and lathe machine. **[10]**

Unit - V

Q9) a) What are the sources of vibrations in machine tool? Enumerate methods of reducing the vibration of machine tool. **[8]**

b) How vibrations of boring bar is damped. **[7]**

OR

Q10) Write note on : **[15]**

a) Remedies for minimizing effect of chatter in machine tool.

b) Electrical automatic control system.

c) Adaptive control optimization.

Unit - VI

Q11) a) Compare NC/CNC machine tool with conventional machine tool in respect of : **[8]**
   i) Accuracy,
   ii) Rigidity,
   iii) Productivity,
   iv) Economy.

b) What are the design considerations of SPM. **[7]**

OR

Q12) a) What are consideration for retrofitting of a lathe machine. **[8]**

b) Explain with neat diagram the electromagnetic clutch for NC machine tool. **[7]**

✹ ✹ ✹

[3964] - 153

B.E. (Production / Production S/W)
MANUFACTURING AUTOMATION AND CONTROL
(Sem. - I) (2003 Course) (411083)

Time : 3 Hours]   *[Max. Marks:100*
Instructions to the candidates:

  1) *Answer any three questions from each section.*
  2) *Answers to the two sections should be written in separate books.*
  3) *Neat diagrams must be drawn wherever necessary.*
  4) *Figures to the right indicate full marks.*
  5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
  6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) A hydraulic cylinder has a bore of 150 *mm* and rod diameter 110 *mm.* For an extend speed of 8 *m/min,* calculate the flow rate from full bore end on retract.   **[5]**

   b) Explain with neat sketch the swash plate type piston pump and also derive an expression for its flow.   **[6]**

   c) Explain with neat sketch the circuit showing the application of counterbalance valve.   **[5]**

OR

Q2) a) A hydraulic system is operating at 250 bar with pump flow 20 *l/min.* The input power to the pump drive is 12 *kW*. The pump is loaded for 45% of the operating time. The overall efficiency when it is on load is 60%. If the ambient temperature is 20º and maximum permissible fluid temperature in the reservoir is 50º. Calculate the suitable size of the reservoir if it is of square section of size 'a' with length '2a'.   **[10]**

   b) Explain with neat sketch the pressure compensated flow control valve.**[6]**

P.T.O.

Q3) a) A hydraulic system requires 100 *l/min* at 25 *bar* pressure for 10 seconds and 25 *l/min* at 120 *bar* pressure for 15 seconds. Calculate size of the pump and input energy to pump if intensifier is used in the circuit. **[6]**

b) Draw a neat sketch and explain the working of regenerative circuit. **[6]**

c) Classify types of seals and define them. **[4]**

OR

Q4) a) A hydraulic press having cylinder bore diameter of 400 mm has following breakdown of total operation time :

   i) Rapid approach of 150 mm in 10 sec. at 30 bars.

   ii) Pressing operation for 20 mm in 15 sec. at 300 bars.

   iii) Return in 20 sec.

   iv) Loading/unloading in 22 sec.

b) Draw the hydraulic circuits and calculate the efficiency of each circuit when using:

   i) Single fixed displacement pump.

   ii) Single fixed displacement pump with accumulator.

   iii) Two fixed displacement pump.

   iv) Single fixed displacement pump with intensifier. **[16]**

Q5) a) Draw a pneumatic circuit to actuate the two cylinders in following sequence:

   i) Cylinder 1 extends

   ii) Cylinder 2 extends

   iii) Cylinder 2 retracts

   iv) Cylinder 1 retracts **[10]**

b) Explain the working of FRL unit used in pneumatic system. **[8]**

OR

Q6) a) Explain with suitable example the working of time delay valve. **[8]**

b) Explain the advantages and limitations of fluidic devices. **[6]**

c) What are advantages and limitations of pneumatic systems? **[4]**

SECTION - II

Q7) a) What is microprocessor? Sketch the general architecture of microprocessor and explain the function of various parts. **[8]**

b) Draw ladder diagram to perform following operations of a washing machine :

i) Switch on the motor pump.

ii) Switch off the pump after 70 seconds.

iii) Switch on the heater for 30 seconds.

iv) Switch off the heater. **[8]**

OR

Q8) a) Explain with suitable example the use of timers in PLC. **[8]**

b) What are factors required to be considered while selecting a microcontroller for a specific application. **[8]**

Q9) a) Describe and compare the characteristics of i) proportional control ii) proportional plus integral (PI) control iii) PID control. **[10]**

b) Explain the digital to analog conversion. **[6]**

OR

Q10) a) Discuss the basic requirements of an interfacing circuit. **[8]**

b) Explain linear feedback control system. **[8]**

Q11) a) Explain with neat sketch various rotary transfer devices. **[8]**

b) Explain with neat sketch vibratory bowl feeder. **[4]**

c) Explain with neat sketch centrifugal feeder. Also state its applications.**[6]**

OR

Q12) Write short notes on : **[18]**

a) Types of escapements.

b) Handling and loading in transfer lines.

c) Automated guided vehicles.

✪✬✪✬

P1085

[3964] - 157

B.E. (Production)
PLANT ENGINEERING AND MAINTENANCE
(2003 Course) (Elective - I) (411085) (Sem. - I)

Time : 3 Hours]　　　　　　　　　　　　　　　　　　*[Max. Marks : 100*

Instructions to the candidates:

1) *Answer Q.No. 1 or Q.No. 2, Q.No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6 from Section - I & Q.No. 7 or Q.No. 8, Q.No. 9 or Q.No. 10, Q.No.11 or Q.No. 12 from Section - II.*

2) *Answers to the two sections should be written in separate books.*

3) *Neat diagrams must be drawn wherever necessary.*

4) *Figures to the right indicate full marks.*

5) *Assume suitable data, if necessary.*

6) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and   steam tables is allowed.*

SECTION - I
Unit - I

Q1) a) What factors will be consider for the site selection for following industries. **[10]**

　　i)　Automobile Industry.　ii)　Thermal Power Plant.

　　b) Explain the scope and importance of Plant Engineering functions in industrial activities. **[8]**

OR

Q2) a) What possible errors can be committed in new site selection? **[8]**

　　b) The governing principle is that "a plant should be so located as to permit the production of the product at the lowest cost per unit" comment.**[10]**

Unit - II

Q3) a) Compare the advantages and disadvantages of a product layout to a process layout with respect to : **[8]**

　　i)　Material handling cost.　ii)　Utilization of machine.

　　iii)　Need for supervision.　iv)　Space required for work in process.

　　b) What is the significance of PQ analysis and PQRST concept in systematic layout planning process? **[8]**

P.T.O.

OR

Q4) a) What is the advantage of computer aided planning for layout design? Describe "CRAFT" in short. **[8]**

b) Explain in short the various fire prevention practices. **[8]**

Unit - III

Q5) a) What is Unit Load concept in material handling? Explain the elements of material handling. **[8]**

b) Explain in short "how to estimate capacity for following auxillary services". **[8]**
   i) Transportation service.
   ii) Water supply.

OR

Q6) a) Explain the recycling method of disposal items in plant. **[8]**

b) What are different charts that are used for analyzing material flow? Discuss any one in detail. **[8]**

SECTION - II
Unit - IV

Q7) a) Explain the product life concept. **[8]**

b) Describe the types of maintenance being practiced in the present day industrial setups. **[8]**

OR

Q8) a) What is the scope of preventive maintenance in an organization? **[8]**

b) Write short notes on : **[8]**
   i) History cards for equipments.
   ii) Maintenance manual records.

Unit - V

Q9) a) How does the information of dynamic effects help in assessing the condition of an equipment / system? **[8]**

b) Describe the various types of lubrication systems used in practice. **[8]**

*Q10)*a) Differentiate between the Spectrometric Oil analysis procedure and the magnetic plug inspection system. **[8]**

b) Explain the importance of warehousing & logistic management in spare parts inventory. **[8]**

Unit - VI

*Q11)*a) How can inventory control to be acquired with the use of computers? **[10]**

b) Discuss the need and importance of maintainability. **[8]**

OR

*Q12)*a) Why does the failure pattern of equipment not remain uniform throughout its life? Explain. **[8]**

b) Write short notes on : **[10]**
   a) Reliability centered maintenance (RCM).
   b) Total Productive Maintenance (TPM).

❖ ❖ ❖ ❖

P1087

[3964]-161

B.E. (Production)
CAD/CAM/CIM
(2003 Course) (411089) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Attempt one question of each unit form section-I and section-II.*
2) *Answer to the questions should be written on separate books.*
3) *Draw neat diagram wherever necessary.*
4) *Assume suitable data if required.*

SECTION - I

Unit - I

Q1) a) Consider A triangle ABC having coordinates A (3, 3), B (7, 3), C (5, 6) determine the new position of triangle for the following transformation.
   i)   rotate by 30° anticlockwise about A,
   ii) scaling by 1.5 units in X and 2 in Y direction.   **[8]**

   b) Explain the following Euler operations-MBFV, -MEKL, -KFEVMG, -MME   **[8]**

OR

Q2) a) Explain the different Network topology in CAD/CAM system.   **[8]**

   b) A line XY with end points X (2, 2) and Y (5, 5), find new co-ordinates of a line for following transformation.   **[8]**

   i)   translate X 2 unit and Y 3 unit,
   ii) scale in X and Y direction by 1.5,
   iii) rotate by 60 degree in CCW,
   iv) reflection about origin.

Unit - II

Q3) a) What is meant by flexibility in connection with FMS? Explain at least three types of flexibility that can be considered while designing FMS.**[6]**

   b) Consider a CNC M/c center process a raw part at a time in M/M/1 fashion. Let parts arriving at a rate 15/hr and service rate is 25 part/hr. Find machine utilisation, mean number of parts in system and in queue, mean waiting time in system and in queue.   **[6]**

   c) Explain how accurate positioning control is obtained in NC/CNC machines.   **[6]**

OR

Q4) a) What are the advantages of AGVS over other material handling system? Discuss automated storage and retrieval system. **[8]**

b) Write a CNC program in G and M code for a part as shown in Fig No.1. Also write a remark for each block. **[10]**
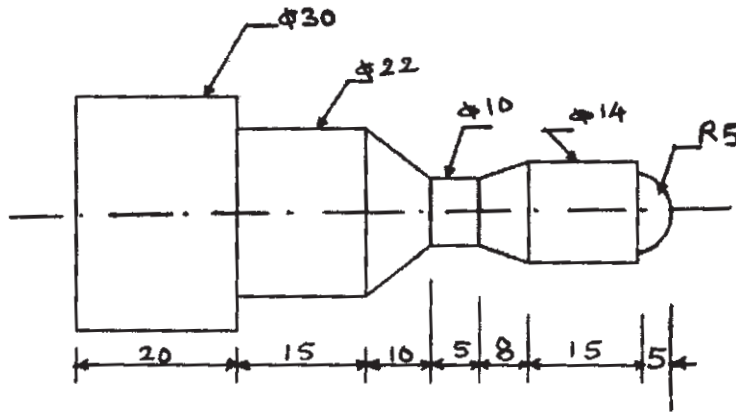
Unit - III

Q5) a) Explain different input and output reports of MRP-I. **[8]**

b) Explain in brief the following in relation with robot programming. **[8]**

i) Manual method.
ii) Walk through method.
iii) Lead through method.

OR

Q6) a) Explain the different basic elements of CIM. **[8]**

b) Explain capacity planning module and material requirement module. **[8]**

SECTION - II

Unit - IV

Q7) a) Explain the steps with neat diagram for producing a part through solid base curing. **[8]**

b) Explain with neat sketch steriolithography RP. **[7]**

OR

Q8) a) Explain basic methodology for getting a product through RP? Write the advantages of RP techniques. **[8]**

b) Explain staircase effect in RP parts. How it will be minimised. **[7]**

Q9) a) Determine most logical sequence for the following data according to To-from ratio, construct flow diagram, draw feasible layout and mark the quantity at entry, exist, intermediate places. **[8]**

	1	2	3	4	5	6
1	0	20	60	0	0	0
2	0	0	15	10	0	20
3	0	0	0	0	0	0
4	70	0	10	0	0	0
5	40	0	15	20	0	0
6	0	10	0	0	0	0

b) State and explain the various boundary conditions used in the Engg. problems. **[6]**

c) Explain the concept of cellular manufacturing. **[6]**

OR

Q10) a) A stepped bar is made of two materials joined together as shown in following Figure No. 2. The bar is subjected to an axial pull of 20KN. Determine the displacement, reaction force at support, stress of each of the section using a lD spar element. **[14]**
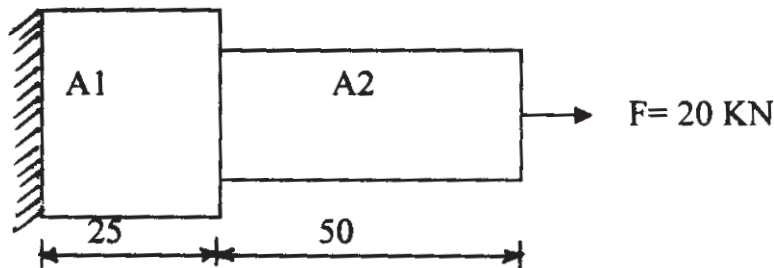
A 1 = 100 mm², E 1 = 200 GPa, A 2 = 50 mm², E2 = 120 GPa

b) Discuss with example classification and coding system using monocode, polycode and mixed code. **[6]**

Unit - VI

Q11) a) Discuss various difficulties encountered in carrying out concurrent engineering. **[7]**

b) Explain with respective to IBM CIM model. **[8]**

i) Data and work flow integration.
ii) Enterprise optimization.

OR

Q12) a) Explain NIST-AMRF Hierarchical Model. [8]

b) Explain how QFD is used in concurrent Engg. [7]

⊠⊠⊠⊠

P1088

[3964]-173

B.E. (Production S/W)
ERGONOMICS AND HUMAN FACTORS IN ENGINEERING
(2003 Course) (Elective - I) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

  1) Question 1 & 7 are compulsory.
  2) Answer any other two questions from section I and any two questions from section II.
  3) Figures to the right indicate full marks.
  4) Neat diagrams must be drawn wherever necessary.
  5) Assume suitable data, if necessary.

SECTION - I

Q1) a) Define anthropometry. Explain any four important body dimensions used in anthropometric measurements. **[4]**

b) Define Ergonomics. State the objectives and doctrine of ergonomics. **[14]**

Q2) a) What is biomechanics. Explain in brief. **[8]**

b) What are the various study areas of ergonomics. **[8]**

Q3) a) What are the important steps in collection of anthropometric data. **[8]**

b) Explain the importance of statistical analysis in anthropometry. **[8]**

Q4) a) What are the effects of heat on human performance. **[8]**

b) Explain in brief glares and its types. **[8]**

Q5) Write short note on (any four) : **[16]**
  a) Control of noise at receiver.
  b) Lighting and elderly.
  c) Photometry.
  d) Mirror image arrangements.
  e) Design of MMH Task.

Q6) a) Explain any two ergonomic design principles with examples. **[8]**

b) Explain the concept of luminance, luminance ratio and reflectance. **[8]**

SECTION - II

Q7) a) Differentiate between Aerobic Glycolysis and Anaerobic Glycolysis. **[6]**

b) Explain in brief Carpal Tunnel Syndrome. **[6]**

c) Explain the importance of Q10 Effect. How is it important in control of body temperature? **[6]**

Q8) a) Explain in brief the concept of learning curves with suitable examples. **[9]**

b) What is Maximum aerobic power? Explain various factors affecting MAP. **[9]**

Q9) a) What is Wet Bulb Globe. Temperature? How do you calculate it? Explain its utility in hot humid conditions. **[8]**

b) What are the Causative factors of heat stroke. **[4]**

c) Explain the concept of work and rest cycles. **[4]**

Q10) a) What are the commonly used design considerations for knobs and foots pedals. **[12]**

b) Describe cardiovascular response in work physiology. **[4]**

Q11) a) Explain the principles used in design of hand tools. **[10]**

b) Write a note on C-R Ratio. **[6]**

Q12) a) Explain MOST and its types in brief. **[8]**

b) Explain the various considerations used in MTM 1. **[8]**

✳ ✳ ✳

P1104

[3964]-216

B.E. (Electrical)

ANN AND IT'S APPLICATIONS IN ELECTRICAL ENGINEERING
(403150) (2003 Course) (Elective - II) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Answers to the two sections should be written in separate books.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Your answers will be valued as a whole.*
5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What is Neural Network? How the ANN is inspired from biological Neuron? **[10]**

b) Sketch Multiple input neuron model and derive it's activation function. **[6]**

OR

Q2) a) Explain Neural Network with sketch and hence enlist disadvantages of an Artificial Neural Network. **[10]**

b) Explain single layer Neural Network with one output and two input. **[6]**

Q3) a) What are paradigms of NN learning. **[8]**

b) Describe the perceptron learning rule. **[8]**

OR

Q4) a) Describe the convergence theorem for perceptron learning rule. **[8]**

b) Describe error minimization technique using perceptron learning Rule. **[8]**

Q5) a) Explain Adoptive learning rule. **[9]**

b) Explain Generalized Delta rule used to adjust the weights of Adaline Network. **[9]**

OR

Q6) a) 'Single Layer Perceptron cannot represent EX - OR'. Justify this statement. **[9]**

b) Explain Gradient descent rule for update of weight matrix. **[9]**

P.T.O.

SECTION - II

Q7) a) What are the advantages of MLP over Single Layer Perceptron. **[8]**

b) What is back propagation Algorithm? Explain. **[8]**

OR

Q8) a) What are the deficiency of back propagation algorithm. **[8]**

b) Explain Hebbian Network. **[8]**

Q9) a) Draw a neat sketch for recurrent n/w write it's output function and hence explain delay and integer block with it's equation. **[10]**

b) Describe Kohonen theory. **[7]**

OR

Q10) a) Explain classical ART N/W and discuss on stability and plasticity. **[9]**

b) What is BAM? Explain energy function of a BAM. **[8]**

Q11) Explain fuel forward approach to robot end effector positioning with camera - robot co - ordination. **[17]**

OR

Q12) Explain with example the application of ANN to load schedding problem. **[17]**

◆◆◆◆

P1106

[3964]-222

B.E. (Electronics)

ELECTRONIC PRODUCT DESIGN

(2003 Course) (Sem. - I) (404202)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

  1) *Answer any three questions from each section.*
  2) *Answers to the two sections should be written in separate books.*
  3) *Neat diagrams must be drawn wherever necessary.*
  4) *Figures to the right indicate full marks.*
  5) *Use of electronic pocket calculator is allowed.*
  6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What are the objectives of ergonomics? State the different basic ergonomics requirements for any product design. **[6]**

   b) Explain the selection criteria for TVS. **[6]**

   c) A DC regulated power supply uses following components with the specified failure rate. Estimate the reliability of the system when operating time t_1 = 100 hrs & t_2 = 1000 hrs. Comment on the result. **[6]**

Sr. No.	Name of the component	Quantity used	FR for 10^6 hrs
1.	Transformer	1	0.18
2.	Rectifier Diodes	4	0.20
3.	Capacitors	3	0.10
4.	Regulator IC	1	0.18
5.	Resistor	1	0.61

OR

Q2) a) Explain shielding effectiveness (SE), & state the factors on which SE depends. **[6]**

   b) Discuss the importance of thermal management while developing an electronic product. **[6]**

   c) Explain different grounding & guarding techniques with suitable diagrams. **[6]**

Q3) a) What are the different PCB design considerations for the digital circuits?**[8]**

b) Calculate the parasitic values for following geometries of PCB tracks -
   i) Resistance of 15 cm long track with 0.8 mm width on standard 35-micron copper clad laminate. Assume resistivity of copper $= 1.72 \times 10^{-6}$ ohm-cm.
   ii) Capacitance of two 1.2 mm wide tracks on opposite side of double sided PCB, each with a track length of 18 cm. The PCB laminate thickness is 1.6 mm & its relative permittivity is 4.2. **[8]**

OR

Q4) a) What is the need of PCB testing? Explain in brief the different methods of PCB testing. **[8]**

b) What precautions to be taken in order to avoid the effect of vibration & shock on any product? **[4]**

c) A microcontroller circuit is implemented on PCB using FR4 laminate with $\in_r = 4.1$. If the length of two tracks carrying a signal is 10 cm. Calculate the maximum clock rise time for which lumped circuit analysis will be valid. **[4]**

Q5) a) Define signal integrity. State & explain the different factors affecting signal integrity of an instrument. **[8]**

b) Write short notes on – **[8]**
   i) Monte-Carlo analysis.
   ii) Capabilities of DPO.

OR

Q6) a) Compare simulation with prototyping. **[4]**

b) Justify the type of instrument that you will use to find faults in the following circuits –
   i) The power ON RESET circuit of microcontroller is working intermittently.
   ii) A combinational logic circuit producing glitches.
   iii) An audio power amplifier is not producing proper o/p.
   iv) A microcontroller interfaced with 12-bit ADC, has some error on digital side.
   [Draw schematic arrangement for above cases] **[12]**

SECTION - II

Q7) a) What are the goals of software design? **[4]**

b) With the help of neat diagram, explain the different phases of software design. **[8]**

c) Explain the different constructs of regular program using neat diagram. **[6]**

OR

Q8) a) What is the need of software testing? State & explain the different tools used for software testing. **[6]**

b) Design a fully automatic electronic voting m/c using ASM. Clearly state the specifications of design. **[12]**

Q9) a) Discuss in detail the following tests : **[8]**

i) Temperature cycling test.

ii) Humidity test.

b) What are the sources of EMI? Discuss the different methods to minimize the EMI. **[8]**

OR

Q10) a) What is CE marking? Discuss in detail the objectives & need of CE marking. **[8]**

b) Specify with proper justification the choice of environmental tests to be carried on following electronic products – **[8]**

i) SMPS.

ii) ECG machine.

iii) Mobile phone.

iv) Digital camera.

Q11) a) What is the role of documentation in product design & development? State & explain different forms of documentation. **[8]**

b) With the help of suitable practical example, explain how bill of material is prepared? **[8]**

OR

Q12) Write detailed notes on : **[16]**

a) Interconnection diagram.

b) Laminate grade.

c) User manual for pocket calculator.

d) Software documentation standards & practices.

✳ ✳ ✳

[3964] - 223
B.E. (Electronics)
ADVANCED POWER ELECTRONICS
(Sem. - I) (2003 Course) (404203)

Time : 3 Hours]   *[Max. Marks:100*
Instructions to the candidates:

    1)   *Answer any three questions from each section.*

    2)   *Answers to the two sections should be written in separate books.*

    3)   *Neat diagrams must be drawn wherever necessary.*

    4)   *Figures to the right indicate full marks.*

    5)   *Your answers will be valued as a whole.*

    6)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

    7)   *Assume suitable data, if necessary.*

SECTION - I

Q1)   a)   Define 'string efficiency' and state its significance in connection with series and parallel operation of power devices?   **[4]**

     b)   i)   Explain how two 3-ϕ full converters can be connected back to form a circulating current type of dual converter.

         ii)   Discuss its operation with the help of voltage waveform across.

            1) each converters 2) load 3) reactor

         iii)   Describe how circulating current waveform can be obtained from reactor voltage.   **[10]**

     c)   Three scr's of the same rating are connected in series will the voltage across each of them be same when

         i)   all SCRS are in the forward-blocking state.

         ii)   all SCRS are conducting.   **[4]**

OR

Q2)   a)   Discuss the effect of source inductance on the performance of 1-ϕ full converter indicating clearly the conduction of various thyristors during one cycle.

P.T.O.

Derive expression for its O/P voltage interms of

    i)   Maximum voltage V_m, filing angle α & overlap angle and

    ii) V_m, α, L_s & load current Io (L_s is source inductance). **[10]**

  b) Draw the circuit diagram of 3-ϕ fully controlled converter operating with a highly inductive load & explain operation with following waveforms $\alpha = 60°$,

    i)   Load current

    ii)   Current through SCR

    iii)   Voltage across SCR

    iv)   Supply current (any one phase) **[8]**

Q3) a) With the help of circuit diagram explain the circuit operation of Boost-inverter circuit with analysis. **[8]**

  b) What is space vector transformation. **[4]**

  c) Explain the necessity of voltage control and harmonic reduction in inverters. **[4]**

OR

Q4) a) Describe a 1 - ϕ auto sequential commutated C.S.I with L load. Write appropriate expressions governing its performance. Waveforms for gating signals, capacitor voltage and current and load current should also be sketched. **[10]**

  b) A 3 - ϕ bridge inverter is fed from a d.c source of Edc volts. The inverter is operated in 180° conduction mode and it is supplying a purely resistive star connected load R Ω/ phase.
Determine the ratings of the thyristors. **[6]**

Q5) a) With the help neat circuit diagram and associated waveforms, explain the operation of class-E resonant inverters. **[8]**

  b) How will you measure

    i)   Sinusoidal voltage and current

    ii)   Non-sinusoidal voltage and current. **[8]**

OR

Q6) Explain the concept of power factor. On which parameters does the power factor depend?

Enlist various power factor improvement techniques for line commutated converters. Explain any one method of power factor improvement in details. Compare it with other techniques. **[16]**

SECTION - II

Q7) a) What are the effects of discontinuous armature current for d.c motor drive. **[6]**

b) A. 210V, 1200 rpm, 10A separately excited d.c motor is controlled by a l-phase fully controlled converter with an ac source voltage of 230V, 50Hz. Assume that sufficient inductance is present in the armature circuit to make the motor current continuous and ripple free for any torque greater than 25 percent of rated torque Ra = 1.5 Ω

   i) What should be the value of the filing angle to get the rated torque at 800 rpm.

   ii) Compute the filing angle for the rated braking torque at 1200 rpm.

   iii) Calculate the motor speed at the rated torque and $\alpha = 165°$, for the regenerative braking in second quadrant? **[10]**

OR

Q8) a) Draw and explain the power circuit of semi converter feeding a separately excited d.c motor. Explain with typical voltage and current waveforms, the operation in both continuous armature and discontinuous armature current modes. **[10]**

b) Describe an efficient unipolar drive for stepper motors. **[6]**

Q9) a) Explain operation of v/f control for the induction motor. **[8]**

b) Draw the torque-speed characteristics of the poly phase induction motor. Also explain the following operating regions

   i) Motoring region

   ii) Generating region

   iii) Braking region **[6]**

c) Explain field failure and under voltage protections for D.C motors. **[4]**

OR

Q10) a) Draw and explain the operation of three-phase brushless d.c motor drive. Also explain the related waveforms **[8]**

b) Explain briefly the following methods of braking a d.c motor.
   i)   Regenerative braking
   ii) Dynamic braking
   iii) Plugging **[6]**

c) Justify "The speed range of an induction motor is restricted to about 30% of full range while operating with slip power regulation system. **[4]**

Q11) a) What is energy audit? Explain types of energy audit. **[8]**

b) Explain contribution of supply & load in power quality. **[8]**

OR

Q12) a) What is power quality? Why it is required? Explain different types of power line disturbances. **[8]**

b) Explain probable preventive solutions to control the factors contributing the power quality distactions. **[8]**

✪✬✪✩

P1108

[3964] - 224
B.E. (Electronics)
VLSI DESIGN
(2003 Course) (404204) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:
 1) *Answer any three questions from each section.*
 2) *Answers to the two sections should be written in separate books.*
 3) *Neat diagrams must be drawn wherever necessary.*
 4) *Figures to the right indicate full marks.*
 5) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
 6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What is need of Package? Write VHDL Code to explain utility of Package. **[8]**

   b) Describe in brief :

   i)   Configuration. **[4]**

   ii) Synthesizable VHDL Statements. **[3]**

   iii) Non-Synthesizable VHDL Statements. **[3]**

OR

Q2) a) Explain Attributes and Procedures with VHDL examples. **[8]**

   b) Write VHDL code for 4:1 MUX with Structural modelling. Also write test bench for it. **[10]**

Q3) a) What is synchronisation in FSM? Explain meta stability with one solution in detail. **[8]**

   b) With neat sketches explain Moore and Mealey Machines. **[8]**

OR

Q4) a) Draw state diagram and write VHDL code for traffic light controller.**[8]**

   b) Draw state diagram and write VHDL code for lift controller. **[8]**

Q5) a) Draw block diagram and explain Architecture of CPLD. **[10]**

b) Differentiate between PLD, ASIC, CPLD and FPGA. **[6]**

OR

Q6) a) Draw block diagram and explain Architecture of FPGA. **[12]**

b) Write 4 specifications of CPLD. **[4]**

SECTION - II

Q7) a) Explain any two methods of clock distribution. **[8]**

b) Explain in brief power distribution, global and switch box routing.**[8]**

OR

Q8) a) List merits and demerits of Draw. Draw the schematics of different DRAM cells. **[8]**

b) Draw circuit diagram, wave forms and explain read and write operation of SRAM cell. **[8]**

Q9) a) Explain and list various parasitics of CMOS. **[9]**

b) What is scaling? Explain different scaling techniques. **[9]**

OR

*Q10)*a) Explain in detail VI characteristics of CMOS inverter. **[10]**

b) Derive the expression and explain the dynamic power dissipation of CMOS inverter. **[8]**

*Q11)*a) What is need of design for testability? What are the constraints while adding testability? **[8]**

b) Draw the architecture of TAP controller in detail and explain in brief.**[8]**

OR

*Q12)*Write short notes on : **[16]**

a) Boundary Scan.

b) JTAG.

c) Stuck fault.

❖ ❖ ❖ ❖

P1109   **[3964]-225**

B.E. (Electronics)
EMBEDDED SYSTEM DESIGN
(Sem. - I) (2003 Course) (Elective - I) (404205)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1)   *Answer any three questions from each section.*

2)   *Answer three questions from Section I and three questions from Section II.*

3)   *Attempt not more than three questions of which at least three questions must be from each Section.*

4)   *Answers to the two sections should be written in separate books.*

5)   *Neat diagrams must be drawn wherever necessary.*

6)   *Figures to the right indicate full marks.*

7)   *Your answers will be valued as a whole.*

8)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

9)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What is a design metric? Explain.   **[8]**

  b) What are the special considerations in designing embedded systems?**[6]**

  c) Explain bluetooth protocol.   **[4]**

OR

Q2) a) Explain the MODBUS - Message structure and device addressing.   **[8]**

  b) What are the recent trends in embedded system.   **[8]**

  c) Differentiate : hard real time and soft real time system.   **[2]**

Q3) a) What is the memory and processor requirement for data acquisition system.   **[8]**

  b) Explain the architecture of digital signal processor.   **[8]**

OR

Q4) a) Explain the TCP/IP protocol used in embedded system.   **[8]**

  b) Explain :   **[8]**

   i)   Interrupt latency time with example

   ii) Context switching

Q5) a) Explain pre-emptive and non-pre-emptive multitasking. **[8]**

b) Explain the function-Queue scheduling in embedded system. **[8]**

OR

Q6) a) Explain the use of device-drivers in embedded system software design.**[8]**

b) Explain round-robin scheduling with interrupts using suitable psudeo code. **[8]**

SECTION - II

Q7) a) Explain the memory management functions of RTOS. **[8]**

b) How the interrupt request are served in RTOS environment. **[10]**

OR

Q8) a) Describe the task states **[9]**
   i) Blocked state.
   ii) Ready state.
   iii) Running state.

b) Explain the use of semaphores to solve the problem of shared data. **[9]**

Q9) a) Explain the basic features of V_x Works **[8]**

b) Explain software development cycle. **[8]**

OR

Q10) a) Explain four semaphore related functions of μCos. **[8]**

b) How tasks and ISR are handled by V_x works. **[8]**

Q11) a) Explain the features of smart card. **[6]**

b) Give complete design aspects of Digital camera as embedded system.**[10]**

OR

Q12) a) Explain the functioning of RFID system with suitable block diagram. What are the frequency bands used in RFID. **[10]**

b) Explain active and passive tag. **[3]**

c) Why Java is popular for smart card application. **[3]**

✳ ✳ ✳

P1110

[3964]-226

B.E. (Electronics)

PROCESS INSTRUMENTATION

(Elective - I) (2003 Course) (404205) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Answer Q.No.1 or 2, 3 or 4, 5 or 6, 7 or 8, 9 or 10, 11 or 12.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Assume suitable data, if necessary.*
6) *All questions are compulsory.*

SECTION - I

Q1) a) Draw the block diagram of a SMART transmitter for transmitting differential pressure. Explain function of each block. **[12]**

    b) Explain the working of conductivity meter. **[6]**

OR

Q2) a) An RTD has $\alpha_0 = 0.005/°C$, $R = 500\,\Omega$ and dissipation constant of $P_D = 30$ mw/°C at 20°C. The RTD is used in bridge circuit with $R_1 = R_2 = 500\,\Omega$ and R_3 a variable resistor used to null the bridge. If the supply is 10V and RTD is placed in a bath at 0°C, find the value of R_3 to null the bridge. **[12]**

    b) Explain the electrodes used for pH measurement. **[6]**

Q3) a) Sketch the following control valve. **[10]**
      i) Diaphragm valve.
      ii) Gate valve.
      iii) Butterfly valve.
      iv) Digital valve.

    b) Suppose a force of 400N must be applied to open a valve. Find the diaphragm area if a control gauge pressure of 70 kPa must provide the force. **[6]**

OR

Q4) a) An integral controller is used for speed control with a set point of 12 rpm within a range of 10 to 15 rpm. The controller output is 22% initially. The constant $K_I = -0.15\%$ controller output per second per percentage error. If speed jumps to 13.5 rpm. Calculate the controller output after 2 second for a constant e_p. **[10]**

b) Explain open-loop transient response method of tunning of controller. **[6]**

Q5) a) Draw the block diagram of a adaptive control system and explain the working. **[8]**

b) Explain how selective control is applied for the protection of a boiler system. **[8]**

OR

Q6) a) Draw the block diagram and explain the working of self tunning regulator. **[8]**

b) Compare feedback and feedforward control system. **[8]**

SECTION - II

Q7) a) Explain process model based control in detail. **[10]**

b) Explain optimization of boilers. **[8]**

OR

Q8) a) What is model predictive control? Give types and explain. **[10]**

b) With block diagram explain feedforward optimization. **[8]**

Q9) a) Distinguish between relay ladder logic and PLC ladder logic. **[4]**

b) Draw the event sequence and ladder diagram for PLC system for a 'Elevator system'. Consider all sensors as direct inputs to PLC. **[12]**

OR

Q10) a) Give typical specifications of PLC processors. **[4]**

b) Draw the event sequence and ladder diagram for PLC system for a 'conveyor system for Bottle Filling'. Consider all sensors as direct inputs to PLC. **[12]**

Q11) a) Draw the block diagram of DCS and explain in detail. **[10]**

b) Explain the need of square root extractor. **[6]**

OR

Q12) a) Explain Direct Digital control system in detail. Give one application. **[10]**

b) Explain the need of Alarm Annunciator. **[6]**

✳ ✳ ✳

P1111

[3964]-227

B.E. (Electronics)

ADVANCED DIGITAL SIGNAL PROCESSING

(Elective - I) (404205) (2003 Course) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Answers to the two sections should be written in separate books.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What is Multirate DSP? Where it is used?   **[6]**

b) Explain clearly the roles of each of the following in a multirate processing system.   **[6]**

    i) Decimating filter.

    ii) Sampling rate compressor.

c) Sampling rate of a three stage decimator is to be reduced from 3072 kHz to 48 kHz satisfying the following specifications.   **[6]**

    Frequency band of interest   : 0–20 kHz

    Passband ripple   : 0.01 dB

    Stopband ripple   : 60 dB

    Decimating factors   : 8, 4, 2

    Determine band edge frequencies for decimating filter at each stage.

OR

Q2) a) Explain multistage approach to sampling rate conversion.   **[6]**

b) Explain polyphase filter of multirate system.   **[6]**

c) Explain the process of subband coding of speech signals.   **[6]**

Q3) a) Explain the concept of adaptive filtering with the help of noise canceller.[4]

b) The estimate of desired signal at the output of adaptive noise canceller is given by **[6]**

$$\hat{\delta_k} = Y_k - \hat{n_k} = S_k + n_k - \hat{n_k}.$$

Show that minimizing the total power at the output of canceller maximizes signal to noise ratio.

c) Explain the application of adaptive filter for echo cancellation in telephony. **[6]**

OR

Q4) a) Derive basic LMS algorithm. **[8]**

b) Write notes on following properties of adaptive filters. **[8]**
   i) Stability condition.
   ii) Convergence rate.

Q5) a) Derive Levinson Durbin Algorithm. **[10]**

b) A 3-stage lattice filter has coefficient $K_1 = \frac{1}{4}$, $K_2 = \frac{1}{2}$, $K_3 = \frac{1}{3}$. **[6]**
   Determine FIR filter coefficient for Direct form structure.

OR

Q6) a) Explain the concept of Forward Linear Prediction. **[2]**

b) Explain two important properties of prediction error filter. **[4]**

c) An AR process $\{x(n)\}$ is characterized by the autocorrelation sequence $R_{xx}(0) = 1$, $R_{xx}(1) = \frac{1}{2}$, $R_{xx}(2) = \frac{1}{8}$. **[10]**
   Design and sketch the lattice filter for synthesizing $x(n)$ from a white noise excitation.

SECTION - II

Q7) a) Determine power spectral density of random process generated by **[4]**
   $$x(n) = w(n) - x(n-2)$$

   Where $w(n)$ is a white noise process with variance σ_w^2.

b) Explain the Welch method of Power Spectrum estimation. **[8]**

c) Show that the power spectral density of a random process is equal to the Fourier transform of its autocorrelation function. **[6]**

OR

Q8) a) We have a signal $x(n) = s(n) + w(n)$
where $s(n) = 0.7s(n - 1) + v(n)$ **[8]**

where $v(n)$ is white noise sequence with $\sigma_v^2 = 0.51$

& $w(n)$ is white noise sequence with $\sigma_w^2 = 1$

Determine the coefficient of FIR Wiener filter of length M = 2 to estimate $s(n)$

b) Suppose we have N = 1000 samples from a sampled sequence of random process. **[10]**

i) Determine the frequency resolution of the Bartleff, Welch (50% overlap), methods for a quality factor $\theta = 10$.

ii) Determine the record length (M) for Bartleff, Welch (50% overlap), methods.

Q9) a) Explain the factors that are considered for selecting a digital signal processor for a specific application. **[8]**

b) Explain, how FIR filter is implemented on a digital signal processor. **[8]**

OR

Q10) a) Write a note on the key architectural features of a DSP. **[10]**

b) What is Barrel Shifter? Explain its working. **[6]**

Q11) a) Explain the digital Model of Vocal Tract. **[8]**

b) What are the standard methods to find linear prediction coefficients of speech signal. Explain any one method in detail. **[8]**

OR

Q12) a) Explain, how will you detect silence, voiced & unvoiced segment of speech signal. **[8]**

b) Explain, how will you derive Mel frequency Cepstral coefficients of a speech segment. **[8]**

✳ ✳ ✳

P1112

[3964]-229

B.E. (Electronics)

SOFTWARE ENGINEERING

(Elective - I) (2003 Course) (404205) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Answers to the two sections should be written in separate books.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Your answers will be valued as a whole.*
5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain "Team Software Process" (TSP). Also explain the objectives of Team Software Process (TSP). **[8]**

b) Explain in detail the following Software Myths **[10]**
   i) Management Myths.
   ii) Customer Myths.
   iii) Practitioner's Myths.

OR

Q2) a) What is prototyping in Software development? Provide Software development project that would be amenable to prototyping. Also give example of Software development project that would be more difficult to prototype. **[8]**

b) Explain in brief various software engineering paradigms you know. **[10]**

Q3) a) Explain in detail the core principles that focus on Software engineering practice as a whole. List and explain in short. **[8]**
   i) Planning practices.
   ii) Design practices.

b) How should we initiate communication between developer and customer to obtain the necessary requirements? Give example. **[8]**

OR

Q4) a) What do you mean by system Modeling and Simulation? Also explain Hatley Pirbhai Modeling in detail. **[10]**

b) Explain Business Process Engineering. **[6]**

Q5) a) What do you mean by PSPEC? Explain in detail Class-Based Modeling? **[8]**

b) Explain in detail Requirement Engineering Task. What are the important characteristics that requirements must preserve? How requirements can be managed? **[8]**

OR

Q6) a) Write notes on any three of the following : **[8]**
   i) Elements of Analysis Model.
   ii) Entity/Boundary/Controls Classes.
   iii) Element of Analysis Pattern Template.
   iv) Object Oriented Analysis.

b) What is meant by Behavioural Modeling? Explain giving examples. **[8]**

SECTION - II

Q7) a) How analysis Model is translated to Design Model? Explain in detail design quality. **[8]**

b) Discuss the relative merits and difficulties of applying data flow oriented design in following area. **[8]**
   i) Communication Software.
   ii) Operating system Software.
   iii) Embedded Microprocessors application.
   iv) Computer Graphics application.

OR

Q8) a) Define the terms : **[8]**
   i) Functional independence.
   ii) Cohesion.
   iii) Coupling.

b) Explain with a suitable example along with all the steps : **[8]**
   i) Transform – flow Mapping to software Architecture.
   ii) Transaction – flow Mapping to software Architecture.

Q9) a) Explain in detail. **[8]**

      i) Unit Testing.

      ii) Unit Test Considerations.

      iii) Unit Test Procedures.

      iv) Debugging process.

    b) What are strategic issues in Software Testing. Explain in detail. **[8]**

      i) Top- Down Integration Testing.

      ii) Bottom - Up Integration Testing.

<div align="center">OR</div>

Q10) a) What are the critical practices we will have to follow for Performance Based Management of software projects. **[8]**

    b) Explain how do we compute Function Points? **[4]**

    c) What are different Metrics available for software quality control? How they Control Quality of Software? **[4]**

Q11) a) Explain all the steps we should follow to reengineer a user interface. **[8]**

    b) Explain the following repository features with respect to software configuration Management. **[10]**

      i) Versioning.

      ii) Dependency tracking and chance management.

      iii) Requirement tracing.

      iv) Configuration management.

      v) Audit trails.

<div align="center">OR</div>

Q12) a) What is reverse engineering? How the reverse engineering is used for **[8]**

      i) Understanding process.

      ii) Understanding data.

    b) Explain forward engineering for Client/server architecture. **[6]**

    c) Write short note on "Identification of objects in the software configuration". **[4]**

<div align="center">✸ ✸ ✸</div>

P1113   **[3964]-230**

B.E. (Electronics Engineering)
ELECTRONICS MEASUREMENT SYSTEM
(2003 Course) (404209) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1)   Answers three questions from section-I and three questions from section-II.

2)   Answers to the two sections should be written in separate books.

3)   Neat diagrams must be drawn wherever necessary.

4)   Figures to the right indicate full marks.

5)   Your answers will be valued as a whole.

6)   Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

7)   Assume suitable data, if necessary.

SECTION - I

Q1) a) How to measure small inductor using LCR-Q meter? Derive an expression for L_S. **[8]**

b) Explain working of True RMS responding voltmeter with neat diagram. How to use average detecting voltmeter for RMS measurement? **[8]**

OR

Q2) a) Explain with neat diagram Vector Impedance meter. **[8]**

b) Explain with neat diagram transistor tester. **[8]**

Q3) a) What do you mean by automation in digital instruments? Explain how it is advantageous for measurement? **[8]**

b) Explain with block diagram principle of frequency ratio measurement. **[8]**

OR

Q4) a) What are the functions of time base generator in frequency counter? Which are the possible errors introduced in frequency measurement due to crystal used in time based generator? **[8]**

b) Explain with neat diagram how to measure pulse width using frequency counter. **[8]**

Q5) a) Explain with neat diagram heterodyne wave analyzer. **[8]**

b) Explain logic analyzer with block diagram and display methods used in analysis using logic analyzer. **[10]**

OR

Q6) a) Explain total harmonic distortion analyzer with neat diagram. **[10]**

b) Explain spectrum analyzer with neat block diagram. **[8]**

SECTION - II

Q7) a) Explain Scalar Network analyzer with neat block diagram. **[8]**

b) Explain method used to measure receiver gain. **[8]**

OR

Q8) a) Which standards are used to do measurements related to transmitter and receiver? **[8]**

b) Explain SINAD sensitivity test. **[8]**

Q9) a) Explain with neat diagram Digital Storage Oscilloscope. **[8]**

b) Explain with neat diagram Analog Data Acquisition system. **[8]**

OR

Q10) a) Sampling Technique used in Sampling CRO. Explain. **[8]**

b) How to do bit error rate measurement? **[8]**

Q11) a) What are the advantages of computer controlled test instruments? Explain how radio receiver are tested using above technique. **[10]**

b) Virtual Instruments and their utility. Explain. **[8]**

OR

Q12) a) Write short note on PCI interface. **[8]**

b) Explain advantages of 'Lab View' for virtual instrumentation. **[10]**

⊠⊠⊠⊠

P1117

[3964]-242

B.E. (E & TC)

VOICE NETWORKS

(Sem. - I) (2003 Course) (404215)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Answer three questions from Section I and three questions from Section II.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain the block diagram of Distributed SPC organization.   **[8]**

b) Derive the expression for Unavailability of Single and Dual processor configuration. Given that MTBF = 3000 hrs and MTTR = 6 hrs, calculate the availability and Unavailability of Single and Dual processor system. The life of exchange is 20 yrs.   **[10]**

OR

Q2) a) Describe the working of Input controlled Time division space switch? An analog non-folded time division space switch is to be designed to support 32 inlets and outlets each. Assuming bi-directional traffic calculate:

i)   The time duration for exchanging samples for one connection.
ii) Size of control memory if switch is output controlled.
iii) Clock rate.   **[10]**

b) Explain the design consideration of DTMF dialler.   **[8]**

Q3) a) Differentiate between Loss system and Delay system. Explain Lost Call Cleared model in traffic Engineering.   **[8]**

b) The traffic statistics of a company using a EPABX indicates that 200 outgoing calls are initiated every hour during working hours. Equal number of calls comes in. Each call lasts for 180 seconds on the average. If the G.O.S required is 0.07, determine the no. of lines required between the EPABX and main exchange.   **[8]**

OR

Q4) a) Derive the expression for Poisson's arrival process and its significance.**[8]**

b) Following data was recorded by observing the activity of a single customer line during the eight hour period from 7.00 a.m. to 3.00 p.m. Determine the traffic intensity during the eight hour period during the busy hour from 10.00 a.m to 11.00 a.m **[8]**

Call No.	Call Started	Call Terminated
1	7:10	7:15
2	8:25	8:28
3	9:45	9:52
4	10:01	10:09
5	10:22	10:27
6	10:35	10:43
7	11:18	11:26
8	1:04	1:11
9	2:20	2:29

Q5) a) Compare N-ISDN with B-ISDN. List the benefits and services of ISDN. **[8]**

b) Describe in detail the architecture of the frame relay network. **[8]**

OR

Q6) a) Explain in detail the architecture of ISDN and its objectives. **[8]**

b) Compare BRI and PRI architecture of ISDN. **[8]**

SECTION - II

Q7) a) Explain in detail the terms : **[12]**

   i) Spectral efficiency.
   ii) Frequency Reuse.
   iii) Cell splitting.
   iv) Cell sectorization.

b) Explain different interference reducing mechanism in GSM. **[6]**

OR

Q8) a) Explain with the flow diagram a step by step process for outgoing call Setup in GSM network. **[8]**

b) Explain with block diagram the GSM architecture and its evolution.**[10]**

Q9) a) Define Handover. Explain in detail following Hand-off mechanisms in CDMA. **[8]**

     i)   Intersector Handoff.
     ii)   Intercell Handoff.
     iii)   Soft-Softer Handoff.
     iv)   Hard Handoff.

    b) Describe the flow diagram to grant traffic channel in CDMA. **[8]**

<div align="center">OR</div>

Q10) a) Compare GSM & IS-95 CDMA architecture w.r.t. following parameters: **[8]**

     i)   Frequency Band   ii)   Channel Bandwidth
     iii)   Voice Quality   iv)   Interference.
     v)   Handoff   vi)   System capacity.
     vii) Radio interface   viii) Economics

    b) Explain various registration supported by IS - 95 architecture. **[8]**

Q11) a) Describe in detail Interexchange signaling in VoIP. **[8]**

    b) Explain the architecture of Session initiation Protocol and call signaling between two user agents. **[8]**

<div align="center">OR</div>

Q12) a) Define VoIP? Draw and explain the various elements of Voice over IP network. **[8]**

    b) Describe in detail Media Gateway control Protocol. **[8]**

<div align="center">✳ ✳ ✳</div>

[3964] - 243
B.E. (E&TC)
ELECTRONIC PRODUCT DESIGN
(Sem. - I) (2003 Course) (404216)

Time : 3 Hours]   *[Max. Marks:100*

Instructions to the candidates:

1) Answer three questions from Section I and three questions from Section II.

2) Answers to the two sections should be written in separate books.

3) Neat diagrams must be drawn wherever necessary.

4) Figures to the right indicate full marks.

5) Use of electronic pocket calculator is allowed.

6) Assume suitable data, if necessary.

SECTION - I

Q1) a) Take a suitable example and explain steps required to arrive at technical specification of a product to be manufactured on large scale. Also explain how techno commercial feasibility is satisfied.   **[10]**

b) Draw a sketch of front panel of a laboratory CRO and explain how ergonomic and aesthetic design considerations are taken care of in the same.   **[8]**

OR

Q2) a) Explain with the help of neat sketches the exact mechanism by which electromagnetic Interference is reduced in case of i) Twisted pair of wires ii) Tranzorbs iii) shielding.   **[12]**

b) A trigger circuit for SCR circuit uses the following components with specified failure rates. Calculate the MTTF for the circuit.   **[6]**

Component	Quantity used	Failure rate for 10^6 hours
Resistors	10	0.61
Capacitors	5	0.60
Diodes	4	0.20
Transistors	2	0.65
Pulse Transformers	2	0.15
Power Transformers	1	0.18

Q3) Discuss the mechanism of generation and preventive methods for following phenomena in High speed PCB designs : - **[16]**
   a) Crosstalk
   b) Reflections
   c) Skin effect
   d) Ground Bounce.

OR

Q4) a) Calculate resistance of 1cm long copper track having width 1mm for standard 70 micron copper clad laminate at 25ºC. Assume resistivity of copper at 25ºC to be 1.832×10^{-6} ohm-cm. What will be percentage change in resistance if temperature increases to 60ºC. **[4]**

   b) What will be inductance of 5cm long 0.25 mm wide track on PCB with standard 35 micron copper clad. **[4]**

   c) Calculate the track capacitance l cm for the geometry :-

   The supply track 1.44 mm on top surface of a double-sided PCB. Underlying that is a ground track that is 1.8 mm wide. The PCB thickness is 1.6 mm and relative dielectric constant of laminate is 5.2. **[4]**

   d) Compare on-board and off-board regulation schemes for placement of DC power supply. **[4]**

Q5) a) What is signal integrity. Explain with the help of neat sketches how it is affected by limited **[8]**
   i) Band-width
   ii) Sampling rate
   iii) Probe impedance
   iv) Memory depth.

   b) Explain how integrated state and timing acquision mode of logic analyzer helps in finding faults in high frequency circuits. **[8]**

OR

Q6) For Digital Storage Oscilloscope (DSO) explain the factors that determine the choice between following alternatives : -
   a) ALT and CHOP mode.
   b) Normal and AUTO mode.
   c) AC and DC coupling.
   d) Real and equivalent time sampling

e) CH1 and CH2 triggering.

f) Edge and level triggering.

g) TV and Line triggering. **[16]**

SECTION - II

Q7) With the help of suitable example, explain how various phases of software design are developed. The discussion should include phases like-problem definition, software structure diagram, modular programming, testing and debugging. **[18]**

OR

Q8) Discuss the advantages and limitations of following methods and tools of software debugging : - **[18]**
a) Single stepping.
b) Break points.
c) Software simulators.
d) Emulators
e) Integrated Development Environment (IDE).

Q9) a) Explain different temperature tests carried out on industrial product and various parameters related to each test. **[8]**

b) Specify with justification the choice of environmental tests to be carried out on :-
i) Washing machine
ii) PLC
iii) UPS **[8]**

OR

Q10) Explain why electronic products are required to be tested for : - **[16]**
a) Conducted EMI
b) Radiated EMI
c) Conducted susceptibility
d) Radiated susceptibility.
For each of above type of test, give suitable practical example to explain the mechanism that disturbs normal working of electronic products.

Q11) With the help of neat diagram explain the significance of following in context of PCB fabrication and assembly **[16]**

a) Drilling details

b) Edge clearance

c) Component assembly diagram

d) Plating on PCB tracks

e) Solder mask

f) Laminate grade

OR

Q12) a) Explain the need of Bare Board testing in mass produced high track density PCB.

b) Develope product test specifications for + 5VDC regulated power supply that uses step down transformer, FWR, IC regulater.

c) Draw up the Bill of material for above.

d) Explain the used of engineering note book in development of a product. **[16]**

❁☆❁☆

P1119

[3964] - 244

B.E. (E&T/C)

VLSI DESIGN

(2003 Course) (404217) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

   1)   *Answer any three questions from each section.*

   2)   *Answers to the two sections should be written in separate books.*

   3)   *Neat diagrams must be drawn wherever necessary.*

   4)   *Use of electronic pocket calculator is allowed.*

   5)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   What do you mean by multiple drivers? Give suitable example & explain how to solve it by resolution function.   **[9]**

    b)   Write VHDL code for 4 bit latch. Write test bench for it.   **[9]**

OR

Q2) a)   Explain high level design flow in detail. What constraints can user give? At what levels?   **[9]**

    b)   Write optimum VHDL code for 4 bit adder & test bench for it.   **[9]**

Q3) a)   Draw state diagram for 11100 Moore sequence detector and write VHDL code for it.   **[8]**

    b)   What are the methods of encoding FSM? Compare these methods.**[8]**

OR

Q4) a)   What are the advantages of asynchronous over synchronous machine? Explain each in brief.   **[8]**

    b)   Draw state diagram of lift controller for ground plus two floors. Write optimum VHDL code for it.   **[8]**

P.T.O.

Q5) a) How does half adder logic get implement in CPLD & FPGA differently? Explain with suitable schematic. **[8]**

b) Draw the generic block diagram of FPGA & explain in brief. Explore I/O block in detail. **[8]**

OR

Q6) a) What are the merits & limitations of CPLD? Explain each in brief. **[8]**

b) Draw the internal details of Macrocell and explain in brief. **[8]**

SECTION - II

Q7) a) Draw DRAM cells made up of different number of MOSFET. Explain Write & Read operation of any one of them. **[9]**

b) What are global & switch box routing? Explain each in brief. What are the challenges involved. **[9]**

OR

Q8) a) Why are power distribution & power optimization so important? Explain the techniques of each in brief. **[9]**

b) Compare CMOS based SRAM, DRAM, SDRAM & FLASH architectures in detail. **[9]**

Q9) a) Draw high freq. equivallent ckt of MOSFET. Mention body effect & device parasitic parameters. Comment on these parasitics. How do they affect on performance? **[8]**

b) Certain CMOS logic has static power dissipation of 100 μW. What is total power dissipation of the same ckt if operates at 10 MHz, V_{DD} = 1V, load of 100 pF? **[8]**

OR

Q10) a) Design CMOS logic for output Y = AB + CDE. Calculate width of each device. Comment on this transistor sizing. **[8]**

b) What are the advantages of Transmission Gate? Draw 8:1 MUX using transmission gates & compare with conventional method. **[8]**

*Q11)*a) What is need of boundary scan? Explain boundary scan technique in detail. **[8]**

b) What is necessity of DFT? What is BIST? Explain with suitable example. **[8]**

OR

*Q12)*a) Explain stuck at faults in detail. **[8]**

b) Draw the state diagram of TAP controller. **[8]**

❖❖❖❖

P1120

[3964]-245

B.E. (E & TC)

EMBEDDED SYSTEMS DESIGN

(2003 Course) (Elective - I) (404218) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Answer three questions from Section I and three questions from Section II.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Compare embedded system with PC. "Embedded system is always a Real Time System". Discuss. **[4]**

b) Explain the following design metrics & explain their significance in product development cycle. **[8]**
   i) Power.
   ii) Performance.
   iii) Size.
   iv) NRE cost.

c) Explain the following communication protocols and compare them. **[6]**
   i) Bluetooth.
   ii) IrDA.

OR

Q2) a) Explain IEEE 802.11 and compare with GPRS. **[8]**

b) Explain physical layer and data link layer of CAN & MODBUS communication. Also compare them. **[10]**

Q3) a) Explain the use and importance of following types of memory in embedded system with the help of C program. **[8]**
   ROM.
   EEPROM.
   FLASH.
   SDRAM.

b) Explain following : **[8]**

   i) Real Time System.

   ii) RTOs.

   Discuss advantages and disadvantages of RTOs.

<div align="center">OR</div>

Q4) a) Explain how shared data problem occurs when interrupt service routine is executed? Explain how this can be avoided. **[8]**

b) With a diagram explain the different states of task & how are they used by scheduling algorithm. **[8]**

Q5) a) Explain the following : **[8]**

   i) Task.

   ii) Process.

   iii) Thread.

b) Explain any three scheduling algorithms & OS where they are used. **[8]**

<div align="center">OR</div>

Q6) a) Explain the different tools (Assembler, Compiler, Linker, Loader, Simulator, Emulator, Programmer) for the development of embedded system. **[8]**

b) Explain in detail the device driver for µC|OS II. **[8]**

<div align="center"><u>**SECTION - II**</u></div>

Q7) a) Explain the following with practical examples **[8]**

   i) Message queue.

   ii) Mailbox.

   iii) Pipes.

   iv) Events.

b) Write C code for implementing pipes in RTOs. **[8]**

<div align="center">OR</div>

Q8) a) Write C code for implementing events in RTOs. **[8]**

b) Compare RTOs µC|OS II with RT Linux. **[8]**

Q9) a) Explain the features of RT Linux & differences as compared to Vxworks. **[8]**

b) Explain the following functions of µC|OS II **[8]**
   i) OSENTER_CRITICAL( )
   ii) OSInit ( )
   iii) OSInt Enter ( )
   iv) OSMbox Post ( ).

OR

Q10) a) Explain in detail spiral model. **[8]**

b) Explain the Product Development cycle for embedded system. **[8]**

Q11) Give a detailed case study of Room Temperature Indicator & Controller.**[18]**

OR

Q12) Give a detailed case study of Digital door camera with LCD display in room.
[18]

✳ ✳ ✳

P1121

[3964]-246

B.E. (E & TC)

ADVANCE POWER ELECTRONICS

(2003 Course) (Elective - I) (404218) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

    1)   Answer any three questions from each section.

    2)   Answers to the two sections should be written in separate books.

    3)   Neat diagrams must be drawn wherever necessary.

    4)   Figures to the right indicate full marks.

    5)   All questions carry equal marks.

SECTION - I

Q1) a) What are phase controlled converters? Explain with circuit diagram & waveforms, working of 3 phase HCC with RL load. Deduce the equation for load voltage. **[12]**

    b) What is the effect of source impedance on converters O/P? **[6]**

OR

Q2) a) What are Dual converters? Explain with diagram & waveforms, working of 1 phase dual converter with circulating unit mode operation. **[10]**

    b) A 1ϕ dual converter is operated from a 120V, 60Hz, supply & load resistance is R = 10Ω. The circulating inductance is Lc = 40 mH. Delay angles are $\alpha_1 = 60°$ & $\alpha_2 = 120°$. Calculate the peak circulating current & peak unit of converter 1. **[8]**

Q3) a) What are DC to AC converter? Explain with circuit diagram & waveforms, working of 3ϕ voltage source inverter (transistorised) operating in 180° mode of conduction, with purely resistive load (stand-connected). **[10]**

    b) What are different types of harmonic reduction techniques? Explain one type. **[6]**

OR

Q4) a) What are bridge inverters? Explain with diagram working of 3ϕ vSI (transistorised) operating in 120° mode of conduction with R-load.[star]. **[10]**

    b) What are p.f improvement techniques in inverter? Explain. **[6]**

Q5) a) What are DC to DC converter? Explain with diagram, working of 4Q-chopper. Comment on p.f. **[12]**

b) Why choppers are preferred over phase controlled convertes? Justify.**[4]**

<center>OR</center>

Q6) a) What are resonant convertes? Explain with diagram & waveforms working of ZVS. **[10]**

b) Compare Linear switched mode & Resonant converter. **[6]**

<center>

SECTION - II

</center>

Q7) a) Define power factor? Explain one type of power factor improvement technique in phase controlled converters. Justify which one is better.**[10]**

b) Compare PAC, EAC, & SAC converters. **[6]**

<center>OR</center>

Q8) a) What is symmetrical angle control of series connected semi converters? Explain. **[10]**

b) Explain how will you measure the following : **[6]**
   i)   DC current sensing.
   ii) Speed measurement of sensing.

Q9) a) What are DC drives? Explain with circuit diagram & waveforms, speed controlled technique of 1ϕ separately excited DC motor with highly inductive load. **[12]**

b) What is motor coasting? Explain. **[4]**

<center>OR</center>

Q10) a) What is the principle of series motor? Explain 1 phase LCC based DC series motor speed control technique. Comment on T_q speed characteristics **[12]**

b) What is the need of Reversible drive? Explain. **[4]**

Q11) a) What is the principle of I.M.? Explain with circuit diagram, $\frac{v}{f}$ control technique of I.M. Comment on T_q, speed, slip characteristics. **[12]**

b) What are braking techniques in AC-Motors? Explain. **[6]**

<center>OR</center>

Q12) Write short notes on - any <u>three</u>   **[18]**

     a)   Stepper Motors.

     b)   Brushless DC Motors.

     c)   Static krammer drive.

     d)   Synchronous Motors.

     e)   DC-servo motors.

     f)   Static & Dynamic Equalizing Circuits.

✳ ✳ ✳

P1122

[3964]-247

B.E. (E & TC)

ADVANCED DIGITAL SIGNAL PROCESSING

(2003 Course) (404218) (Elective - I) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

   1) *Answer three questions from Section I and three questions from Section II.*
   2) *Answers to the two sections should be written in separate books.*
   3) *Neat diagrams must be drawn wherever necessary.*
   4) *Figures to the right indicate full marks.*
   5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
   6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Draw the block diagram of a three-stage decimator which is used to reduce the sampling rate from 96 kHz to 1 kHz. The three decimation factors are 8, 4 and 2. Indicate the sampling rate at the output of each of the three stages. Assume that the decimator satisfies following conditions:

Input sampling frequency F_s	96 kHz
Decimation factor, M	96
Passband ripple	0.01dB
Stopband ripple	60 dB
Freq. band of interest	$0 - 450$Hz

Determine the bandedge frequencies for the decimating filter at each stage.   **[14]**

   b) Prove that auto correlation function and ESD form a Fourier transform pair.   **[4]**

OR

Q2) a) What are polyphase filter structures? Explain polyphase filtering for interpolators in detail.   **[8]**

   b) Give software implementation of decimator with the help of signal flow graph.   **[6]**

   c) When large changes in sampling rate are required it is more efficient to change the rate in two or more stages than in one single stage. Justify this statement.   **[4]**

Q3) a) Discuss the need of adaptive filters. **[6]**

b) Show that minimizing the total power at the output of the canceller maximizes the output signal-to-noise ratio. **[8]**

c) Give the block diagram of an adaptive filter as noise canceller. **[2]**

OR

Q4) a) Discuss in detail the basic LMS adaptive algorithm. **[8]**

b) Explain adaptive telephone echo cancellation. **[8]**

Q5) a) Define AR, MA & ARMA processes. **[4]**

b) Give Levinson-Durbin Algorithm in detail for solving normal equations. **[12]**

OR

Q6) a) With the help of block diagram, explain Forward Linear Prediction. **[8]**

b) Consider a signal $x(n) = s(n) + w(n)$, where $s(n)$ is an AR(1) process that satisfies the difference equation.

$s(n) = 0.8\ s(n-1) + v(n)$, where $\{v(n)\}$ is a white noise sequence with variance $\sigma_v^2 = 0.49$ and $\{w(n)\}$ is a white noise sequence with variance $\sigma_w^2 = 1$. The processes $\{v(n)\}$ and $\{w(n)\}$ are uncorrelated. Design a Wiener filter of length $M = 2$ to estimate $\{s(n)\}$. **[8]**

SECTION - II

Q7) a) Explain how estimation of the autocorrelation and power spectrum of random signals can be done using periodogram. **[8]**

b) Compare the salient features of the following : **[8]**
   i) Welch's method of power spectrum estimation.
   ii) Barllott's method of power spectrum estimation.

OR

Q8) a) Explain the use of DFT in power spectrum estimation. **[8]**

b) What is non-parametric power spectrum estimation? Compare the performance characteristics of non-parametric power spectrum estimator. **[8]**

Q9) a) What is Barrel shifter? What is its role? **[6]**

b) How will you select a digital signal processor? **[6]**

c) Explain the term 'zero overhead looping'. **[6]**

Q10) a) Highlight the major differences between the application areas of fixed point DSP processor & floating point DSP processor. **[8]**

b) Explain the Harvard architecture used for signal processing with the help of neat block diagram. Explain the modified Harvard architecture also.**[10]**

Q11) a) Describe the mechanism of human speech production with the help of a neat sketch. **[8]**

b) Explain the following terms : **[8]**
  i) Channel vocoders.
  ii) Sub-band coding.

Q12) a) Define the following : **[8]**
  i) Vowels.
  ii) Consonents.
  iii) Nasals.
  iv) Dipthongs.
  v) Formats.
  vi) Fundamental frequency.

b) Explain the following : **[8]**
  i) Homomorphic processing for speech.
  ii) Voiced sound and unvoiced sound.

✳ ✳ ✳

P1123

[3964]-248

B.E. (E & TC)

ARTIFICIAL NEURAL NETWORKS

(2003 Course) (Elective - I) (404218) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

  1)   Answer three questions from Section I and three questions from Section II.
  2)   Answers to the two sections should be written in separate books.
  3)   Neat diagrams must be drawn wherever necessary.
  4)   Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
  5)   Assume suitable data, if necessary.

SECTION - I

Q1) a) Compare Biological Neural Networks with computer.   **[6]**

  b) Explain the additive and shunting models of activation models.   **[6]**

  c) Explain the following in detail :   **[6]**

   i)   Hebbian learning.
   ii)   Competitive learning.
   iii) Stochastic learning.

OR

Q2) a) Explain the main differences among the three models of artificial neuron namely McCulloch-Pitts, perceptron and Adaline.   **[8]**

  b) Fig. 1 implements McCulloch Pitts models neurons. Calculate and tabulate the o/ps of the N/W for all combination of i/ps.   **[10]**
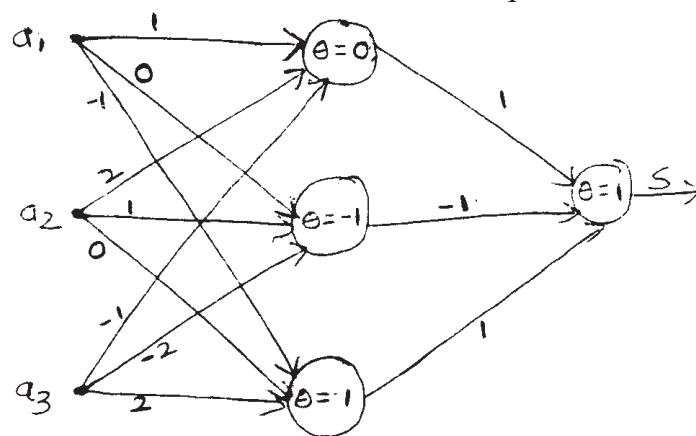
Fig1 A Feedforward
N/w with MP neurons

Q3) a) Explain the architecture of Adaline and explain the various steps involved in the training of Adaline N/W. **[8]**

b) Explain the architecture of single layer perceptron and the training algorithm used in perceptron. **[8]**

OR

Q4) a) Derive LMS Adaline law. **[6]**

b) With reference to Back propagation Networks explain : **[10]**
   i) How are weights initialized?
   ii) Per pattern learning and per epoch (or batch mode) learning.
   iii) Choice of learning rate.
   iv) Momentum.

Q5) a) Draw the architectural diagram of the Boltzmann machine and explain it. **[6]**

b) State the application algorithm used in Boltzmann machine. **[7]**

c) Explain simulated annealing. **[3]**

OR

Q6) a) What is state transition diagram for a feedback network? Explain how to derive it for a given Network. **[12]**

b) What are pattern storage networks. **[4]**

SECTION - II

Q7) a) Explain the training algorithm for ART 1 Network. **[8]**

b) Construct a maxnet with 4 neurons and inhibitory weights $\in = 0.2$. The initial activations are
$a_1(0) = 0.3, a_2(0) = 0.5, a_3(0) = 0.7 \ a_4(0) = 0.9$ **[8]**

c) Explain clustering. **[2]**

OR

Q8) a) Explain Simple competitive learning with the algorithm. **[6]**

b) Explain the training algorithm used in LVQ1. **[6]**

c) Explain the training algorithm used in SOM. **[6]**

Q9) a) Explain the principle of Neocognitron for pattern variability task. **[8]**

b) Explain PCA with the algorithm. **[8]**

OR

Q10) a) Explain the difference between auto associative, hetero associative and bidirectional associative memory net. **[8]**

b) What is the distinction between pattern classification and function approximation tasks. **[4]**

c) How Radial basis function can be used for function approximation problem. **[4]**

Q11) a) What is a time delay neural network architecture? How is it suitable for classification of CV segments. **[8]**

b) Explain applications of Neural Networks in control system field. **[8]**

OR

Q12) a) Explain how neural Network approaches are useful for a texture classification problem. **[8]**

b) What are some direct applications of the principles of neural Networks. Why all they called direct applications. **[8]**

✷ ✷ ✷

P1124

[3964]-249

B.E. (E & TC)

ROBOTICS & INDUSTRIAL AUTOMATION

(2003 Course) (404218) (Elective - I) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

    1)   Answer any three questions from each section.

    2)   Neat diagrams must be drawn wherever necessary.

    3)   Assume suitable data, if necessary.

SECTION - I

Q1) a) A point $P(7, 3, 2)^T$ is attached to a tool tip frame $((\bar{n}, \bar{o}, \bar{a})$ and is subjected to the transformations as given below. Find the coordinates of the point relative to the reference frame at the conclusion of transformations.**[10]**

    i)   Rotation of 90º about the Z axis.

    ii)   Rotation of 90º about the Y axis.

    iii) Followed by a translation of [4, –3, 7].

  b) What is work space?   **[6]**

    For the two link planar manipulator as shown in figure 1, the first link is twice the second link. Sketch the reachable workspace if

        $0 < \theta_1 \leq 360º$

        $0 < \theta_2 \leq 360º$
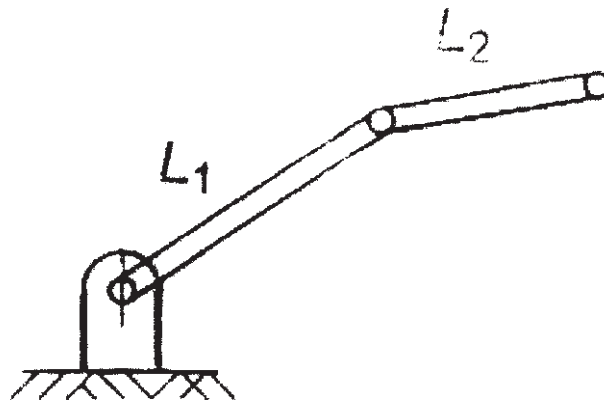
Figure 1

Q2) Differentiate [16]

    a) Continuous path motion and point to point motion.

    b) Open loop control and closed loop control of the Robot.

    c) Single acting cylinder and double acting cylinder.

    d) Internal sensors & external sensors.

Q3) For the three degree freedom, articulated arm (as shown in figure 2) using D-H algorithm find transformation matrix 'T'. [16]
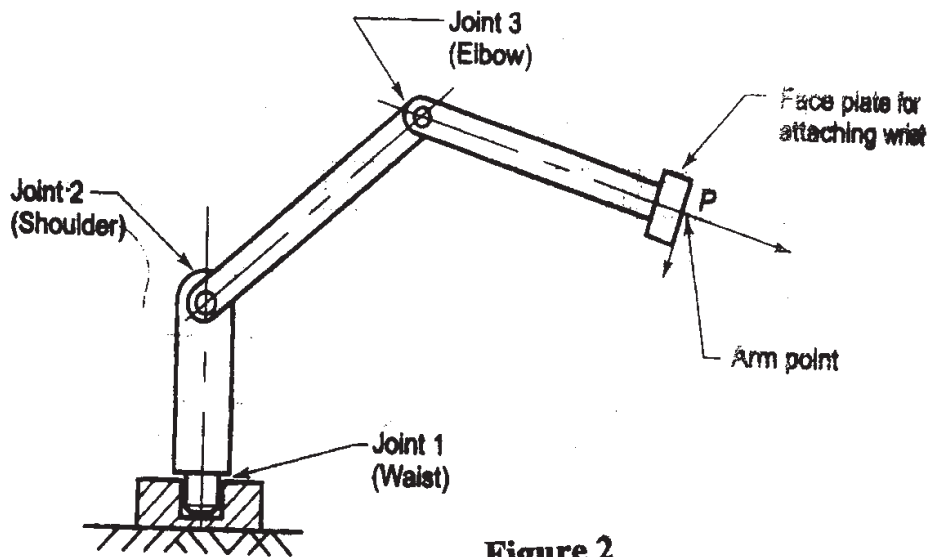

Figure 2

Q4) a) Explain working of electric gripper. State its applications, advantages and disadvantages. [8]

    b) With suitable diagram explain Yaw, Pitch and Roll Motion of Wrist. [8]

Q5) Write short notes on : [18]

    a) D.C. Servomotor control for Robot.

    b) Use of gear mechanism in Robotics.

    c) Intelligent Robot.

SECTION - II

Q6) a) With neat diagram explain Robot vision system. Give its applications. [8]

    b) What is segmentation of the Image? Explain any two segmentation methods. [8]

Q7) a) What is trajectory? Explain following terms related to trajectory planning.

[8]

     i)   Knot points or via points.

     ii)   Joint space trajectory planning.

     iii) Cartesian space trajectory planning.

   b) The second joint of a SCARA manipulator is required to move from $\theta_2 = 30°$ to $105°$ in five seconds. Find the cubic polynomial to generate the smooth trajectory for the joint. **[8]**
Assume start & end velocity zero.

Q8) a) Explain following terms : **[8]**

     i)   Off-line programming.

     ii)   Continuous path programming.

     iii) Teaching a Robot.

     iv) Task level programming.

   b) For a mobile Robot, it is necessary to avoid collision with obstacles. Suggest suitable sensor for this purpose. Explain its working. **[8]**

Q9) a) Explain how optical encoders are used to get Robot position and velocity. Give advantages and disadvantages of it. **[8]**

   b) What is tactile sensor? Explain working of tactile sensor **[8]**

Q10) a) Give advantages and disadvantages of electric Robot over the pneumatic Robot.

   b) Explain any rotary to linear motion conversion technique.

   c) What is MEMs technology ? State its applications.

[18]

✳ ✳ ✳

[3964] -253

B.E. (E&TC)

ADVANCED COMMUNICATION SYSTEM

(New) (2003 Course) (404225) (Elective - II) (Sem. - II)

Time : 3 Hours] *[Max. Marks:100*

Instructions to the candidates:

1) *Answer from Section I Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, from Section II Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.*
2) *Answers to the two sections should be written in separate answer books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain the amplification mechanism used in Erbium-doped fiber amplifier in detail & Draw the possible configuration of EDFA. **[8]**

b) A product sheet for a 2x2 single-mode biconical tapered coupler with a splitting ratio of $\frac{40}{60}$ states that the insersion losses are 2.7 dB for the 60-percent channel & 4.7 dB for the 40 - percent channel. **[6]**

   i) If the input power $P_0 = 200$ μW, find the output levels P_1 & P_2.

   ii) Find the excess loss of the coupler.

   iii) From the calculated values of P_1 & P_2 verify that the splitting ratio is $\frac{40}{60}$

c) Explain the key system feature of WDM. **[2]**

OR

Q2) a) Explain various types of Tunable filters used in optical Network in detail. **[8]**

b) Consider an InGaAsP semi conductor optical amplifier with active area width of 5 μM & active area thickness of 0.5 μM. If the group velocity of incident light $V_g = 2 \times 10^8$ m/s. If a 1.0 μW optical signal at 1550 nm enters the device, calculate the photon density in SOA.

   i) If a 100-mA bias current is applied to the device & if the Amplifier length is 500 μM. Calculate the pumping rate.

P.T.O.

ii) If the confinement factor is 0.3, the time constant (Z_r) is 2hs. The gain coefficient & threshold density are $2 \times 10^{-20} m^2$ & $1.0 \times 10^{24} m^{-3}$ respectively. Calculate the zero signal gain for SOA. **[8]**

Q3) a) Explain the basic setup for measuring optical amplifier gain & EDFA noise figure using the optical spectrum Analyzer. **[8]**

b) Compare the power budget of three linear buses having 5, 10 & 50 stations respectively. Assume that G i.e the fraction of power that is removed from the bus & delivered it detector port is 10%. Calculate tap losses & throughput coupling losses.

If stations are relatively close to each other say 500m & with an attenuation of 0.4 dB/km at 1300 nm. Calculate fiber loss.

If the intrinsic loss $Li = 0.5$ dB &
connector loss $Le = 1.0$ dB. Calculate total losses. **[8]**

OR

Q4) a) Explain in detail the architecture of a four fiber bidirectional line switched SONET ring. With the reconfiguration under transiever or line failure. **[8]**

b) Explain various types of ultra high capacity optical networks. **[8]**

Q5) a) What are Kepler's three laws of planetary motion? Give the mathematical formulation of Kepler's third law of planetary motion. What do the terms pevigee & apogee mean when used to describe the orbit of a satellite orbiting the earth? **[9]**

b) An earth station situated in pune needs to calculate the 100 K angles to a geo stationary satellite INSAT 4A with satellite longitude of 83ºE. The details of the earth station are as – Earth station latitude & longitude is 18.5317º & 73.8391º. **[9]**

OR

Q6) a) Explain in detail different types of Transponders used in any satellite communication system. **[8]**

b) A low earth orbit satellite is in a circular polar orbit with an attitude 'h' of 1000 km. A transmitter on satellite has a frequency of 2.65 GHz. Find

i) The velocity of the satellite in the orbit.

ii) The component of velocity toward an observer at an earth station as the satellite appears over the horizon, for an observer who is in the plane of the satellite orbit.

iii) Find the Doppler shift of the received signal at the earth station. Use mean earth radius value, Ve of 6378 km. The sattellite also carries a ka-band transmitter at 20.0 GHz.

iv) Find the Doppler shift for this signal when it is received by the same observer. **[8]**

c) What are the important orbital elements for a satellite revolving around the earth? **[2]**

SECTION - II

Q7) a) A satellite link achieves a C/N ratio in the receives under clear air conditions of 14.0 dB. The receives has a RRC filter with a noise bandwidth of 1.0 MHz & a roll-off factor of 0.3 with ideal correlation detection BPSK & QPSK demodulator. What are the bit rate, symbol rate, occupied (absolute) bandwidth of the link & BER when the link is operated.

i) With BPSK modulation &

ii) With QPSK modulation

If rain attenuation on the link causes the received signal to be attenuated by 3 dB, what are new BER values for BPSK & QPSK modulation? Assume that ideal RRC filter are used. **[8]**

b) Explain what is pre-emphasis & de-emphasis in frequency modulation with their characteristics. **[8]**

OR

Q8) a) Explain with block schematic the QPSK modulator & Demodulator in detail. Draw QPSK variants. **[8]**

b) A C-band satellite link sends a single NTSC-TV signal through a 36 MHz transponder on a C-band GEO satellite. The NTSC video signal is modulated onto the carrier using wideband FM & the bandwidth of the transmitter RF signal is 32 MHz. The baseband bandwidth of TV signal is 4.2 MHz.

i) Calculate peak frequency deviation of the FM carrier using Carson's Rule.

ii) Calculate the unweighted FM improvement factor for the video signal.

iii) Overall C/N in an earth station receiving the FM-TV transmission is 17 dB. What is the unweighted video S/N ratio at baseband?

iv) De-emphasis & weighting factors improve the quality of C/N ratio by subjective factor of 17 dB. What is the weighted S/N of the baseband video signal. **[8]**

Q9) a) Draw the block schematic & its equivalent noise analysis circuit for the simplified earth station of satellite receiver & Derive the system noise temperature for above system. **[8]**

b) A direct broadcast television (DBS-TV) satellite is in Geostation any orbit at 100º west longitude. It carries 16 transponder, each with a saturated output power of 200 W & a bandwidth of 25 MHz. The antenna on the satellite has a gain (on-axis) of 34 dB.

The receiving terminals all use antennas with a circular aperture with a diameter of 18 inches. & an aperture efficiency of 65%. The Noise bandwidth of the digital TV receiver is 20 MHz. Use a distance to the GEO satellite of 38,500 km.

i) Calculate free space path loss & the receiving terminal antenna gain at 12.2 GHz.

ii) Draw up link budget for the down link from the satellite to an earth station on the 3dB contour of the satellite antenna beam. Assume that the satellite transmits at a power level of 18W. Include a clear air atmospheric loss of 0.5dB & miscellaneous losses of 1.2 dB in your down link budget.

iii) The receiving terminal has a system noise temp. of 110K in clear air. Draw up a noise power budget for the receiver using receiver's noise bandwidth.

iv) Calculate clear C/N ratio for the receiver with a noise B.W of 20 MHz.

The minimum permissible C/N ratio is 10.0dB. What is clear air link margin. **[10]**

OR

Q10) Geostationary at 73º W longitude 28-C band transponder, 3.2 kW RF power output, antenna gain on axis C band (transmit & receive) = 31dB. Receive system noise temperature = 500 K, transponder saturated output power = 40 W, Transponder band width = 36 MHz.

FM-TV analog signal to be received in a band width of 27 MHz, multiplexed digital TV signals transmitted as QPSK with symbol rate 27 MSPS using half rate FEC with coding gain of 5.5 dB.

Minimum permitted C/N overall = 9.5 dB

a) Design a transmitting earth station to provide a clear air C/N of 26 dB in a C band transponder at a frequency of 6.28 GHz. Use an uplink antenna with a diameter of 9m & an aperture efficiency of 68% & find the uplink transmitter power required to achieve the required C/N ratio. The uplink station is located at 2dB contour of the satellite foot print. Allow 0.5dB on the uplink for miscellaneous & other losses.

b) Design a C band receiving earth station to provide an overall clear air C/N of 13dB in a 27 MHz. If noise bandwidth at a carrier frequency of 4.06 GHz. The antenna noise temp. is 20 K & LNA noise temp. is 55K. The C band satellite transponder is operated with 1 dB output back off. Determine the diameter of the receiving antenna. The receiving terminal is located on the 3dB counter of satellite foot print & clear air attenuation on path & other losses total 0.5 dB.

c) Under conditions of heavy rain, the C-band uplink path attenuation is 2dB.

Calculate the overall C/N & the uplink margin of system. Under conditions of heavy rain, the C band downlink path attenuation is 1.5 dB. Calculate overall C/N & downlink margin of the system. **[18]**

Q11) a) Explain in detail the Network architecture of VSAT system. **[8]**

b) A TDMA Network of five earth stations shares a single transponder equally. The frame duration is 2.0 ms. The preamble time per station is 20 μsec & gaurd bands of 5 μsec are used between the bursts. Transmitters bursts are QPSK at 30 M band.

Calculate the no.of 64 kbps voice channels that each TDMA earth station can transmit. If the earth station send data rather than digital speech, what is transmission rate of each earth station in Mbps? What is the efficiency of the TDMA system? **[8]**

OR

Q12) a) Explain in detail the block schematic of Direct-broad cast satellite television receiver. **[8]**

b) Explain the block schematic of VSAT earth station in detail. What types of antennas are used in VSAT earth station. **[8]**

✪✫✪✫

P1129

[3964] -254
B.E. (E&TC)
DIGITAL IMAGE PROCESSING
(2003 Course) (404225) (Elective - II) (Sem. - II)

Time : 3 Hours]   *[Max. Marks:100*

Instructions to the candidates:

    1)   Answer any three questions from each section.

    2)   Answers to the two sections should be written in separate answer books.

    3)   Figures to the right indicate full marks.

    4)   Neat diagram must be drawn wherever necessary.

    5)   Assume suitable data if required.

SECTION - I

Q1) a) What is distance function? For what purpose it is required? Explain different distance functions generally used in image processing.

    b) Image is filtered using box filter repeatedly, what effect it will make on edges?

    c) When we enter in cinema hall, for short period we are not able to see anything, but with some time we can see the things inside. Explain the reason.

                                                                       [18]

OR

Q2) a) Explain subtractive color model.

    b) 'For color image processing instead of RGB, YUV or HSI model is preferred' Justify the statement.

    c) What is pseudo-coloring? State its application.

                                                                        [18]

Q3) a) Explain histogram equalization. Why it is required?   **[8]**

    b) For the four bit (4 x 4) image given below plot the histogram. What change it will make on histogram of the image if,   **[8]**

    i) Image is negated

    ii) Histogram equalization is applied

15	10	12	10
10	10	10	8
8	8	8	8
8	8	6	6

<div align="center">OR</div>

Q4) a) What is image smoothening? What are the properties of Gaussian filter that makes it useful for image smoothening. **[8]**

b) 4 x 4 gray-scale original image passes through spatial linear shift-invariant filter, Compute filtered image **[8]**

0	½	0
0	0	0
0	½	0

<div align="center">Filter</div>

12	10	8	6
10	8	6	4
8	6	4	2
6	4	2	0

<div align="center">Input image</div>

Q5) Write short notes on : **[16]**

a) Image degradation model.

b) Image restoration.

<div align="center">OR</div>

Q6) Write short notes on : **[16]**

a) High boost filter.

b) Monochrome vision model.

<div align="center">**SECTION - II**</div>

Q7) a) Explain **[8]**

i) Bit plane coding.

ii) Run length coding.

b) With the help of block diagram explain lossy predictive coding. **[8]**

<div align="center">OR</div>

Q8) a) 4 x 4 image is represented by following matrix

20	40	40	50
10	40	50	50
30	40	50	50
40	40	50	50

Generate a simple Huffman code for gray levels in the image. Find compression achieved. **[8]**

b) Explain principal of bit allocation in transform coding. **[8]**

Q9) a) Compare following image transforms based on energy compaction, computation efforts, separabillity and application. **[8]**

        i)   K-L transform.

        ii)   Discrete cosine transform.

        iii)   Hadamard transform.

    b) Write a short note on Haar transform. **[8]**

<div align="center">OR</div>

Q10) a) Write the equation for Walsh transform for two dimensional image and obtain the Walsh basis image for N = 4. **[8]**

    b) Explain application of K - L transform for principal component analysis. **[8]**

Q11) Write short notes on : **[18]**

    a) Edge detection and boundary linking.

    b) Morphological opening and closing.

<div align="center">OR</div>

Q12) a) Explain how Fourier descriptor can be used for boundary representation. **[9]**

    b) Explain fingerprint recognition using image processing. **[9]**

<div align="center">✪✰✪✰</div>

[3964] -255
B.E. (E&TC)
BIOMEDICAL ENGINEERING
(Sem. - II) (2003 Course) (Elective - II) (404225)

Time : 3 Hours] *[Max. Marks:100*

Instructions to the candidates:

1) *Answers to the two sections should be written in separate answer books.*
2) *Neat diagrams must be drawn wherever necessary.*

SECTION - I

Q1) a) Draw the block schematic of man-instrument system. Explain the functioning of the different blocks with necessary waveform. **[8]**

b) Explain the process of polarization, depolarization and repolarization related to human cell. **[8]**

OR

Q2) a) Name the types of electrodes used for ECG. Explain any one with diagram. **[8]**

b) Explain the temperature sensors used in medical applications. **[8]**

Q3) a) Explain the cardiovascular system with the blood flowing through the heart. **[8]**

b) Give the important specifications of ECG amplifier. **[6]**

c) Explain systole and diastole. **[2]**

OR

Q4) a) Draw the block diagram of ECG machine and explain the working of the different blocks. **[8]**

b) What are the different methods of Blood flow measurement. Explain any one with necessary diagram. **[8]**

Q5) a) Explain the working principle of photocardiography with necessary diagram to show the position of atrium and ventricle. **[8]**

b) Draw the block diagram of Bedside monitors explain the parameters that can be measured by bedside monitor. **[10]**

Q6) a) What is pacemaker. Name the types of pacemaker available. Explain any one in detail. **[8]**

b) Explain the different grounding technique used in medical instruments. **[10]**

SECTION - II

Q7) a) Draw the practical setup of flame-photometer and explain the emission system, optical system and recording system. **[8]**

b) State the working principle of colorimeter. Explain the operation of multi-channel colorimeter with necessary diagram. **[8]**

OR

Q8) a) Explain the complete blood gas analyzer with the help of block diagram.**[8]**

b) What is the difference between CRO and Non-fade CRO. **[4]**

c) Give the specification of mediscope. **[4]**

Q9) a) With the help of neat sketch explain how preamplification of signals is done in electroencephalography. Also explain how the gain of EEG machine is controlled. **[8]**

b) With the help of blocks schematic explain how EMG recording is done. Also explain the role of low frequency and high frequency filters. **[8]**

OR

Q10) a) What are the different components of central nervous system? Explain in detail. **[8]**

b) Name the different types of EEG amplifier and explain what factors are considered while designing the EEG amplifier. **[8]**

Q11) a) Explain the working principle of MRI. **[8]**

b) Draw the block diagram of MRI machine and describe how MRI scanner work. **[10]**

OR

Q12) a) Explain how lasers are used in vision correction. **[8]**

b) Explain the technique of producing CT images with necessary diagram. **[10]**

✪✩✪✩

P1131

[3964] -256
B.E. (E&TC)
AUDIO - VIDEO ENGINEERING
(Sem. - II) (404225) (2003 Course) (Elective - II)

Time : 3 Hours]   *[Max. Marks:100*

Instructions to the candidates:

1) *Answer any three question from each section.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of electronic pocket calculator is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Draw a neat sketch of composite video signal. Indicate the numerical values for different timing for various pulses used in CCIR-B standard. What is the necessity to these pulses? **[6]**

b) Explain the construction of a CCD imager. State the different methods of charge transfer and explain any one in detail. **[8]**

c) State the different specifications of CCIR-B standard for color TV.**[4]**

OR

Q2) a) Describe the working of an LCD TV display using schematic diagram. **[6]**

b) Explain the significance of following terms with reference to TV

   i) Horizontal resolution.

   ii) Vertical resolution.

   iii) Kell factor.

   iv) Aspect ratio. **[6]**

c) Explain the construction and working of SATICON tube. **[6]**

Q3) a) Compare NTSC, PAL and SECAM system. **[6]**

b) Explain with the help of block schematic the facilities provided in a wobbuloscope and explain its use in alignment of RF tuner, video IF amplifier and sound IF amplifier. **[10]**

Q4) a) Explain the terms :

    i)   Chroma signal

    ii)   Color burst signal

    iii) hue and saturation

    iv) brightness.   **[8]**

    b) Draw the block diagram of color TV receiver and explain function of each block.   **[8]**

Q5) a) State the advantages of digital TV. Also explain the different digital TV signals in detail.   **[8]**

    b) What are the objectives of MPEG-2 standard? Explain the term bit stream scalability.   **[5]**

    c) How does duo-binary coding scheme reduces the bandwidth requirement?   **[3]**

OR

Q6) a) Draw the neat block diagram of digital TV receiver and explain the function of each block.   **[8]**

    b) What is the need of MAC encoding? Explain the general format of MAC signal for transmitting color TV signals.   **[8]**

SECTION - II

Q7) a) Explain HDTV transmitter using neat block diagram.   **[8]**

    b) What is set-top box? Draw the neat block diagram of set-top box and explain the function of each block.   **[6]**

    c) Calculate the bandwidth of HDTV system using 1125 lines and aspect ratio of 16 : 9, scanning at 60Hz with 2 : 1 interlace.   **[4]**

OR

Q8) a) Explain 3D- sterioscopic TV techniques in detail.   **[8]**

    b) Write short notes on (Any Three) :

    i)   Video on demand.

    ii)   Interactive TV.

    iii) CATV.

    iv) Digital satellite TV.   **[10]**

Q9) a) What is the relationship between gap size, tape speed and frequency of audio signal in case of magnetic recording on tape? Explain the importance of relationship to get optimum o/p for audio bandwidth.**[8]**

b) Explain CD recording and reproduction with the help of block diagram.

[8]

OR

Q10) a) What is the need of biasing? Explain the different methods of biasing with their advantages and drawbacks. **[8]**

b) Describe with a neat diagram variable density method for sound recording on photographic film. **[8]**

Q11) a) Explain the satellite radio receiver system with block diagram. **[8]**

b) Explain the necessity of acoustical design for an auditorium & how it can be implemented. **[8]**

OR

Q12) a) Explain working principle of a chordless microphone PA system. State the type of modulation technique used in this system. **[8]**

b) Explain the following terms :
i) Sound reduction Index (SRI)
ii) Special types of speakers
iii) Reverberation
iv) Phase delay. **[8]**

✪✫✪✫

P1132

[3964] -257
B.E. (E&TC)
SYSTEM PROGRAMMING & OPERATING SYSTEMS
(2003 Course) (404225) (Sem. - II) (Elective - II)

Time : 3 Hours]   *[Max. Marks:100*

Instructions to the candidates:

1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, from section I Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 section II.*
2) *Answers to the two sections should be written in separate answer books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What are different language processing activities? Give the details of each activity. **[8]**

   b) Draw block diagram of complier phases & give function of each phases in brief. **[8]**

OR

Q2) a) Give the machine dependent & machine independant phases of complier & Explain why these phases are machine dependant & independant?**[8]**

   b) Write short note on different components of language processor. **[8]**

Q3) a) What are different types of errors can be detected by assembler? State with examples pass-I & pass - II errors. **[8]**

   b) What are Macros? Explain the different feature of a macro. **[8]**

OR

Q4) a) Explain advantages & disadvantages of single pass assembler with example. **[8]**

b) Explain the features of nested macro calls. **[8]**

Q5) a) Name various types of loader & enlist the function of each in brief. **[8]**

b) What are different feature of MS-DOS linker. **[4]**

c) Explain the absolute loader in brief. **[6]**

OR

Q6) a) What are the data pase that are required during the pass - I & pass - II of direct linking loader? Explain. **[8]**

b) Explain : **[10]**
   i) Subroutine linkers.
   ii) Relocation loader.

SECTION - II

Q7) a) Give the services provided by O.S. & discuss operating system structures. **[8]**

b) What is dead locks? How it can be detected & avoided? Explain. **[8]**

OR

Q8) a) Explain processor management in connection with process control & interacting processes. **[8]**

b) Explain How process synchronization is achieved in operating system. **[8]**

Q9) a) Explain Memory Fragmentation in computer system. **[8]**

b) Explain virtual memory using paging. **[8]**

OR

Q10) a) Write note on non-contignous memory allocation. **[8]**

b) Write short note on :
   i) File sharing
   ii) File system reliability. **[8]**

Q11) a) What are different feature of physical IOCS? Discuss the functions of PIOCS. **[10]**

b) Explain the concept of advanced IO programming. **[8]**

<div align="center">OR</div>

Q12) a) Explain io time, access time, & transfer time for magnetic tape, curtridges & disks. **[10]**

b) Explain devices driver for USB. **[8]**

<div align="center">✪✡✪✡</div>

P1134

[3964] - 263

B.E. (Instrumentation & Control)
DIGITAL CONTROL
(2003 Course) (406263) (Sem. - I)

Time : 3 Hours] [*Max. Marks : 100*

Instructions to the candidates:

1) Answer any three questions from each section.
2) Answers to the two sections should be written in separate books.
3) Neat diagrams must be drawn wherever necessary.
4) Use of logarithmic tables, slid rule, Mollier chart, electronic pocket calculator and steam tables is allowed.
5) Assume suitable data, if necessary.

SECTION - I

Q1) a) Derive the pulse transfer function of the closed loop control system shown by Fig. 1 **[8]**
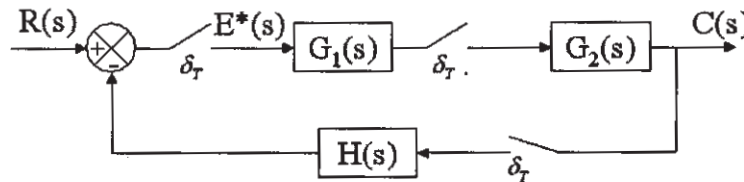

Fig. 1

b) Examine the stability of the system whose closed loop characteristic equation P(z) given below using Jury stability test. **[8]**
$$P(z) = z^4 - 1.5z^3 + 0.5z^2 + 0.3z - 0.008$$

OR

Q2) a) Obtain the pulse transfer function of the system shown in Fig. 2 **[8]**
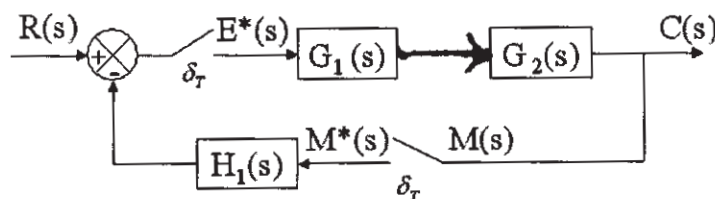

Fig. 2

P.T.O.

b) Examine the stability of the system whose closed loop characteristic equation P(z) given below using Bilinear transformation. **[8]**

$$P(z) = z^4 - 1.1z^3 + 0.6z^2 + 0.5z - 0.07$$

Q3) a) Explain the concept of design of digital controller for minimum settling time with zero steady state error (Deadbeat controller). State the characteristics of Deadbeat controller. **[10]**

b) Explain velocity and position form of PID Controller. State the advantages of velocity form over position form of PID algorithm. **[8]**

OR

Q4) a) Obtain the state transition matrix of the following discrete time system.

$$\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -0.32 & -1.2 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix} + \begin{bmatrix} 1 \\ 1 \end{bmatrix} u(k) \text{ and} \qquad \textbf{[10]}$$

$$y(k) = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix}.$$

b) Obtain the state model of following system using cascade programming.

$$H(z) = \frac{(z+1)(z+3)}{(z-1)(z+2)(z-3)} \qquad \textbf{[8]}$$

Q5) a) Determine the stability of the equilibrium state of the following system. **[8]**

$$\dot{x}_1 = -x_1 - x_2$$
$$\dot{x}_2 = x_1 - 2x_2$$

Also find the Liapunov function.

b) Diagonalize the following matrix **[8]**

$$G = \begin{bmatrix} 1 & 1 & 2 \\ 0 & 1 & 3 \\ 0 & 0 & 2 \end{bmatrix}$$

OR

Q6) a) Determine the stability of the origin of the following system [8]

$$\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ -0.5 & -1.2 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix}$$

Also find the Liapunov function.

b) Explain the concept of ringing of poles. Consider a transfer function

of digital controller $D(z) = \dfrac{K(1-0.8z^{-1})}{(1+0.9z^{-1})(1-z^{-1})(1-0.7z^{-1})}$

Obtain the modified transfer function of the controller by minimizing the ringing effect. [8]

SECTION - II

Q7) a) Find the pulse transfer function matrix of following system [8]

$$\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \end{bmatrix} = \begin{bmatrix} -4 & 1 \\ -3 & 0 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix} + \begin{bmatrix} 1 \\ 5 \end{bmatrix} u(k) \text{ and } y(k) = \begin{bmatrix} 1 & 0 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix}.$$

b) Define the complete output controllability of the system. Derive the necessary and sufficient condition for the system to be completely output controllable. [10]

OR

Q8) a) Using Cayley-Hamilton Theorem obtain the state transition matrix of the discrete time system whose state matrix is [8]

$$G = \begin{bmatrix} 0 & 1 \\ -0.16 & -1 \end{bmatrix}$$

b) What is the condition for complete observability of system in z-plane? Check the observability of the following system in z-plane. [10]

$$\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \\ x_3(k+1) \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -6 & -11 & -6 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \\ x_3(k) \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} u(k) \text{ and}$$

$$y(k) = \begin{bmatrix} 4 & 5 & 1 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \\ x_3(k) \end{bmatrix}$$

Q9) a) Consider the system $x(k + 1) = Gx(k) + Hu(k)$ and $y(k) = Cx(k)$ where

$$G = \begin{bmatrix} 0 & -0.24 \\ 1 & -1 \end{bmatrix}, H = \begin{bmatrix} 0 \\ 1 \end{bmatrix} \text{ and } C = \begin{bmatrix} 0 & 1 \end{bmatrix}$$ **[8]**

Design a full order observer, if the desired eigen values of the observer matrix are $z = 0.5 \pm j0.5$.

b) Consider the system **[8]**

$$\begin{bmatrix} x_1(k+1) \\ x_2(k+1) \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ -4 & -3 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix} + \begin{bmatrix} 2 \\ 1 \end{bmatrix} u(k) \text{ and } y(k) = \begin{bmatrix} 1 & 1 \end{bmatrix} \begin{bmatrix} x_1(k) \\ x_2(k) \end{bmatrix}.$$

It is desired that the error vector exhibits deadbeat response. Find observer feedback gain matrix K_e.

OR

Q10) Explain the internal model control (IMC) strategies. Design IMC for the system with transfer function **[16]**

$\tilde{G}_p(s) = \dfrac{3e^{-3s}}{1+16s}$. Also convert it into conventional controller with approximate

dead time as $e^{-Ds} = \dfrac{1 - \dfrac{Ds}{2}}{1 + \dfrac{Ds}{2}}$.

Q11) Consider the discrete time control system defined by **[16]**

$$x(k+1) = 0.286x(k) + 0.714u(k) \text{ and } x(0) = 1$$

Determine the optimum control low to minimize the performance index

$$J = \frac{1}{2}\left[x(10)^2\right] + \frac{1}{2}\sum_{k=0}^{9}[x^2(k)+u^2(k)].$$

OR

Q12) What is system identification? What is its purpose? What are the different parametric methods of system identification? Explain any two with suitable mathematical model. **[16]**

❖ ❖ ❖ ❖

P1135   **[3964]-264**

B.E. (Instrumentation & Control)
BIOMEDICAL INSTRUMENTATION
(2003 Course) & (1997 Course) (406264) (Elective - I) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

    1)   Answer three questions from Section I and three questions from Section II.

    2)   Answers to the two sections should be written in separate books.

    3)   Neat diagrams must be drawn wherever necessary.

    4)   Assume suitable data, if necessary.

SECTION - I

Q1) a) Define offset potential, action potential, resting potential, evoked potential.
    [8]

    b) Explain electrode offset potential? How effect of electrode offset potential is overcome. Explain the various properties that bio electrode should possesses.
    [8]

OR

Q2) a) Why silver chloride electrode is suitable in biomedical applications? State the properties possess by bioelectrodes.
    [8]

    b) Define and discuss the term "biosensors".
    [8]

Q3) a) Explain different chambers of heart. Explain an electrical conduction system of heart.
    [8]

    b) Design a heart rate meter for rate & rhythm measurement.
    [8]

OR

Q4) a) Describe heart valves and their functions, subsequently generated heart sound.
    [8]

    b) State the specifications of ECG recorder.
    [8]

Q5) a) Explain the dye dilution method of cardiac output measurement.
    [8]

    b) Discuss Doppler shift ultrasonic blood flow measurement along with neat diagram.
    [10]

OR

Q6) a) Enlist two important techniques used in sphygmomanometer BP measurement. Explain the same method of BP measurement along with its advantages and disadvantages. **[10]**

b) Discuss Magnetic blood flow measurement along with neat diagram. **[8]**

SECTION - II

Q7) a) Draw and explain various parts of Brain. **[8]**

b) Draw and explain the structure of neuron. **[6]**

c) What is biofeedback? **[2]**

OR

Q8) a) Explain 10-20 electrode placements for EEG recording. **[8]**

b) Explain various EEG recording modes. **[8]**

Q9) a) Explain the role of cones and rods in human vision. **[4]**

b) Enlist various ophthalmic instruments and briefly explain instrument used for measurement of IOP. **[8]**

c) Explain various errors in vision and their method of correction. **[4]**

OR

Q10) a) What are three main sections of Human auditory system? Explain the impedance matching in human hearing phenomenon. **[10]**

b) What is the main organ responsible for frequency discrimination in human auditory system? **[6]**

Q11) a) What is Spirogram? Draw and explain Wedge Spirometer for respiratory measurement. **[10]**

b) Draw and explain Thermal conductivity analyzer. **[8]**

OR

Q12) a) Explain the various methods of accident prevention in medical equipments. **[8]**

b) State the condition of patient at which support of ventilator is essential? What is role of nebulizers and aspirators in ventilator? **[10]**

✳ ✳ ✳

P1136

[3964] - 265
B.E. (Instru. & Control)
INSTRUMENTATION FOR ENVIRONMENTAL ENGINEERING
(2003 Course) (406264 (2)) (Elective - I) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) Attempt any three questions from each section.
2) Figures to the right indicate full marks.
3) Programmable calculators are not allowed.
4) Neat diagrams must be drawn wherever necessary.
5) Assume suitable data, if necessary.

SECTION - I

Q1) Enlist spectroscopic methods for pollution analysis. Explain atomic absorption spectroscopy in detail.   **[16]**

OR

Q2) Enlist modern methods of qualitative analysis of pollution. Explain classical & volumetric methods.   **[16]**

Q3) a) Explain vibrational and Altitude Environmental Testing.   **[10]**

   b) Describe an Ecological Risk Assessment Paradigm.   **[6]**

OR

Q4) a) Discuss on Dry heat & Dry cold testing.   **[10]**

   b) Write a note on ISO 14001 standard.   **[6]**

Q5) a) What are effects of air pollution on materials.   **[8]**

   b) A multitray setting chamber having 8 trays including the bottom surface handles 6 m^3/s of air at 20°C. The trays are spaced 0.25 m apart & the chamber is to be 1 m wide & 4m long. What is the minimum particle size of density for 2000 kg/m^3 that can be collected with 100% efficiency? What will be efficiency of settling chamber if 50 μm particles are to be removed? Given μ_s at 20°C = 1.81 × 10^{-5} kg/ms.   **[10]**

Q6) Enlist the air pollution monitoring instruments. Explain detailed working of NO-NO$_x$ & their controls. **[18]**

SECTION - II

Q7) How the physical examination of waste water is carried out? Explain chemical characterization of water. **[16]**

OR

Q8) Explain biological investigations of DO & BOD. **[16]**

Q9) a) Explain effects of radiation pollution & its controls. **[8]**
   b) What is sonic boom? Explain noise measurement techniques using suitable diagram. **[8]**

OR

*Q10)*a) Suggest suitable method to control radioactive pollution on living organisms. **[8]**
   b) Suggest instrumentation setup for Noise Pollution. **[8]**

*Q11)*Write notes on : **[18]**
   a) Analysis of micronutrients.
   b) Chromatographic characterization of pollution analysis.
   c) Environmental Impact Analysis.

OR

*Q12)*a) Suggest instrumentation setup for soil pollution analysis. **[10]**
   b) Explain polorographic analysis of particles. **[8]**

❖ ❖ ❖ ❖

P1137

[3964] - 266

B.E. (Instrumentation & Control)
LASER APPLICATIONS IN INSTRUMENTATION
(2003 Course) (406264) (Sem. - I) (Elective - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

  1) *Answer three questions from Section - I and Section - II.*
  2) *Answer to the two sections should be written in separate books.*
  3) *Neat diagrams must be drawn wherever necessary.*
  4) *Use of electronic pocket calculator is allowed.*
  5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Calculate the ratio of rates of spontaneous and stimulated emissions for a tungsten filament lamp operating at temperature of 2000K with average frequency to be 4.5×10^{14} Hz.   **[5]**

  b) Estimate the relative populations of two energy levels such that a transition from the higher to the lower will give visible radiations of 560 nm at room temperature (T = 300K).   **[5]**

  c) What are the properties of Laser?   **[6]**

OR

Q2) a) Write a short note on the process of absorption, spontaneous and stimulated emissions of radiation.   **[8]**

  b) Discuss the significance of Einstein relations in emissions of radiation.**[8]**

Q3) a) Explain the construction and working of any gas laser.   **[8]**

  b) Classify the laser products for safety standards?   **[4]**

  c) Calculate the threshold pumping power of a laser for critical population inversion of 8×10^{21} / m³ and spontaneous life time of 400μs. The upper level is at energy of 1.5eV.   **[6]**

P.T.O.

Q4) a) What are different laser system components? Explain each in short.**[12]**

b) Estimate the efficiency of a GaAs laser operating well above threshold. The refractive index of material is 3.6 and laser cavity length is 0.2 mm. The loss coefficient is 800 per meter length and the internal quantum efficiency is 0.8. **[6]**

Q5) a) Classify the basic optical interferometers. **[8]**

b) Describe subjective and objective speckles in detail. **[8]**

OR

Q6) a) Describe the electronic speckle pattern interferometer (ESPI) for displacement measurement. **[8]**

b) Describe the speckle in single point interferometers. **[8]**

SECTION - II

Q7) a) Explain the performance parameters of Laser Velocimeter. **[8]**

b) Differentiate between time domain and frequency domain processing of the Doppler signal. **[8]**

OR

Q8) a) Explain the time domain processing of Doppler signal in detail. **[8]**

b) Discuss the performance parameters of operation of laser velocimeter.**[8]**

Q9) a) Write short note on Sagnac effect. **[8]**

b) Describe the all fiber FOG configuration. **[8]**

OR

*Q10)*a) Write short note on Ring Laser Gyroscope. **[8]**

b) Explain in detail the Fiber Optic Gyroscope. **[8]**

*Q11)*a) A thin strip of the hologram undergoing stress parallel to the x-axis is illuminated by a He-Ne laser. The fringes are localized in a plane having slope of 1.5 per unit length in x-direction and the fringe spacing is found to be 1 mm. Hence find the strain. **[8]**

b) Explain the any one applications of holographic interferometer that you know. **[10]**

<div align="center">OR</div>

*Q12)*Write a short notes on :
a) Holographic Interferometer. **[9]**
b) Applications of holographic interferometer. **[9]**

<div align="center">❖ ❖ ❖ ❖</div>

P1138

[3964] - 267

B.E. (Instrumentation and Control)
ADVANCED CONTROL SYSTEM
(Sem. - I) (2003 Course) (Elective - I) (406264)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

 1) *Answer 3 questions from Section - I and 3 questions from Section - II as per the given instructions.*
 2) *Answers to the two sections should be written in separate books.*
 3) *Neat diagrams must be drawn wherever necessary.*
 4) *Figures to the right indicate full marks.*
 5) *All questions carry equal marks.*
 6) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
 7) *Assume suitable data, if necessary.*

SECTION - I

Q1) Find the Describing Function for the Nonlinearity as shown in Fig. Q.1. **[18]**

Fig. Q. 1
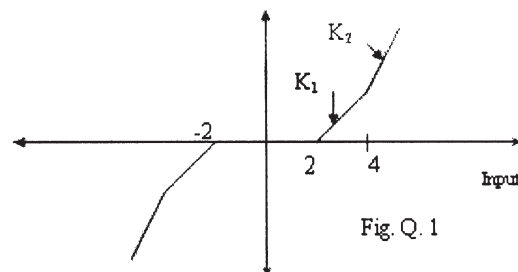
Also fine the describing function when the slope $K_1 = K_2$ $K_1 = K_2$.

OR

Q2) a)   Write short note on Jump resonance with suitable example.   **[9]**

 b)   Explain the procedure to construct phase plane with suitable mathematical example.   **[9]**

Q3) Find Frequency and Amplitude of Limit Cycle (s) for the system as shown in figure 2.   **[16]**
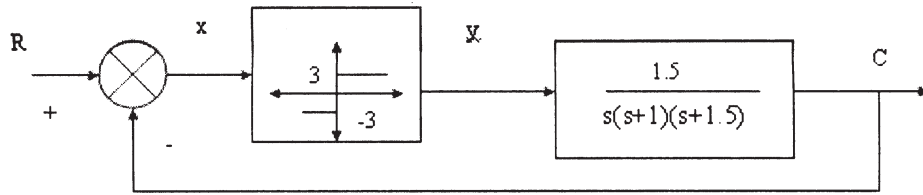
Fig. 2

OR

Q4) An amplifier as shown in figure 3 drives a Two Phase Servomotor. The transfer function of the motor is **[16]**

$$G(s) = \frac{Ke^{-0.2s}}{s(0.2s+1)}$$

Investigate the stability of the system for K = 0.2. What is the largest value of K for no limit cycle to exist.

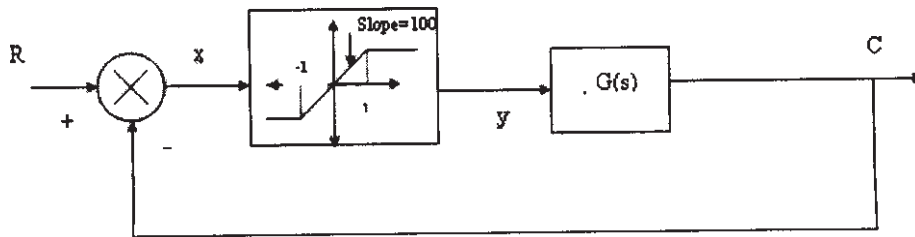Fig. 3

Q5) Consider the Dynamics of Mass-Spring-Damper system given by **[16]**

$$M\frac{d^2y}{dt^2} + B\frac{dy}{dt} + Ky = u$$

where
M = B = K = 1,
y = output
u = input

Design Model Reference Adaptive Control (MRAC) system to follow the response of reference model given by

$$\frac{d^2y_m}{dt^2} + 2\frac{dy_m}{dt} + y_m = r$$

Select r = 1 (unit step)

OR

Q6) a) Explain Model Reference Adaptive Control using Lyapunov approach for stability analysis of continuous time system. **[8]**

b) Explain MIT rule with mathematical background. **[8]**

SECTION - II

Q7) Derive an expression for Recursive Least Squares (RLS) as a real time parameter estimator. Using least square approach find the unknown parameters of the model $y(t) + ay(t-1) = bu(t-1) + e(t)$ **[18]** where e(t) is error signal

The input-output data is collected as follows

Time (*t*)	Input data [*u(t)*]	Output data [*y(t)*]
1	1.0	0.0
2	0.0	1.0
3	1.0	-0.5
4	1.0	1.25
5	0.0	0.375

OR

Q8) Write short note on following : **[18]**

a) Self Tuning Regulator.

b) Self Tuners.

c) Concepts of Linear Quadratic in self tuning regulator.

Q9) a) Explain control of multivariable systems using adaptive control. **[8]**

b) Explain any one product which incorporate adaptive control techniques. **[8]**

OR

Q10) Explain Firstloop and Asea Brown Boveri (ABB) adaptive controller with reference to parameter estimation, control design, prior information and industrial experiences. **[16]**

*Q11)*Consider the plant   [16]

$$\begin{bmatrix} \dfrac{dx_1}{dt} \\ \dfrac{dx_2}{dt} \end{bmatrix} = \begin{bmatrix} 0.5 & 0 \\ -1 & 0.7 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} + \begin{bmatrix} 2 \\ 0 \end{bmatrix} u$$

a) Find the eigen values and Comment on stability of the system.

b) Find the controllability and observability of the system and comment on controllability and observability of the system.

c) Select the values for matrices Q and R with the constraint that they are positive definite and design a controller for the plant so as to minimize

$$J = \frac{1}{2}\int_0^\infty (x^T Q x + u^T R u)dt$$

Also comment on the overall system stability.

OR

*Q12)*Write short note on <u>any three</u> (with suitable example/application/analysis/ mathematical background/schematic diagram, whenever applicable)   [16]

a) Significances of describing function in control system design.

b) Significances of optimal control over classical control in control system design.

c) Use of adaptive control system in industrial area.

d) Role of advanced control strategies in modern process industries.

❖ ❖ ❖ ❖

P1139

[3964] - 268

B.E. (Instrumentation & Control)
BUILDING AUTOMATION - I
(2003 Course) (Elective - I) (406264) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:
1)   Answers to the two sections should be written in separate books.
2)   Neat diagrams must be drawn wherever necessary.
3)   Figures to the right indicate full marks.
4)   Assume suitable data, if necessary.
5)   All questions are compulsory.

SECTION - I

Q1) a)   What is fire? Explain fire modes.   **[10]**

    b)   What are the components of fire?   **[8]**

OR

Q2) a)   List out the various FAS field components along with their application.

                                                                               [8]

    b)   Explain various stages of fire.   **[10]**

Q3) a)   A. Discuss voltage drop calculation of FAS.   **[8]**

    b)   Explain main controller of FACP.   **[8]**

OR

Q4) a)   Discuss battery calculation of FAS.   **[8]**

    b)   Explain various elements of FACP.   **[8]**

Q5) a)   What do you mean by zoning? Explain importance of zoning.   **[8]**

    b)   What are the benefits of intelligent system.   **[8]**

OR

P.T.O.

Q6) a) Explain software zoning. **[8]**

b) Describe the spot detector placement. **[8]**

SECTION - II

Q7) a) What are access control systems? Discuss importance of access control system. **[10]**

b) Discuss false acceptance & false rejection in biometrics the installation of various access control system. **[8]**

OR

Q8) a) What is security system? Discuss importance & applications of security system. **[10]**

b) Describe the installation of various access control components. **[8]**

Q9) a) State & explain features of video cassette used for recording in CCTV system. **[8]**

b) Discuss various mountings of cameras. **[8]**

OR

*Q10)*a) Describe image capture phenomenon in camera. **[8]**

b) Discuss various enclosures used for cameras. **[8]**

*Q11)*a) Draw block diagram of perimeter intrusion detection system & explain. **[8]**

b) Explain architecture of PIDS. **[8]**

OR

*Q12)*a) Explain various types of intrusion detection system. **[8]**

b) Explain any one applications of perimeter intrusion detection system.**[8]**

❖ ❖ ❖ ❖

P1148

[3964]-302

B.E. (Chemical Common to Biotechnology)
CHEMICAL REACTION ENGINEERING - II
(Sem. - I) (2003 Course) (409343)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Answers to the two sections should be written in separate books.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
4) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) For the kinetics of fluid particle reaction and shrinking core model derive expression relating contact time *t* and conversion when diffusion through gas film is the controlling step. **[8]**

b) Spherical particles of zinc blende of size R = 1 mm are roasted in an 8% Oxygen stream at 900ºC and 1 atm. The stoichiometry of the reaction is
$$2Z_n S + 3O_2 \rightarrow 2Z_n O + 2SO_2$$
Assuming that reaction proceeds by the shrinking core model calculate the time needed for complete conversion of a particle and the relative resistance of ash layer diffusion during this operation.

Data : Density of solid ρ_B = 4.13 gm/cm^3 = 0.0425 mol/cm^3
Reaction rate constant k" = 2 cm/sec
For gases in the Z_nO layer D_e = 0.08 cm^2/sec.
Gas film resistance can be neglected. **[10]**

OR

Q2) a) For the kinetics of fluid particle reaction and shrinking core model derive expression relating contact time *t* and conversion when diffusion through ash layer is controlling mechanism. **[8]**

b) Uniform sized spherical particles UO$_3$ are reduced to UO$_2$ in a uniform environment with the following results :

t hr	0.180	0.347	0.453	0.567	0.733
X_B	0.45	0.68	0.80	0.95	0.98

If the reaction follows the shrinking core model find the controlling mechanism and a rate equation to represent this reaction. **[10]**

Q3) Air with gaseous A bubbles through a tank containing aqueous B. Reaction occurs as follows : **[16]**

$$A(g \rightarrow l) + 2B(l) \rightarrow R(l)$$

$$-r_A = k C_A C_B^2 \qquad\qquad k = 10^6 m^6/mol^2.hr$$

For this system

$k_{Ag} a = 0.01$ mol/hr. m^3.Pa, $f_l = 0.98$, $k_{Al} a = 20$ hr^{-1}

$H_A = 10^5$ Pa.m^3/mol, very low solubility

$D_{Al} = D_{Bl} = 10^{-6}$ m^2/hr $\qquad a = 20m^2/m^3$

For a point in the absorber reactor where

$P_A = 5 \times 10^3$ Pa and $C_B = 100$ mol/m^3.

a) Locate the resistance to reaction. (What % is in the gas film, in the liquid film, in the main body of liquid)

b) Locate the reaction one.

c) Determine the behavior in the liquid film (whether pseudo first order reaction, instantaneous, physical transport etc.)

d) Calculate the rate of reaction (mol/m^3.hr)

<center>OR</center>

Q4) The concentration of undesirable impurity in air (at 1 bar = 10^5 Pa) is to be reduced from 0.1% (or 100 Pa) to 0.02% (or 20 Pa) by absorption in pure water. Find the height of tower required for counter-current operation.

Data : $\quad k_{Ag}.a = 0.32$ mol/hr.m^3.Pa $\quad k_{Al} a = 0.1$/hr,

The solubility of A in water is given by Henry's law constant

$H_A = P_{Ai}/C_{Ai} = 12.5$ Pa.m^3/mol.

The flow rates per meter squared cross section of tower are

$F_g/A_{cs} = 1 \times 10^5$ mol/hr.m^2

$\quad F_l/A_{cs} = 7 \times 10^5$ mol/hr.m^2

The molar density of liquid under all conditions is $C_T = 56000$ mol/m^3. **[16]**

Q5) a) In an experiment to determine the pore volume and catalyst particle porosity the following data were obtained on a sample of activated silica (granular, 4 to 12 mesh size).

Mass of the catalyst sample placed in the chamber = 101.5g, Volume of helium displaced by sample = 45.1 cm^3, volume of mercury displaced by sample = 82.7 cm^3. Calculate V_g, ρ_s and $\in_p$. **[6]**

b) For the following mechanism derive rate equation for the case of surface reaction as rate controlling step. **[10]**

$$A + S \rightleftharpoons A{\cdot}S \qquad \text{Adsorption}$$
$$B + S \rightleftharpoons BS$$
$$A{\cdot}S + B{\cdot}S \rightleftharpoons C{\cdot}S + S \qquad \text{Surface Reaction}$$
$$CS \rightleftharpoons C + S \qquad \text{Desorption}$$

OR

Q6) a) Explain BET method of determination of surface area of the catalyst. **[6]**

b) Calculate the external surface area of non-porous spherical particle of 2 microns diameter. What size particles would be necessary if the external surface is to be 100 m^2/g? The density of the particles is 2.0g/cm^3. **[6]**

c) Explain method of determination of void volume and solid density of catalyst. **[4]**

SECTION - II

Q7) Derive equation of effectiveness factor and Thiele's modulus for porous catalyst with cylindrical pore and first order reaction. **[16]**

OR

Q8) a) Explain thermodynamic and kinetic selectivity of a catalyst? **[6]**

b) What is deactivation of catalyst. How regeneration of the catalyst is done? **[6]**

c) State Thiele's modulus and its significance. **[4]**

**Q9)** A solid catalyzed gaseous reaction has the form $A + B \rightarrow C$. **[16]**
Sketch curves of initial rate vs the total pressure for the following cases.

a) The mechanism is the reaction between adsorbed A and adsorbed B molecules on the catalyst. The controlling step is the surface reaction.

b) The mechanism is same as above but adsorption of A is controlling.

c) The mechanism is same as above but desorption of C is controlling. Assume that the overall equilibrium constant is large with respect to the adsorption equilibrium constants.

d) The mechanism is a reaction between adsorbed A and B in the gas phase. The controlling step is the surface reaction. Justify the sketches.

OR

Q10) a) What experimental procedure is employed to determine rate controlling mechanism in case of solid catalyzed reactions. **[8]**

b) For the dissociation reaction facilitated by catalyst derive rate equation for adsorption as rate controlling step. **[8]**

$$A_2 + S \rightleftharpoons A_2.S$$
$$A_2 S + S \rightleftharpoons 2AS$$
$$AS \rightleftharpoons A + S$$
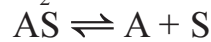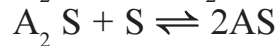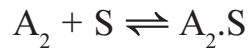
Q11) a) A feed consisting of 30% of 50μm radius particles, 40% of 100 μm-radius particles, and 30% of 200 μm radius particles is to be reacted in a fluidized bed steady state flow reactor constructed from a vertical 2m long 20 cm ID pipe. The fluidizing gas is the gas phase reactant, and at the planned operating conditions the time required for complete conversion is 5, 10 and 20 min. for the three sizes of feed. Find the conversion of solids in the reactor for a feed rate of 1 kg solids/min if the bed contains 10 kg solids. The changes in gas phase composition in the bed is small. **[12]**

b) State Michaelis-Menten Kinetic expression. What is significance of V_{max} and K_m. How to determine these parameters? **[6]**

OR

Q12) a) State equations for kinetics of competitive and non competitive inhibition. From the experimental data how to determine which is the controlling mechanism. **[8]**

b) Compare slurry and bubble colum reactor. **[5]**

c) How fluidized bed reactors are modelled why? **[5]**

✸ ✸ ✸

P1149

[3964] - 303

B.E. (Chemical)
CHEMICAL PROCESS SYNTHESIS
(2003 Course) (Sem. - I) (409344)

Time : 3 Hours] [*Max. Marks : 100*

Instructions to the candidates:

1) *Answers to the two sections should be written in separate books.*

2) *Neat diagrams must be drawn wherever necessary.*

3) *Figures to the right indicate full marks.*

4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Discuss hierarchy of chemical process design. **[8]**

b) Mention different types of reaction systems and discuss any two with suitable example. **[8]**

OR

Q2) a) Discuss idealized reactor model. **[8]**

b) Explain in short different parameters in choice of reactor. **[8]**

Q3) Benzene is to be produced from toluene according to the reaction **[16]**

$$C_6H_5CH_3 + H_2 \rightarrow C_6H_6 + CH_4$$
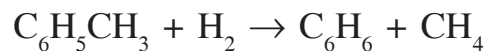
Some of the benzene formed undergoes a secondary reaction in series to an unwanted by product, diphenyl according to reaction

$$2C_6H_6 \rightleftharpoons C_{12}H_{10} + H_2$$

Table gives the compositions of the reactor feed and effluent streams. Calculate the conversion, selectivity and reactor yield with respect to

a) toluene feed and

b) the hydrogen feed

P.T.O.

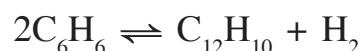| Component	Inlet flow rate K. mol h^{-1}	Outlet flow rate K.mol h^{-1}
H$_2$	1858	1583
CH$_4$	804	1083
C$_6$H$_6$	13	282
C$_6$H$_5$CH$_3$	372	93
C$_{12}$H$_{10}$	0	4

OR

Q4) a) Explain the effect of reactor pressure on the selectivity and reactor volume. **[8]**

b) Explain four possible arrangements for fixed bed reactors. **[8]**

Q5) a) Discuss primary selection factor if distillation is the choice of separator. **[9]**

b) Explain extractive distillation with suitable example. **[9]**

OR

Q6) Write short notes on : **[18]**
a) Thermal dryers.
b) absorption.
c) Centrifugal separation.

SECTION - II

Q7) a) Discuss thermal coupling of the prefraction ator arrangement. **[8]**

b) Explain distillation sequencing for 5 components system with diagram. **[8]**

OR

Q8) a) Discuss integration of refrigeration cycle. **[8]**

b) Explain threshold problems in heat exchanger network. **[8]**

Q9) a) Explain composit curves with suitable example related to heat recovery problems. **[8]**

    b) What is simple furnace method. **[8]**

OR

*Q10)*a) Explain Integration of steam turbine with the process above the pinch. **[8]**

    b) Explain the concept problem table algorithm. **[8]**

*Q11)*a) Discuss various types of explosion hazards. **[6]**

    b) What are safety and health considerations? **[6]**

    c) Explain schematically servo reaction system. **[6]**

OR

*Q12)*Write short notes on : **[18]**

    a) Unconfined vapour cloud explosion.

    b) Hazard triangle.

    c) Toxic release from process.

❖❖❖❖

P1157

[3964]-318

B.E. (Chemical)

INDUSTRIAL HAZARDS & SAFETY

(Sem. - II) (2003 Course) (Elective - II) (409348)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Answers to the two Sections should be written in separate books.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*
4) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Discuss the importance of ingredients of successful safety program and Draw a neat sketch of the same. **[8]**

b) Explain about Dose versus response curves and Relative toxicity. **[8]**

OR

Q2) Describe in detail about **[16]**

a) Safety culture.

b) Storage of dangerous materials.

Q3) a) Discuss the importance of Industrial Hygiene in Chemical Laboratories. **[9]**

b) Discuss the evaluation of worker's exposure to Noise. **[9]**

OR

Q4) a) Comment on Govt. Regulations related to Industrial safety **[8]**

b) Determine the TLV for uniform mixture of dust containing. **[10]**

Dust	Concentration, wt%	TLV in ppcf
A	60	20
B	30	3

Q5) a) Distinguish between fires & Explosion **[8]**

b) What are the different types of fire extinguishers? Give their Compositions & specific application. **[8]**

OR

Q6) Write short notes on [16]
    a) Scale of disaster.
    b) Role of computers & software in Industrial safety.

SECTION - II

Q7) Explain about the design to prevent fires & explosions and discuss about the explosion proof equipments & instruments. [16]

OR

Q8) a) Discuss in detail about the Runway reactions [8]
    b) Draw a neat sketch of VSP for acquiring runway reactions data and discuss in detail. [8]

Q9) Give the importance of [16]
    a) Risk assessment.
    b) Probability theory for Risk assessment.

OR

Q10) Discuss in detail about [16]
    a) Event trees and Fault trees.
    b) Process hazards checklists.

Q11) Write short notes on [18]
    a) Safety versus production.
    b) Hazard model & Risk data.

OR

Q12) Write short notes on [18]
    a) Plan for emergency.
    b) Safety Audit in Chemical Laboratories.

◆◆◆◆

P1158

[3964]-319

B.E. (Chemical)
PIPING DESIGN AND ENGINEERING
(2003 Course) (409348) (Elective - II) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

    1)   *Answers to the two sections should be written in separate answer books.*

    2)   *Neat diagrams must be drawn wherever necessary.*

    3)   *Figures to the right indicate full marks.*

    4)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

    5)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain pressure drop calculations for Non - Newtonian fluids.   **[8]**

    b) Hydrocarbon oil (mol. wt. = 220, density = 1.6 g/c.c., viscosity = 5 c.p.) is being pumped from a storage tank at ground floor to the top of absorption tower of height 10 m, at a rate of 2000 kg/min through of 5 cm diameter smooth PVC pipe. Assuming an efficiency of 60 percent. Calculate pump work required in m. The losses due to valves and expansion may be taken as 1.5 m.   **[8]**

OR

Q2) a) Explain the following terms.   **[8]**

      i)   Pipe sizing.

      ii)   Economic velocity.

    b) Explain Non - Newtonian fluids - types with examples.   **[8]**

Q3) a) What are the desirable properties of piping materials.   **[6]**

    b) Explain materials for low and high temperature services.   **[8]**

    c) Explain types of gaskets.   **[4]**

OR

Q4) a) Give common ASTM and IS specifications for seamless/ERW pipes.   **[8]**

    b) What are the functions and properties of gaskets.   **[6]**

    c) Write a note on materials for corrosion resistance.   **[4]**

Q5) a) Write a note on safety valves. What are the constructional features involved in it. **[10]**

b) Explain different piping components. **[6]**

OR

Q6) a) Give selection criteria for valves. **[4]**

b) Write a note on two phase flow. Give different types of two phase flow. **[8]**

c) What are the different pressure relieving devices. **[4]**

SECTION - II

Q7) Write down the design principles and give the steps of line sizing for : **[18]**

a) Vacuum pipelines.

b) Slurry pipelines.

c) Surge drums.

d) Flare stacks.

OR

Q8) a) Explain operating characteristics of centrifugal pump. **[8]**

b) Write down system characteristics and design principles related to steam flow at high pressure. **[6]**

c) Write a note on equalizing lines. **[4]**

Q9) Write a note on : **[16]**

a) P & I diagrams.
b) Process flow diagrams.

c) Guidelines for plot plan.

d) Piping layout.

OR

Q10) Write down typical piping system layout considerations for distillation systems and heat exchanges. **[16]**

Q11) a) What are the conductive and convective heat transfer principles to heat loss or gain through baropipe surfaces. **[10]**

b) What are the purposes of thermal insulation? **[6]**

Q12) a) Write down the different steps to estimate the thickness of insulation.

[6]

b) Explain the term Insulation for hot and cold materials and their important properties. **[6]**

c) Write a note on critical thickness of insulation. **[4]**

◆◆◆◆

P1160

[3964] - 333

B.E. (Petrochemical)
REACTION ENGINEERING - II
(Sem. - I) (2003 Pattern) (412403)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) Answer any three questions from each section.

2) Answers to the two sections should be written in separate answer books.

3) Figures to the right indicate full marks.

4) Assume suitable data, where ever necessary.

5) Use of electronic calculator is allowed.

SECTION - I

Q1) A catalytic reaction $A \rightarrow 3B$ is studied in a laboratory fixed bed reactor using various amounts of catalyst and 20 lit/hr of pure A feed at 3.2 atm and 117°C. The following data is recorded. **[18]**

Run No.	1	2	3	4	5
W kg cat	0.020	0.040	0.080	0.120	0.160
$C_{A\,out}$ mol/lit	0.074	0.060	0.044	0.035	0.029

Calculate weight of the catalyst needed for 45% conversion of A in

a) isothermal fixed bed reactor and

b) an isothermal fluidized bed reactor both operating at 117°C for feed flow rate of 200 m³/hr and feed containing 60% of A at 10 atm total pressure.

Q2) a) Gas phase catalytic reaction $A + 2B \iff R$ takes place in the presence of a catalyst. Find the rate expression when surface reaction controls.**[8]**

b) State important characteristics of catalyst. Discuss in brief a method for any two of them. **[8]**

P.T.O.

Q3) Following data is given on a first order catalytic decomposition of A over a particular catalyst. Report your calculations of : **[16]**
   a) Relative proportion of External and internal mass transport resistances.
   b) Maximum possible temperature difference between particle and bulk gas.
   c) Maximum possible temperature difference within the particle.
   Data :
   d_p = 2.5mm D_e = 5.3 × 10⁻⁵ m³/hr m cat (effective diffusivity)
   k_{eff} = 0.35 Kcal/hr m cat °K (effective thermal conductivity)
   h = 60 Kcal/hr m² cat °K (heat transfer coefficient)
   K_g = 175 m³/hr m² cat (mass transfer coefficient)
   ΔH_R = – 200 Kcal/mol A (exothermic heat of reaction)
   C_{Ag} = 15 mol/m³ (bulk gas concentration of A)
   $-r_{Aobs}$ = 8 × 10⁵ mol/hr m³ cat (observed rate).

Q4) a) A first order catalytic reaction 2 A → products is taking place along with slow first order (and concentration independent) deactivation of the catalyst. Derive relationship between concentration of A and time for the case of mixed solids mixed constant flow of fluid. **[8]**
   b) Describe different mechanisms of catalyst deactivation. **[8]**

SECTION - II

Q5) Derive conversion-time relationships for a gas-solid non-catalytic reaction for the following cases : **[16]**
   a) Constant size spherical solid particle with ash film controlling the overall rate.
   b) Shrinking solid sphere with surface reaction controlling the overall rate.

Q6) Explain with reference to gas-liquid reactions :
   a) Design for minimum tower height. **[6]**
   b) Suitability of employing liquid side reaction for mass transport enhancement in depending upon solubility behaviour for the active gas component. **[4]**
   c) Reactors for gas-liquid reactions. **[6]**

Q7) An impurity A in a gas is to be reduced from 2.5% to 2.5 ppm by counter current contact with an aqueous solvent containing a reactant B. The reaction 2A + B → product is almost instantaneous. What incoming concentration of B would give the minimum height of tower? What is this height? **[16]**

Data :

K_{Ag} a = 15000 mol/hr m³ atm.

K_{Al} a = K_{Bl} a = 0.95/hr.

L = 7 × 10⁵ mol/hr m²,   G = 2 × 10⁵ mol/hr m²

H_A = 2.0 × 10⁻³ atm m³/mol

Q8) Write notes :

    a)   Reactors used in crude refining.   **[6]**

    b)   Models for nonideal flow.   **[6]**

    c)   Design of non-adiabatic plug flow reactor.   **[6]**

❖ ❖ ❖ ❖

P1161

[3964]-343

B.E. (Polymer Engineering)
POLYMER COMPOSITES AND BLENDS
(2003 Course) (409363) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1)   Answers to the two sections should be written in separate books.
2)   Draw neat diagrams wherever necessary.
3)   Numbers to the right indicate full marks.
4)   Assume suitable data, if necessary.
5)   Use of logarithmic table, electronic pocket calculators is allowed.

SECTION - I

Q1) Answer any four of the following :   **[16]**

a)   Explain the mechanism of toughing of glassy polymer via Blend technology.

b)   Immiscible Polymer Blends.

c)   Compatible Polymer Blends.

d)   Miscible PB.

e)   Explain different methods of preparing PB.

OR

Q2) a)   Discuss with one example how to achieve the selection of the polymers to prepare the polymer blends.   **[6]**

b)   Explain the merits and demerits of solution blending over melt blending. Discuss the term polymer blend, polymer alloy.   **[10]**

Q3) a)   Discuss with any three examples the reactive compatibilization method.   **[10]**

b)   Discuss with example the advantages of blending technology.   **[8]**

OR

Q4) a) Distinguish between Coupling agent Vs Compatibilizer. Discuss then role of thermodynamics in polymer blend technology. **[10]**

b) Discuss the concept of Compatibilization and Interphase role in polymer blends and alloys. **[8]**

Q5) Write a note on the followings : **[16]**
   a) Blends of Nylon 6.
   b) Blends of Polystyrene.
   c) Commercial Blends of Polypropylene.
   d) Semi-IPN, Sequential-IPN.

OR

Q6) a) Explain the how to use known model system to predict rheology of miscible polymer blends. Explain the Followings : i), ii) **[8]**

b) Explain the how to use Suspension model system to predict rheology of Immiscible polymer blends. **[8]**

SECTION - II

Q7) a) How reinforcements are classified? Explain in brief about nature fiber used in polymer composite. **[8]**

b) Discuss in detail the different types of matrices used in FRP. Explain the role of adhesion promoters in FRP. **[10]**

OR

Q8) a) Explain the role of Mold Release Agent in FRP. Discuss in detail the different types of reinforcements used in FRP. **[10]**

b) What are essential properties necessary for resin to use in composite? Explain various epoxy resin used in polymer composite. **[8]**

Q9) a) Explain Pultrusion process with neat sketch. **[8]**

b) Explain the Spray up technique used in FRP. **[8]**

OR

*Q10)*a) Differentiate between Vacuum bag Forming and pressure bag forming.

[8]

b) Explain with neat sketch filament winding process. **[8]**

*Q11)*a) Trouble shooting in Spray Up Technique. **[8]**

b) Discuss in brief the application of FRP in Automotive, Aerospace areas. **[8]**

OR

*Q12)*a) Trouble shooting in Filament winding Technique. **[8]**

b) Explain with suitable example the repairs of composites. **[8]**

❖❖❖❖

P1163

[3964]-363

B.E. (Information Technology) (Common to Computer)
OBJECT ORIENTED MODELING & DESIGN
(2003 Course) (410443) (Sem. - I)

Time : 3 Hours]						*[Max. Marks : 100*

Instructions to the candidates:

1) Answer three questions from Section - I and three questions from Section - II.

2) Answers to the two sections should be written in separate books.

3) Figures to the right indicate full marks.

SECTION - I

Q1) a) Explain in detail model driven Architecture.				**[8]**

b) Explain in detail the logical view and process view of the 4 + 1 view model.				**[10]**

OR

Q2) a) Explain the role of meta object facility in model driven Architecture.**[8]**

b) Explain in detail the development view and the physical view of the 4 + 1 view model.				**[6]**

c) Describe Run time type identification.				**[4]**

Q3) a) Explain in detail the basic building blocks of the UML.		**[10]**

b) State influence of state diagrams in an embedded application.	**[6]**

OR

Q4) a) What is the purpose of Interaction diagram and timing diagram in UML 2.0? Explain with a suitable example.				**[10]**

b) What is forward Engineering? How is it applied to design a class from class diagram?				**[6]**

Q5) a) Explain in detail Class Responsibility Collaborator model. **[6]**

b) In a digital library the purchase of CD/DVD is carried out in the following manner : **[10]**

   i) Maintaining a demand list of popular CD/DVD.

   ii) A catalog of available CD/DVD titles and number of copies.

   iii) List of identified vendors and purchase orders.

   Based on above factors a recommendation for purchase of title is made. Draw a class diagram for "purchase of CD/DVD" by identifying the appropriate classes, their attributes, relationships and operations.

OR

Q6) a) How do we represent a template class in UML? Explain with ex. **[4]**

b) Which properties are used to model the details in Association? Explain each with example. **[4]**

c) A training institute provides training in technical skills and communication skills. Specialized trainers conduct trainings in respective categories for the trainees. The training sessions on specific topics in specific categories are announced and the trainees need to register for the training. Identify the appropriate classes, attributes, relationship and operations to draw the class diagram for the above system. **[8]**

SECTION - II

Q7) a) List and explain by giving suitable example the basic elements used in sequence diagram. **[10]**

b) The project leader schedules a meeting of members of project group by using a meeting scheduler. These are some of the assumptions :
The project leader interacts through a GUI form to schedule the meeting. A schedular does the automated scheduling of meeting based on the free slots in the timetable. All the members involved in the meeting will get an invitation through SMS on their mobiles. The system depends on an external mobile gateway to forward SMS. Draw a sequence diagram that describes the above system. **[8]**

OR

Q8) a) What are partitions? How do we use it in representing classes? How are they related to interaction diagram? Explain with suitable example.**[12]**

b) Explain communication diagram with a suitable example. **[6]**

Q9) a) Explain the following by drawing a neat fragment on a state diagram
   i) Entry and exit actions of a state. **[12]**
   ii) History states.
   iii) Nested states.
   iv) Activities.

b) Compare Activity diagram in UML 1.3.0 and UML 2.0. **[4]**

OR

Q10) a) What are swimlanes? How do we model multidimensional swimlanes in an activity diagram. **[6]**

b) A candidate applies in a placement call for placement in a company. He can be placed in one of the companies registered with the placement call. The candidates applications are sorted on aggregate percentage basis. Top students are selected for placements in the registered companies on merit basis. The joining process involves candidate being shown available companies. Candidate selects a company, chooses optionally accommodation facility, in parallel selects membership of health club, food club and entertainment club. On successful placement he is given a selection letter and a copy of company schedule. A candidate not placed can select to register himself for waitlist. Draw an activity diagram for the above described system making suitable assumptions about scope. **[10]**

Q11) a) What are the new concepts in UML 2.0 that support for modeling Architectures? Explain with a suitable example. **[12]**

b) Consider a system of your choice to represent a relationship between a component and its interface. **[4]**

OR

Q12) a) What is a component? What are the different types of components? Explain each with a suitable example. **[6]**

b) What is a well structured node? How do we represent it? **[4]**

c) Explain role of UML in modeling web applications. **[6]**

❖ ❖ ❖ ❖

P1176

[3964] - 393
B.E. (Biotech.)
BIO-PROCESS EQUIPMENT DESIGN
(2003 Course) (Sem.- I) (416283)

Time : 3 Hours]   *[Max. Marks:100*
Instructions to the candidates:

1) *Figures to the right indicate full marks.*
2) *Use of Programmable calculator is not allowed.*
3) *Draw a neat sketch wherever necessary.*
4) *Make necessary assumptions wherever required.*
5) *Answer any Three Questions from Section I and any Three Questions from Section II.*

SECTION - I

Q1) a) Describe the design of following rotary equipments. **[12]**

 i) Rotary drum filter.

 ii) Centrifuge with perforated basket.

 b) Define Retention volume. Calculate the capacity factors and relative retention of two solutes with retention time of 8.5 and 10 min. When chromatographic column is loaded at the flow rate of 3.5 ml/min. The t_0 value is 1.8 min. **[6]**

OR

Q2) a) Discuss the classification of Chromatographic method used in Quantitative analysis of organic compounds. **[8]**

 b) Write short note on : **[10]**

 i) Screw conveyor centrifuge

 ii) Spiral scraper centrifuge

Q3) a) State the various materials used for the design of process equipment along with their properties. **[6]**

 b) Describe methods implemented to prevent corrosion of pressure vessels. **[8]**

c) Sketch symbols for following   **[2]**
    i)   Centrifugal pump
    ii) Ejector pump

<div align="center">OR</div>

Q4) a) Discuss the construction of Pneumatic control valve. State their merits over manual valves.   **[8]**

b) Draw neat sketches of the following :   **[8]**

    i)   Gate valve

    ii) Globe valve.

    iii) Diaphragm valve

    iv) Plug valve

Q5) a) Explain the methods of attachment of Nozzles to the pressure vessel shell.   **[4]**

b) Design pressure vessel from following data: **[12]**

    Shell   : Inner dia.=700 mm

                Material - Stainless steel

                Permissible stress - 130 N/mm^2

                Internal Pressure - 0.8 N/mm^2

    Head   : Flanged and Dished head

                Outer dia - 700 mm

                Crown radius - 700 mm

                Knuckle radius - 72 mm

                Material - same as shell

    Flanges : Material - Carbon steel

                Permissible stress - 98 N/mm^2

                Gasket - Asbestos

    Nozzle   - Material - same as shell.

                Inner dia - 100 mm

                Thickness - 3mm

<div align="center">OR</div>

Q6) a) Describe the Autofrettage construction of High pressure vessel. **[6]**

b) Design High pressure vessel from following data using maximum shear stress theory. **[10]**

Inner dia.of shell - 400 mm

Internal pressure - 145 N/mm^2

External pressure - Atmospheric

Material - High tensile steel

Max.permissible stress - 600 N/mm^2

Modulus of Elasticity - 2* 10^5 N/mm^2

Coeff.of linear expansion - 12.5*10^{-6} per °C

SECTION - II

Q7) a) Explain the design of thin film evaporator with neat sketch. **[6]**

b) Design shell and tube heat exchanger from following data : **[12]**

Shell side - No.of passes - 1

Material - Carbon steel Corrosion allowance - 3mm

Fluid - Crude oil Inlet temp. 40C; outlet temp.78 C

Working pressure - 6.5 bar

Design pressure - 8 bar.

Nozzles Inlet & Outlet - 80 mm

Tube side - Material- Stainless steel

No.of tubes - 46 Pitch- Triangular

Outer dia - 19 mm

Length - 5 m.

Fluid-Keresone Inlet temp.90 C Outlet temp. 40 C

Permissible stress - 100.7 N/mm^2

Nozzles - Vent & Drain - 25 mm

Material - Carbon steel

Permissible stress - 95 N/mm^2

<div align="center">OR</div>

Q8) a) Describe the design components of U - tube heat exchanger. **[8]**

b) Explain the different types of baffles used in shell & tube heat exchanger.**[6]**

c) Explain the purpose of baffles and tie rods in design of shell and tube heat exchanger. **[4]**

Q9) a) Explain the design of Agitator based on critical speed. **[6]**

b) Design Turbine agitator which is operating in vessel of 1000 mm dia.using Critical speed criteria. **[10]**

Liquid in vessel - Specific gravity -1. 1 ;Viscosity - 1000 cP

Internal pressure in vessel 1.5 N/mm²

Diameter of agitator - 300 mm

No.of blades - 4; Width of blade - 90 mm ;Thickness of blade - 5 mm

Shaft Material - Carbon steel

Permissible shear stress - 95 N/mm²

Poissons ration - 0.2

E - 17.2 * 10⁴ N/mm²

OR

Q10) a) Explain the various methods of attaching Jacket to reaction vessel shell. **[6]**

b) Design reaction vessel with plain jacket from following data : **[10]**

Vessel shell Inner dia -1500 mm

Jacket inner dia - 1600 mm

Jacket length - 1950 mm

Dia.of channel jacket - 100 mm

Internal pressure in shell - 0.75 N/mm²

Internal pressure in jacket - 0.40 N/mm²

Head Type - Torispherical

Inner dia - 1500 mm

Crown radius - 1500 mm Knuckle radius - 700 mm

Material - Stainless steel

Allowable stress - 95 N/mm²

E - 105 *10⁵ N/mm²

μ - 0.3

Q11) a) Describe the design of segmental and pipe type downcomer. **[8]**

b) Explain the design components of packed column along with neat sketch of entire column. **[8]**

Q12) a) Describe the occurance of stresses in distillation column shell and how they are used to determine the height of column. **[8]**

b) Determine the height of distillation column from following data : **[8]**

Shell Inner dia - 1000 mm

Design pressure - 2.5 N/mm^2

Design temp. - 300 C

Material - Carbon steel

Maximum tensile stress - 95 N/mm^2

Top chamber height - 1.2 m

Bottom chamber height - 2.5 m

Insulation Thickness - 90 mm

Tensile stress - 95 N/mm^2

Head - Welded to shell Material – same as shell

Trays - Sieve type with spacing 0.6 m

Hole dia - 3.5 mm

Thickness - 1.5 mm

Weight of attachment 1000 N/mm^2

Weight of liquid pool & tray 900 N/mm^2

Wind pressure - 1400 N/mm^2

Total weight of column - 3000 kg.

✪✵✪✵

[3964] - 102

B.E. (Civil)

ENVIRONMENTAL ENGINEERING - II

(2003 Course) (401002) (Sem. - I)

Time : 3 Hours]   *[Max. Marks:100*

Instructions to the candidates:

1) *Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 from Section I and Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12 from Section II.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain giving reasons, when to adopt separate and combined systems. **[6]**

b) The BOD of sewage incubated for one day at 30ºC has been found to be 150 mg/lit. What will be 5 day BOD at 20ºC? Assume K = 0.12 (base 10) at 20ºC. **[6]**

c) Differentiate between sanitary sewage and storm water runoff. **[4]**

OR

Q2) a) Design a sanitary sewer for the following data : **[6]**
   i) Population = 80,000 persons
   ii) Rate of water supply = 200 lit/capita/day
   iii) N = 0.013
   iv) Peak factor = 2.5
   v) Slope = 1 in 850

b) Explain procedure of B.O.D. test. **[6]**

c) Write a short note on 'Drop manhole'. **[4]**

Q3) a) Give the Streeter-Phelps equation and explain each term in the equation.
[6]

b) What are the natural forces acts for the purification of streams? [6]

c) Explain different treatment units in preliminary treatment of waste water.
[4]

OR

Q4) a) Design a grit chamber for the following data : [6]
i) Maximum flow : 30 mld.
ii) Diameter of particle to be removed : 0.2 mm and more.
iii) Specific gravity of particle : 2.65.
iv) Average temperature : 20ºC

b) Design bar screen for a peak flow of 60 million litres per day. [6]

c) Write a short note on proportional flow weir. [4]

Q5) a) Explain i) HRT, ii) SRT, iii) MCRT and iv) F/M ratio. [6]

b) Describe with a sketch the treatment of sewage by Activated Sludge Process. [6]

c) Given the following data of operating Activated Sludge Process. [6]
i) Waste water flow = 30,000 m^3/day.
ii) Influent total solids = 600 mg/lit.
iii) Influent suspended solids = 120 mg/lit.
iv) Influent BOD = 170 mg/lit.
v) Effluent total solids = 480 mg/lit.
vi) Effluent suspended solids = 20 mg/lit.
vii) Effluent BOD = 20 mg/lit.
viii) MLVSS concentration = 3000 mg/lit.
ix) Return sludge solid concentration = 9800 mg/lit.

OR

Q6) a) Compare the conventional trickling filter and high rate trickling filter.[6]

b) Explain with a neat sketch the working of trickling filter. [6]

c) What do you understand by "Trickling Filter"? Explain with the help of neat sketch in detailed. Explain regarding biological process involved in the working of trickling filter. [6]

SECTION - II

Q7) a) Explain algae bacteria symbiosis. **[6]**

b) Write about constructional details & design criteria of oxidation pond. **[6]**

c) What are the advantages of oxidation pond. **[4]**

OR

Q8) a) What are the different methods of aeration in the treatment of aerated lagoon? **[6]**

b) How the detention time of oxidation pond is estimated. **[6]**

c) What is the principle involved in the design of oxidation ditch. **[4]**

Q9) a) Draw a neat sketch of septic tank. Show plan, sectional elevation with baffle walls, inlet outlet positions in detail. **[8]**

b) Design a septic tank for small colony of 300 persons with average daily sewage flow 100 lit per head per day. **[8]**

OR

Q10) a) What are the advantages and disadvantages of anaerobic treatment. Draw a sketch of anaerobic digester. **[8]**

b) How does the anaerobic digestion works? Give the various steps involved in the design. **[8]**

Q11) a) Draw a flow diagram of manufacturing process of sugar and show the points where the waste is generated. Discuss the characteristics of waste water of sugar industry. **[9]**

b) Draw a flow diagram of treatment of wastewater of paper mill and dairy. **[9]**

OR

Q12) a) Explain ignibility and toxicity in hazardous waste. **[6]**

b) What are the benefits of hazardous waste reduction. **[6]**

c) What are the different methods to treat hazardous waste. **[6]**

✪✩✪✩

P1223

[3964] - 201

B.E. (Electrical)

POWER SYSTEM OPERATION AND CONTROL

(2003 Course) (403141) (Sem. - I)

Time : 3 Hours]　　　　　　　　　　　　　　　　　　*[Max. Marks:100*

Instructions to the candidates:

　1)　*Answer any three questions from each section.*

　2)　*Answers to the two sections should be written in separate books.*

　3)　*Neat diagrams must be drawn wherever necessary.*

　4)　*Figures to the right indicate full marks.*

　5)　*Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

SECTION - I

Q1)　a)　Explain steady state stability and transient stability. State the assumptions for transient stability analysis.　**[6]**

　　b)　Draw a plot of power angle versus time for stable and unstable systems. Derive the condition for stability from the swing equation.　**[6]**

　　c)　Write a note on :

　　　Multimachine stability.　**[4]**

OR

Q2)　Explain following two applications of equal area criterion of stability.

　　a)　Sudden loss of one of parallel lines.　**[6]**

　　b)　Sudden short circuit on one of parallel lines away from line ends. Derive the expression of critical angle for case (b).　**[10]**

Q3)　a)　Explain the necessity of Unit Commitment in power system.　**[4]**

　　b)　Explain the priority list method with example for Unit Commitment.**[8]**

　　c)　Discuss different constraints used while optimizing the objective of Unit Commitment.　**[4]**

OR

Q4) a) Explain Dynamic programming method along with advantages developed for Unit Commitment. **[8]**

b) Discuss the concept of spinning reserve. **[4]**

c) Explain the consideration of constraints with reference to use of non-conventional energy sources. **[4]**

Q5) a) Discuss the concept of Automatic Generation Control. Explain different ways to control generation automatically. **[9]**

b) With neat block diagram explain the load frequency control of an isolated power system. **[9]**

OR

Q6) a) Explain the concept of control area. **[6]**

b) Explain with neat block diagram the load frequency control of two area. **[12]**

SECTION - II

Q7) a) Explain the concept of real time control and justify its necessity. **[8]**

b) With neat block diagram explain the principle of operation of supervisory control and Data Acquition system. **[8]**

OR

Q8) a) What are the centralized and decentralized energy control centers. **[8]**

b) Explain the functions of remote terminal unit, display monitoring and data logging. **[8]**

Q9) a) Explain the series compensation for transmission lines. State the advantages of series compensation. State and explain problems associated with series compensation. **[10]**

b) Explain the concept of reactive power generation by a synchronous generator. **[8]**

OR

Q10) a) Discuss static VAr compensation system and explain steady state performance of static VAr compensators. **[10]**

b) Discuss various types of FACTS controllers. **[8]**

Q11) a) Explain interchange of power between interconnected utilities under open access conditions. **[8]**

b) Explain economy interchange evaluation and interchange evaluation with Unit Commitment. **[8]**

OR

Q12) Write short notes on : **[16]**

a) Capacity and diversity interchange.

b) Energy banking.

c) Emergency power interchange.

d) Power pools.

✪✧✪✧

[3964] - 281
B.E. (Printing)
COSTING AND ESTIMATING, PROJECT MANAGEMENT AND OPERATION RESEARCH
(Theory) (Sem. - I) (2003 Course) (408282)

Time : 3 Hours]   *[Max. Marks:100*

Instructions to the candidates:

　　1)　　*All questions are compulsory.*

　　2)　　*Answers to the two sections should be written in separate books.*

　　3)　　*Neat diagrams must be drawn wherever necessary.*

　　4)　　*Figures to the right indicate full marks.*

　　5)　　*Assume suitable data, if necessary.*

SECTION - I

Q1)　a)　Prepare a cost sheet from the following data   **[8]**

　　　　ABC Pvt. Ltd, a stationery manufacturing company, produces two types of items, as A – for the school and B – for the office. From the following available, prepare cost sheet for the item A and B.

　　　　Direct material –　A : 27,300/-　　　　B : 97,850/-

　　　　Direct labour –　　A : 15,600/-　　　　B : 61,800/-

　　　　Direct expenses – A : 6,240/-　　　　B : 26,780/-

　　　　Factory overheads are charged at 75% on labor cost. Administrative overheads are charged at 25% on factory cost. Selling and distribution overheads A : 25/- and B : 55/- per unit Profit : 10% for both the items. Items sold A : 78 and B : 206.

　　b)　Comment on the following :   **[8]**

　　　　i)　Marginal cost

　　　　ii)　Standard cost

OR

P.T.O.

a)   Prepare a cost sheet from the following data   **[8]**

The standard production of a particular product is 20 units / day and the rate of wages is Rs. 60/- per unit, if daily production is 20 units per day or more. The rate of wages is Rs. 50/- per unit if the production is less than 20 units per day. Cost of material is Rs. 30/- per unit.

It is proposed to charge factory overheads according to one of the following method, i) 80% on prime cost,   ii) 100% on labour cost

Calculate the data in the form of suitable statement, finding out factory cost per unit under each of the above method, if daily production is 15 units, 20 units and 25 units.

b)   Comment on the following :   **[8]**

i)   Product cost

ii)   Process cost

Q2) a)   Explain the term Globalization with respect to Printing Industry.   **[8]**

b)   Differentiate between Perfect competitive, Monopoly and Monopolistic market with suitable examples.   **[8]**

OR

a)   Explain in detail the element of Direct costs with suitable examples.**[8]**

b)   Explain in detail the element of Indirect costs with suitable examples.**[8]**

Q3) a)   Explain the project scheduling and economical feasibility with the help of any appropriate example.   **[9]**

b)   How to ensure the quality of the project? Explain with the suitable example.   **[9]**

OR

a)   What is Project Management? Explain all the facets of Project Management.   **[9]**

b)   Explain the characteristics to become a successful project manager.**[9]**

Q4) Consider a task of ISO 9000 quality certification for an organization. The activity involved dependence and estimated duration are as given below.

Activity	Dependence	Estimated duration		
		to	tm	tp
A	-	7	4	1
B	-	9	6	3
C	A	14	5	2
D	C	3	2	1
E	A, B	18	9	6
F	D	27	18	9
G	D, E	40	20	10
H	F, G	18	9	6
I	D, E	28	10	4
J	A, B	5	5	5

Find total Float, Free float and Independence Float. **[16]**

Q5) Z min $= 12 X_1 + 20 X_2$
Subjected to,
$6 X_1 + 8 X_2 \geq 100$
$7 X_1 + 12 X_2 \geq 120$
$X_1, X_2 \geq 0$ **[16]**

OR

Z max $= 10 X_1 + 20 X_2$
Subjected to,
$3 X_1 + 2 X_2 \leq 1200$
$2 X_1 + 6 X_2 \leq 1500$
$X_1 \leq 350$
$X_2 \leq 200$ **[16]**

Q6) a) Find the job sequence to minimize total time in sequence A, B, C and find idle time for machine B and machine C. **[8]**

Job	1	2	3	4	5
A	8	10	6	7	11
B	5	6	2	3	4
C	4	9	8	6	5

b) Find the minimum transportation cost **[10]**

	1	2	3	4	
A	4	6	8	13	50
B	13	11	10	8	70
C	14	4	10	13	30
D	9	11	13	8	50
	25	35	105	20	

OR

a) Solve Assignment problem **[10]**

	I	II	III	IV	V
1	11	17	8	16	20
2	9	7	12	6	15
3	13	16	15	12	16
4	21	24	17	28	26
5	14	10	12	11	13

b) Derive the relation for EOQ for inventory model. **[8]**

✪☆✪☆

[3964] - 344
B.E. (Polymer)
MOLD AND DIE DESIGN
(2003 Course) (Sem. - I) (409364)

Time : 4 Hours]   **[Max. Marks:100**

Instructions to the candidates:
1) *All questions from section I and section II are compulsory.*
2) *Marks are given on Right hand side.*
3) *Use of calculators is allowed.*
4) *Assume suitable data,very necessary.*

SECTION - I

Q1) Design and draw plan view and sectional side view to bring out details of feed, cooling and ejection system for a two cavity two plate mold for the component shown in fig 1. Material : HDPE; cavitypressure : $200\frac{kg}{cm^2}$ **[35]**

OR

Q2) Design and draw plan view and sectional side view to bring out the details of feed, cooling and ejection system of a two cavity underfed mold for the component shown in fig 2.

Material : PP; Cavity p r : $250\frac{kg}{cm^2}$ **[35]**

Q3) Calculate the size of cavity insert for the mold designed in Q1 or Q2.   **[5]**

OR

Q4) Calculate the size of guide pillar for the mold designed in Q1 or Q2.   **[5]**

Q5) Explain the dog leg cam actuation for split cavity mold with a neat figure. **[10]**

<center>OR</center>

Q6) Explain the cam track plate actuation for split cavity mold with a neat figure.

<div align="right">

[10]

</div>

<center>

SECTION - II

</center>

Q7) a) Compare hot runner molds with underfed molds. **[8]**

   b) Explain antechamber nozzle design with a neat figure. **[8]**

<center>OR</center>

Q8) a) Explain various shut off valves used in hot runner molds. **[8]**

   b) Explain important design features of hot runner molds. **[8]**

Q9) a) Write down a process sheet for guide bush for mold designed in Q1 or Q2. **[8]**

   b) Explain mold polishing and buffing techniques. **[8]**

<center>OR</center>

Q10) a) Explain the process of wire cut EDM in details. **[8]**

   b) Explain the process of costing of injection molds. **[8]**

Q11) a) Draw a proportionate sketch of a side fed blown film die. **[8]**

   b) Write down the steps and mathematical formulae used for estimation of pressure drop and die gap for a centre fed blown film die. **[10]**

<center>OR</center>

Q12) a) Draw a neat sketch of a in-line pipe die. **[8]**

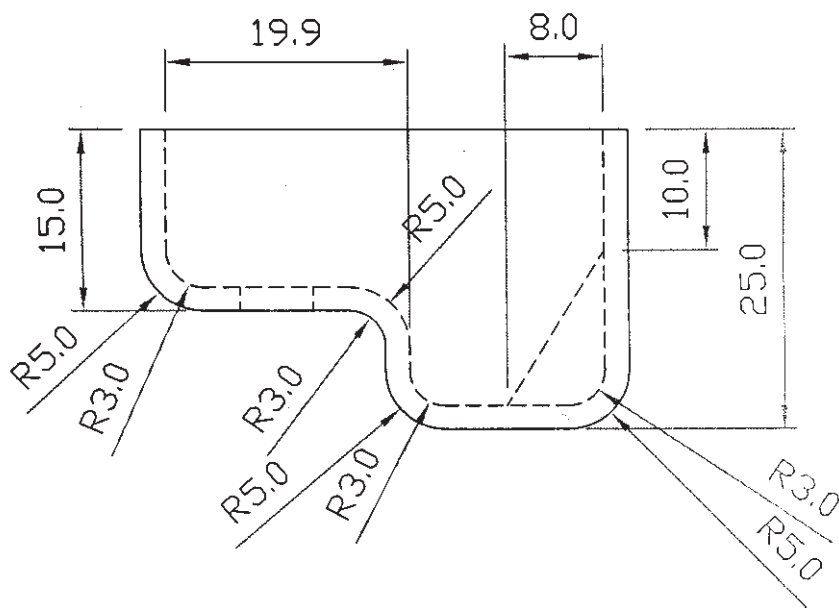   b) Write down the steps and mathematical formulae for designing a rod. die. **[10]**
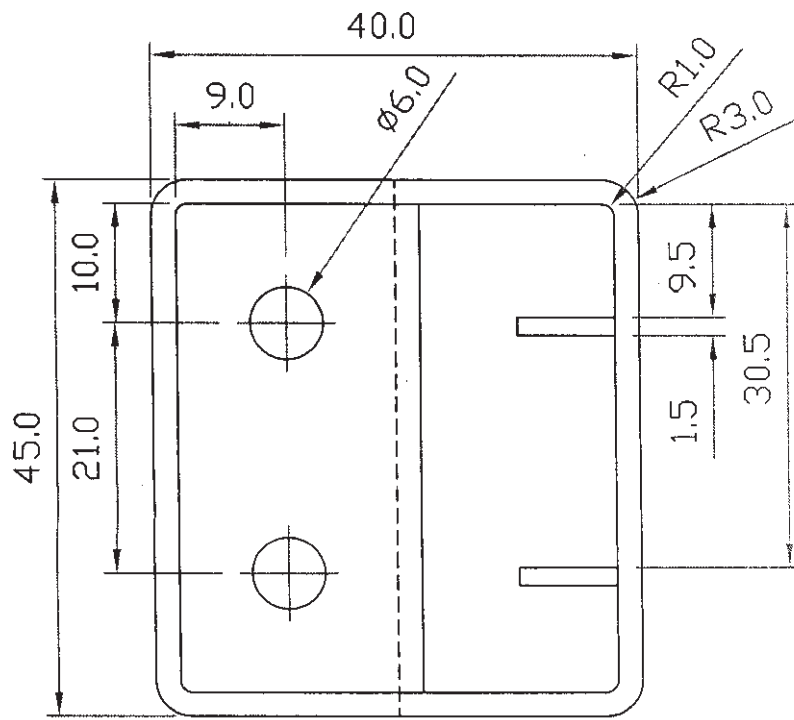
Fig.1
All dimensions are in mm.
Take uniform wall thickness = 2mm
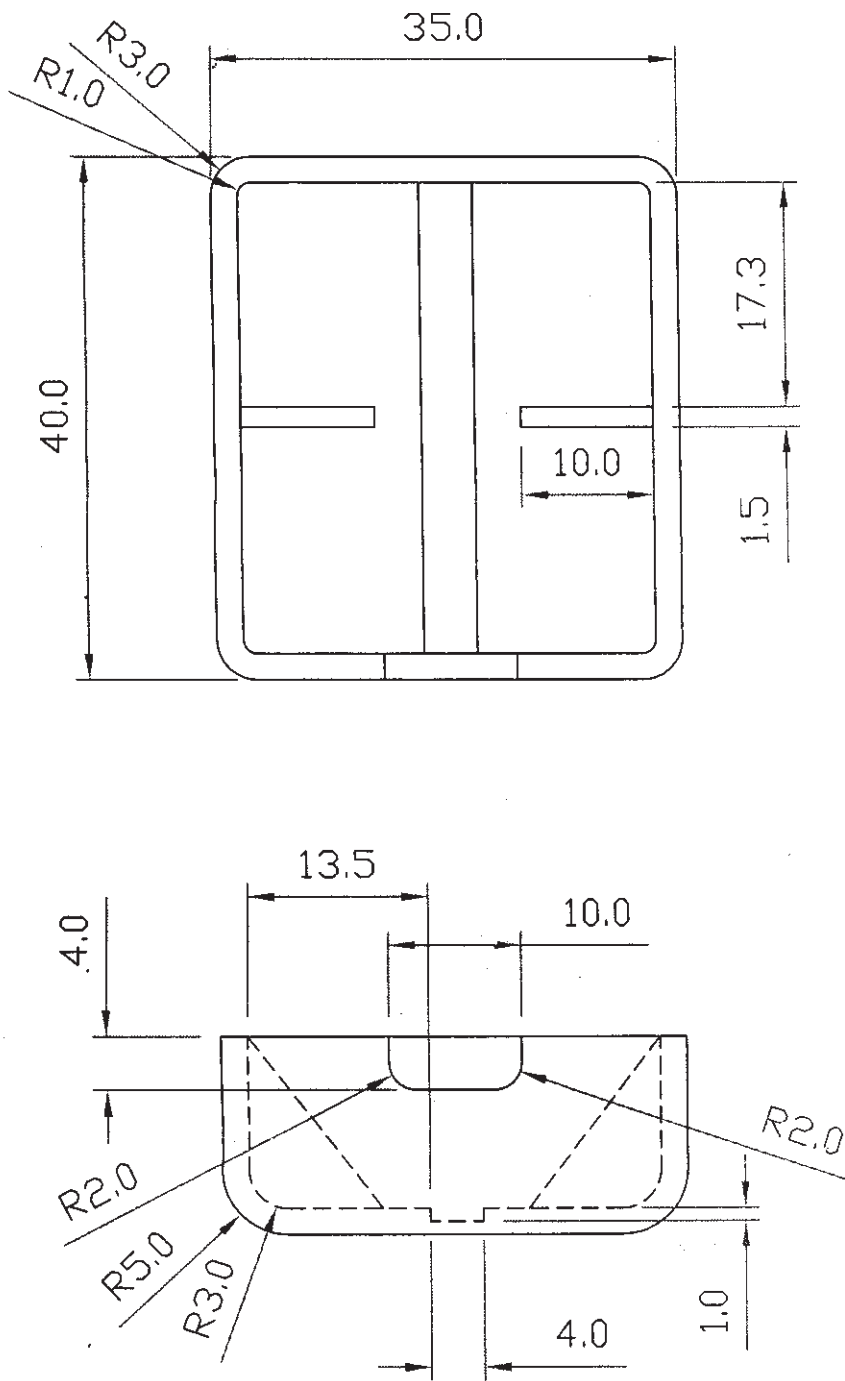
Fig.2
All dimensions are in mm.
Take uniform wall thickness = 2mm

P1235

[3964] - 361
B.E. (Computer)
DESIGN AND ANALYSIS OF ALGORITHMS
(2003 Course) (Sem. - I) (410441)

Time : 3 Hours]   *[Max. Marks:100*
Instructions to the candidates:
   1)   Answer THREE questions from each section.
   2)   Answers to the TWO sections should be written in SEPARATE answer books.
   3)   Figures to the right indicate full marks.
   4)   Assume suitable data, if necessary.

SECTION - I

Q1)   a)   Write a recurrence relation for the following algorithm and solve the same.

int rsum (a,n)

// a is an array of n numbers.

{

    count = count+1;

    if (n<0)

    {

    count ++;

    return 0;

    }

else

    {

    count++;

    return (rsum (a,n,-1) + a [n]);

    }

}   **[10]**

   b)   Explain in brief Amortized analysis.   **[8]**

Q2) a) If $f(n) = a_m n^m + \ldots\ldots\ldots + a_1 n + a_0$ then prove that $f(n) = O(n^m)$. **[8]**

b) State whether the following statements are TRUE or FLASE :

   i) $3n+2 = \Omega(n)$ ii) $6*2n+n2 = \Omega(2^n)$

   iii) $6*2n+n2 = \Omega(n^2)$ iv) $10n2+4n+2 = \Theta(1)$ **[4]**

c) Prove by contradiction that : "There are infinitely many prime numbers. **[6]**

Q3) a) Write Prim's algorithm for finding the minimum cost spanning tree. What is the time complexity of this algorithm? **[8]**

b) If objects are selected in order of decreasing V_i/W_i, then prove that algorithm for knapsack problem finds an optional solution using greedy method. **[8]**

OR

Q4) a) With respect to dynamic programming, explain in brief the following:

   i) Optimal substructure   ii) Overlapping sub problem. **[8]**

b) Write a control abstraction for divide and conquer strategy. Give the recurrence relation for the same and solve this recurrence relation. **[8]**

Q5) a) Two jobs have to be scheduled on three processors. The task times are given by matrix :

$$J = \begin{vmatrix} 2 & 0 \\ 3 & 3 \\ 5 & 2 \end{vmatrix}$$

Show all possible schedules for the jobs. Prove that there exists an optimal schedule. **[8]**

b) Write a function to compute length of shortest paths of a given graph. **[6]**

c) Enlist the elements of dynamic programming. **[2]**

OR

Q6) a) Consider the following instance of the Knapsack problem :

Number of objects n=3, knapsack capacity m=20, profits (P_1, P_2, P_3) =(25,24,15) and weights (w_1, w_2, w_3)=(18,15,10). Obtain the possible feasible solutions for this instance using greedy technique. What is the optimal solution? **[8]**

b) Consider the directed graph and edge length matrix as shown in fig Q6(b). Find the optimal tour of this graph using dynamic programming approach. Show all the steps involved in computing the same.
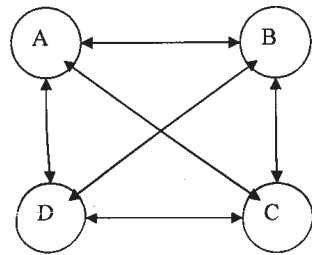
Fig Q6(b)

The edge length matrix

0	10	15	20
5	0	9	10
6	13	0	12
8	8	9	0

[8]

SECTION - II

Q7) a) Write an algorithm for finding m-colorings of a graph using back tracking strategy. What is the time complexity of this algorithm? **[8]**

b) Write a function for 0/1 knapsack problem using branch and bound method. **[8]**

c) What are the major advantages of branch and bound strategy. **[2]**

OR

Q8) a) Explain in detail control abstraction of L.C search. **[8]**

b) If (u,v) is any edge in graph G, then prove relative to the depth first spanning tree t, either u is an ancestor of v or v is an ancestor of u. So there are no cross edges relative to a depth first spanning tree. (u,v) is a cross edge relative to t if and only if u is not an ancestor of v and v is not an ancestor of u. **[10]**

Q9) a) Consider the following expression
$((7-(21/3))*3)+((9*(10-8))+6)$. Explain how it can be evaluated parallely. **[8]**

b) State and explain pointer doubling problem. **[4]**

c) Comment on the statement "A parallel algorithm is optimal if it is work efficient with respect to the best possible sequential algorithm". **[4]**

OR

Q10) a) If a comparison network with n inputs sorts all 2^n possible sequences of 0's and 1's correctly then prove that it sorts all sequences of arbitrary numbers correctly. **[8]**

b) Write an algorithm to find the sum of n-elements of a complete binary tree. What is the time complexity of this algorithm? **[8]**

Q11) a) State TRUE or FALSE :

    i) Node cover problem, where in decision to find graph has node cover of size at most K. (K is some integer) is NP complete.

    ii) A planar undirected graph G with node degree at most four, problem of finding whether G is three colorable? **[4]**

b) Consider the following algorithm;

Vertex – cover (G)

{

    C = ∅; // C contains vertex cover being constructed.

    E' = E(G) // E is set of edges, E' holds copy of E

while (E' ! = 0)

{

    let (u,v) be an arbitrary edge of E'

    C = C U (u,v)

    Remove every edge incident an u or v.

 }

}

Prove that this algorithm is polynomial time 2–approximation algorithm.

[8]

c) The problem of generating optimal code for level one directed acyclic graph is NP- hard even when the machine for which code is being generated has only one register. **[4]**

OR

Q12) a) Prove that "If any NP-complete problem belongs to class P, then P=NP".

[8]

b) Prove that if P!=NP, then for any constant P >= 1, there is no polynomial time approximation algorithm with approximation ratio P for the general traveling salesman problem. **[8]**

✪✩✪✩

[3964] - 362

B.E. (Computer Engineering)
OPERATING SYSTEMS
(Sem. - I) (2003 Course) (410442)

Time : 3 Hours] *[Max. Marks:100*
Instructions to the candidates:

1) *Answers to the two sections should be written in separate books.*
2) *Figures to the right indicate full marks.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What is critical section problem in uniprocessor system? List four design issues handled by Operating System related to concurrency. **[8]**

b) What is bounded buffer problem? Write a solution to bounded buffer producer / consumer problem using semaphore. **[8]**

OR

Q2) a) What is busy waiting with respect to process synchronization? Explain how semaphore reduces the severity of this problem. Write solution to implement counting semaphore using binary semaphore. **[8]**

b) What is Reader writer problem? Write solution to this problem using a monitor. **[8]**

Q3) a) Describe two approaches to intrusion detection. What does an audit record contains? **[8]**

b) Explain Deadlock Detection algorithm with example. **[8]**

OR

Q4) a) Write a note on protection domain. **[6]**

b) Define and differentiate between passive and active threats. **[6]**

c) A computer has six tape drives with n processes competing for them. Each process may need two drives. For which value of n is the system deadlock free? **[4]**

P.T.O.

Q5) a) Explain in brief.with user perspective 1> the UNIX file system and 2>UNIX building block primitives. **[8]**

b) Explain buffer header and structure of buffer pool with example. **[6]**

c) Write and explain bread algorithm. **[4]**

OR

Q6) a) Explain in detail functionalities of process control subsystem with system calls and kernel level data structures involved in it. **[10]**

b) What is delayed write block? Explain any 3 scenario of retrieval of buffer in brief. **[8]**

SECTION - II

Q7) a) Explain UNIX file system structure in detail with significance of each block and fields of each block. **[12]**

b) Explain functionalities of following system calls with example- **[6]**

   i) mount

   ii) chmod

   iii) link

OR

Q8) a) Write an algorithm for assigning inode to new file. **[8]**

b) Differentiate in between Named and Unnamed Pipes. Explain following operations on unnamed pipes in detail.

   i) pipe creation

   ii) Reading and Writing to pipe

   iii) Closing pipe. **[10]**

Q9) a) How does kernel deals with signals? What are conditions for the generation of signals. **[8]**

b) Explain system boot and init process. **[8]**

OR

Q10) a) What is context of a process explain in detail. **[10]**

b) Write a note on following : **[6]**

   i) A waiting process termination

   ii) Zombie and orphan process

Q11) a) Explain in detail driver entry points and role of device switch table for accessing the device. **[10]**

b) Explain in brief swapping in UNIX. **[6]**

OR

Q12) a) Explain the terminal driver in canonical and raw mode. **[8]**

b) Discuss in detail various data structures involved in Unix demand paging system. **[8]**

✪✧✪✧

P1237

[3964] - 381

B.E. (Information Technology)
INFORMATION SYSTEM SECURITY
(Revised 2003 Course) (414441) (Sem. - I)

Time : 3 Hours]   *[Max. Marks:100*
Instructions to the candidates:

    1)   *Answers to the two sections should be written in separate books.*

    2)   *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 in Section-I and Answer Q7 or Q8, Q9 or Q10, Q11 or Q12 in Section-II.*

    3)   *Figures to the right indicate full marks.*

SECTION - I

Q1)   a)   Define information assets and categories the threats on such assets.**[10]**

     b)   Among the Security goals such as Integrity, Secrecy, Authentication, Access Control, Non Repudiation, Availability, Identify and state which Security Goal(s) are affected.   **[8]**

         i)   Rahul is the employee of Itsoft ltd. As per policy, pen drives are not allowed to be used in the premises. Rahul uses his pen drive.

         ii)   Mr. Ramlal gave cheque to Shamu to withdraw money from the bank. Shamu carefully changed the amount written on the cheque.

         iii)   You submitted your application for bank loan. Later officer denied having received your application. You had not taken receipt while submitting the form.

         iv)   Thieves wore the police uniforms and entered the protected area for dacoity.

<div align="center">OR</div>

Q2)   a)   State 8 guidelines for information security defense.   **[10]**

     b)   Your are a Security Manager to define policies. Write IT security policies for small organization including aim, objectives, do's and dont's.   **[8]**

Q3)   a)   State and Illustrate Bell-LaPadula security Model.   **[8]**

     b)   State four security design principles   **[8]**

<div align="center">OR</div>

Q4) a) Illustrate end to end security of a business system. **[8]**

b) Compare Chinese Wall Model and Clark-Wilson model. **[8]**

Q5) a) List four important ways of secret and public key distributions. **[8]**

b) Write steps of DES algorithm for Encryption. **[8]**

OR

Q6) a) How does the PKI works in a world scenario. **[8]**

b) Explain working of firewalls. **[8]**

SECTION - II

Q7) a) Illustrate diffie- hellman key exchange protocol. **[10]**

b) Explain the kerberos system. **[8]**

OR

Q8) a) Discuss the database security mechanisms. **[10]**

b) Suggest 8 points to protect our children from internet abuse. **[8]**

Q9) a) Explain Anonymity and Privacy with examples. **[8]**

b) Illustrate concept of Identity. What is it, in case of Human being, Computers, Software? Elements, Physical controls, Networking Devices, Servers in the context of Security. **[8]**

OR

Q10) Write short notes on.

a) Software Tools for Security. **[8]**

b) SSL Protocol. **[8]**

Q11) a) Explain the architecture of Intrusion detection system. **[8]**

b) Discuss in detail vulnerabilities assessment. **[8]**

OR

Q12) a) Compare Stream Ciphers and Block Ciphers. **[8]**

b) Illustrate as how hybrid authentication is better than single control authentication. **[8]**

✪✧✪✧

[3964] - 383
B.E. (I.T.)
SOFTWARE TESTING & QUALITY ASSURANCE
(Sem. - I) (2003 Course) (414444)

Time : 3 Hours]   *[Max. Marks:100*

Instructions to the candidates:

1) *Answer question number 1 or 2, 3 or 4, 5 or 6 from section I.*
2) *Answer question number 7 or 8, 9 or 10, 11 from section II.*
3) *Answers to the two sections should be written in separate answer books.*
4) *Neat diagrams must be drawn wherever necessary.*
5) *Figures to the right indicate full marks.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Define any four of the following terms. **[8]**
   - i) Failure
   - ii) faults
   - iii) Test Bed
   - iv) Defects
   - v) Errors
   - vi) Software Quality.

   b) Explain in short any four methods of System Level Testing. **[8]**

OR

Q2) a) What are different levels of testing? Which software components are most suitable for unit testing and why? **[8]**

   b) Differentiate between white box testing & black box testing. **[8]**

Q3) a) Explain Unit test planning in detail. **[8]**

   b) Describe the software defect life cycle. **[8]**

OR

Q4) a) Explain in detail different functions (responsibilities) to be handled in a testing life cycle or process. **[8]**

b) Enumerate all components of a test plan. Explain test scheduling & test environment planning in detail. **[8]**

Q5) a) Explain with example the GQM method for identifying software measures. **[10]**

b) Explain different types of measurement scales with example. **[8]**

OR

Q6) a) Explain the importance of the metric - *percentage delinquent fixes* in context with software maintenance. **[8]**

b) What is customer problem metric? What are approaches to achieve low PUM? **[10]**

SECTION - II

Q7) a) Enumerate Ishikawa's seven basic quality tools. Explain any two in detail. **[8]**

b) Illustrate with examples the use of following techniques in improving quality :

i) Code Inspection   ii) Project Planning. **[8]**

OR

Q8) a) What does SQA ensure? What are the goals of SQA activity? **[6]**

b) Write a note on :

i) Scatter diagrams

ii) Cause and effect diagrams. **[10]**

Q9) a) Explain the goals & activities performed in the following KPA's

i) Software Project Tracking & Oversight (SPTO).

ii) Organization Process definition. **[8]**

b) List all the requirements of ISO 9000 and ISO 9001. **[8]**

OR

Q10) a) What is Six Sigma? Explain the terms DMAIC and DMADV with reference to six sigma. **[8]**

b) How is defect prevention and process change management brought into practice? **[8]**

Q11) Write short notes on any three : **[18]**

a) Differentiate between web application testing and client/server testing.

b) Functional testing of Web-site.

c) Client-Server Testing techniques.

d) Class testing.

✪✧✪✧

P1273

[3964]-105

B.E. (Civil)

ADVANCED GEO TECH. ENGINEERING

(2008 Course) (Elective - I) (401005) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Answer any three questions from each section.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain with appropriate examples, how classification of soil helps in

     i) Selection of equipment for compaction.

     ii) Selection of soil for design of filters in dam.

     iii) Selection of methodology to be used for drainage/dewatering.

     iv) Construction of cofferdam.

     v) Sinking of well foundation.

     vi) Deciding type of pile foundation.

   b) Liquid limit, plastic limit and % of clay content for soil A are 55, 20 and 14 respectively. Corresponding figures for soil B are 55, 20 and 70 respectively. Answer following :

     i) Which of the two soils have higher swelling potential.

     ii) Classify soils.

     iii) State likely clay minerals of each soil.

                                                  [18]

<p align="center">OR</p>

Q2) a) Results of mechanical sieve analysis and consistency tests for soil A, B and C are given below. Explain classification of each soil.

Soil sample	%of passing sieve		Liquid limit	Plastic limit
	75µ	4.75 mm		
A	60	5	40	20
B	60	30	40	20
C	40	5	40	20

b) Explain with suitable diagrams :-
  i)   Flocculated structure.
  ii)   Structure of Kaolinite
  iii) Structure of Montmonillonite.

[18]

Q3) a) Explain in what respects Rankine's theory of earth pressure differs that from coloumb.

b) Design base width of 6m high masonry retaining wall having top width of 1m, such that no tention is developed under full earth pressure.

Assume following :-

Density of soil = 15 kN/m³, $\not\subset$ = 30º
Density of masonry = 20 kN/m³

There is uniform surcharge of 22.5 kN/m² on the soil for a considerable distance. Determine maximum compressive stress in soil.

[16]

OR

Q4) a) Explain factors influencing the suitability of following :-
  i)   Gravity wall.
  ii)   RCC counterfort retaining wall.
  iii) Cantilivers sheet pile.
  iv)   Anchored sheet pile.

b) Determine active pressure on a retaining wall, assuming following data :-
  i)   Height of wall 7m.
  ii)   Angle of internal friction and wall friction as 35º and 20º respectively.
  iii) Density of backfilled soil = 16 kN/m³.
  iv)   Back of wall is inclined 20º to vertical.
  v)   Back fill is sloping at 1 : 10
        (Example may be solved graphically).

[16]

Q5) a) Draw three type chart showing different types of geo textiles. Also state important characteristics of each. Draw sketches showing applications of geotextiles.

b) Explain the design measures to be taken to guard against failure of grouted soil nails.

[16]

OR

Q6) a) Draw a neat labelled sketch of a reinforced earth retaining wall. Explain how following is designed :-
   i) Length of reinforcement.
   ii) Size of reinforcement .
   iii) Zone of providing reinforcement.

b) State functions for which geotextiles can be used. Draw suitable sketches. Also explain procedure of laying of geotextile.

[16]

SECTION - II

Q7) a) Draw a neat sketch of a curve of strain (x – axis) and stress (y – axis) for determination of soil modulus. From this curve explain and demonstrate how would you determine tangent modulus. State where the value of tangent modulus is maximum.

b) Explain how would you calculate analytically elastic settlement of foundations.

c) Draw a neat sketch of frequency $f(x$ – axis) and soil response (y – axis) and explain its behaviour and state how would you calculate critical frequency.

d) Define spring constant. Explain how would you determine the same in field as well as from laboratory tests.

[17]

OR

Q8) a) Draw a smooth curve of strain and stress and state how would you determine secant modulus from the curve. Also explain how would you determine the same by empirical method.

b) Define tolerable settlement. Explain the factors affecting the same by giving any two numerical examples. **[17]**

Q9) a) Explain the following with reference to dynamic consolidation with sketches :
   i)   Procedure in details.
   ii) Where useful and why.
   iii) Field control-adopted.

b) Explain the following with reference to sand drain and blanket.
   i)   Draw a neat sketch of proposal in plan and section.
   ii) Principle involved.
   iii) Specifications for drain & blanket.

[17]

OR

Q10) a) Explain by drawing a table showing size of soil grain with classification (*x*-axis) and eight different methods used for in place treatment on other axis.

b) Explain the following with reference to blasting.
   i)   General Procedure.
   ii) Specifications.
   iii) Precaution.

[17]

Q11) Explain sketches the following models with their mathematical formulation and graphical presentation. **[16]**

a) St. Venant Model.

b) Maxwell Model.

c) Kelvin Voieht Model.

OR

Q12) Starting with three fundamental models of elastic, viscous and friction develop the models suggested by Burger and Bingham and present them with sketch, mathematical and graphical presentation. **[16]**

✸ ✸ ✸

P1274

[3964]-158

B.E. (Production)
MATERIAL HANDLING TECHNOLOGY AND EQUIPMENT DESIGN
(2003 Course) (Elective - I) (411085) (Sem. - I) (Theory)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

    1)   Answer three questions from each section.
    2)   Answers to the two sections should be written in separate books.
    3)   Neat diagrams must be drawn wherever necessary.
    4)   Figures to the right indicate full marks.
    5)   Use of logarithmic table, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
    6)   Assume suitable data if necessary.

SECTION - I

Q1) a) Explain various factors (situations) which are the indicators of improvement opportunities of material handling system. **[8]**

    b) Explain the material handling philosophy in detail. What are the different factors are to be considered during designing M.H. system. **[8]**

OR

Q2) a) Explain different tools and techniques of industrial engineering which can be used to develop M.H. System. **[8]**

    b) Explain various factors are to be considered while selecting M.H. equipment. **[8]**

Q3) Explain principles of material handling. **[16]**

OR

Q4) Explain the following with neat sketches.
    a) Line restricted M.H. System. **[10]**
    b) Position restricted M.H. System. **[6]**

Q5) Write short note on : **[18]**

    a) Wheel conveyor.

    b) Stacker crane.

    c) Fork lift truck.

Q6) Write short notes on : **[18]**

    a) Screw conveyor and its application.

    b) Types of pallets.

    c) Bridge crane and its suitability.

SECTION - II

Q7) a) Explain the advantages and disadvantages of automated material handling system. **[8]**

    b) Explain various drives used in material handling equipments. **[8]**

OR

Q8) a) Explain the application of industrial robot for handling in the industries which have hazardous working conditions. Explain with suitable illustration. **[8]**

    b) Explain a detail design consideration of bulk material handling equipment. **[8]**

Q9) a) Explain types of AGV's in details. **[8]**

    b) Explain ASRS. **[8]**

OR

Q10) a) Explain machine vision. State different applications of machine vision. **[6]**

    b) Write short note on : **[10]**

       i) Anti collusion system.

       ii) Vehicle guidance technology in AGV.

Q11) Explain the following terms in relation with Material handling and Manufacturing applications.

    a) RFID. **[7]**

    b) Magnetic stripes. **[6]**

    c) Optical character recognition. **[5]**

OR

Q12) Write short notes on : **[18]**

    a) Computer application in M.H.

    b) Human factor consideration in M.H.

    c) Productivity improvement with the help of material handling.

✳ ✳ ✳

P1276

[3964]-162

B.E. (Production Engineering)
ROBOTICS
(2003 Course) (411090) (Elective - II) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

   1)   *Attempt Q. 1 or Q. 2, Q. 3 or Q. 4, Q. 5 or Q. 6, from Section - 1 and Q. 7 or Q. 8, Q. 9 or Q. 10, Q. 11 or Q. 12 from Section - II*

   2)   *Answers to the two Sections should be written in separate books.*

   3)   *Neat diagrams must be drawn wherever necessary.*

   4)   *Figures to the right indicate full marks.*

SECTION - I

Q1) **a)** What is the basic structure of Industrial Robot? What are advantages of this structure for its applications? **[8]**

    b) Explain the six degrees of freedom associated with the manipulator. **[8]**

OR

Q2) **a)** Define Robot. Explain with time period the development process in each robot generation. **[8]**

    b) With neat sketch explain robot anatomy. **[8]**

Q3) **a)** For a pick and place type of robot, the link parameters table is given below:

i	α_{i-1}	a_{i-1}	d_i	θ_i
1	0	2	0	10°
2	-60	0	-3	0°
3	0	0	0	90°

Determine the location of the end point of the link 3 with respect to the base **[8]**

    b) Explain the forward kinematics associated with planar 3R manipulator. **[8]**

OR

Q4) a) For a pick and place type of robot, the link parameters table is given below:

i	α_{i-1}	a_{i-1}	d_i	θ_i
1	0	0	0	30°
2	-90°	0	0	-90°
3	0	-3	0	15°

Determine the location of the end point of the link 3 with respect to the base. **[8]**

b) Explain the Inverse kinematics associated with planar 3R manipulator. **[8]**

Q5) a) Describe the various considerations in gripper design and selection. **[8]**

b) Explain the concept of low vision and high vision associated with robot vision system. **[10]**

OR

Q6) a) With neat sketch explain the functioning of slip type tactile sensor. **[8]**

b) The following data represent a 8 × 8 array of pixel. Each element in array indicates the gray level of pixel.

10	17	19	17	19	17	19	12
13	17	19	18	19	19	18	13
14	15	11	19	19	15	10	14
13	10	11	2	20	11	11	13
12	12	12	2	21	12	11	12
11	12	12	19	19	12	10	12
12	18	18	18	19	18	20	11
12	19	19	18	19	20	22	12

Convert it into black and white image. **[10]**

SECTION - II

Q7) a) Explain the lead through programming method used in robots. **[8]**

b) How machine intelligence can be incorporated in robots. **[8]**

OR

Q8) a) Explain 'WAIT', 'DELAY', 'SIGNAL', 'DEPART' commands. **[8]**

b) Explain with neat sketch hydro - pneumatically actuated robot. **[8]**

Q9) a) Explain the working of RS 232C interface. **[8]**

b) Describe with suitable sketch any two applications of the industrial robot. **[8]**

OR

Q10) a) What is handshaking? Explain hardware handshaking of robot. **[8]**

b) What do you understand from robot economics? **[8]**

Q11) Write a note on : **[18]**

a) Walking robots.

b) Robots used in mines.

OR

Q12) Write a note on : **[18]**

a) Underwater robots.

b) Distance controlled robots.

♦♦♦♦

P1277

[3964]-174

B.E. (Production S/W)
FINANCIAL MANAGEMENT & COSTING
(2003 Course) (Elective - I) (411122) (Sem. - I)

Time : 3 Hours]　　　　　　　　　　　　　　　　　*[Max. Marks : 100*

Instructions to the candidates:

　　1)　Answers to the two sections should be written in separate books.
　　2)　Neat diagrams must be drawn wherever necessary.
　　3)　Figures to the right indicate full marks.
　　4)　Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.
　　5)　Assume suitable data, if necessary.

SECTION - I

Q1) a)　Explain in detail Financial functions?　　　　　　　　　　**[8]**

　　　b)　What are the sources of Finance? How will you raise finance from private sector?　　　　　　　　　　　　　　　　　　　　**[8]**

OR

Explain following (any two) :　　　　　　　　　　　　　　**[16]**

a)　Profit & loss account.

b)　Ratio analysis.

c)　Balance sheet.

Q2) Enlist need of capital expenditure? Explain in detail evaluation process-payback approach with suitable example.　　　　　　　　　　**[16]**

OR

Explain following :　　　　　　　　　　　　　　　　　　**[16]**

a)　Accounting rate of return.

b)　Present value method vs. Internal rate of return.

Q3) a)　Explain following for working capital (any two) :　　　　　**[16]**

　　　　i)　　Concept & design.
　　　　ii)　　Types & sources.
　　　　iii)　Cost and capital .

　　　b)　What is time value of money.　　　　　　　　　　　　　**[2]**

P.T.O.

a) Explain in detail concept of funds flow analysis, its objectives & techniques of funds flow statement. **[16]**

b) Enlist different types of funds flow statement. **[2]**

SECTION - II

Q4) What are the different methods of costing & elements of cost? Explain material cost aspects in detail? Also enumerate different methods of pricing of issue of materials? **[16]**

OR

Explain following for Labour cost. **[16]**

a) Wage & incentive plans.

b) Labour turnover & its methods.

Q5) What are the classification of overheads? How primary & secondary apportionment of overheads is carried out? **[16]**

OR

What do you understand by absorption of overheads? How to calculate Machine hour & labour hour rates? **[16]**

Q6) a) Explain in detail concept development & use of standard costing? How variance analysis is carried out? **[16]**

b) Explain Marginal costing. **[2]**

OR

Explain following for Activity Based costing (any three) : **[18]**

a) Cost drives.

b) Transfer cost.

c) Concept of by products.

✳ ✳ ✳

P1279

[3964]-206

B.E. (Electrical)

POWER QUALITY

(Elective - I) (2003 Course) (403143) (Sem. - I)

Time : 3 Hours]　　　　　　　　　　　　　　　　　*[Max. Marks : 100*

Instructions to the candidates:

　　1)　In Section I, attempt Q1 or Q2, Q3 or Q4, Q5 or Q6. In Section II, attempt Q7 or Q8, Q9 or Q10, Q11 or Q12.

　　2)　Answers to the two sections should be written in separate answer books.

　　3)　Figures to the right indicate full marks.

　　4)　Neat diagrams should be drawn wherever necessary.

　　5)　Use of non-programmable electronic pocket calculator is allowed.

　　6)　Assume suitable data if necessary.

SECTION - I

Q1) a) Define and explain the following terms as per IEEE Std. 1159, such as **[10]**

　　　　i)　　Impulsive transient.
　　　　ii)　 Oscillatory transient.
　　　　iii)　Voltage variations.
　　　　iv)　Voltage sags and
　　　　v)　 Voltage variations.

　　b) Explain purpose of grounding. What are the problems due to poor grounding? **[8]**

OR

Q2) a) Explain various grounding practices as per IEEE standard. **[10]**

　　b) Explain various definitions of power quality with reference to each stake holders. **[8]**

Q3) a) Explain various causes, effects of overvoltage. Suggest various mitigation measures. **[8]**

　　b) What are the various causes of voltage flicker and explain their effects on power system operation. **[8]**

OR

Q4) a) What are the various devices used for voltage regulations? Explain. **[8]**

b) Explain the following terms related with voltage flicker **[8]**
   i) Short term (P_{st}) and
   ii) Long term (P_{lt}) voltage flicker.

Q5) a) Differentiate between voltage sags and voltage interruptions. What are the major causes of voltage sags? **[8]**

b) Explain step by step procedure for assessment of equipments sensitivity to voltage sags. **[8]**

OR

Q6) a) Explain voltage sag characteristics such as magnitude, duration, phase angle jump and missing voltage. **[8]**

b) What are the mitigation measures for voltage sags? Explain any two measures in detail. **[8]**

SECTION - II

Q7) a) Explain the following terms related with waveform distortion. **[8]**
   i) Harmonics.
   ii) Interharmonics.
   iii) Subharmonics.
   iv) Trippln harmonics.

b) Explain step by step procedure for harmonics analysis. **[10]**

OR

Q8) a) What is harmonic filtering? Explain active and passive filters. **[8]**

b) Explain harmonics series and parallel resonances. What are its consequences? **[8]**

Q9) a) Explain transients, their sources and its effects on power system operation. **[8]**

b) List various devices used for over voltage protection? Describe any two in detail. **[8]**

OR

Q10) a) Explain switching transient problems with loads. Which computer tools are used for transient's analysis? **[10]**

b) Explain impulsive transients due to lightening. **[6]**

Q11) a) Explain need of power quality monitoring. What is reactive and proactive approach? **[8]**

b) Explain procedure for selection of monitoring equipments and use of various equipments required for power quality monitoring. **[8]**

OR

Q12) a) What are the requirements of power quality monitor to monitor various power quality parameters and various techniques of data collection? **[8]**

b) Explain selection procedure of transducers for power quality monitoring. **[8]**

✳ ✳ ✳

P1280

[3964]-233

B.E. (Electronics)

REAL TIME OPERATING SYSTEMS

(2003 Course) (404212) (Elective - II) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1)   Answers to the two Sections should be written in separate answer books.

2)   In section - I attempt Q. 1 or 2, Q. 3 or 4 and Q. 5 or 6 in section - II. Attempt Q. 7 or 8, Q. 9 or 10 and Q. 11 or 12.

3)   Neat diagrams, flow charts must be drawn and well commented pseudo code written wherever necessary.

4)   Figures to the right indicate full marks.

5)   Assume suitable data, if necessary.

SECTION - I

Q1) a)   What is context switching, explain with suitable example.   **[8]**

     b)   Explain semaphore? How it can be used for buffer management?   **[8]**

OR

Q2) a)   Explain Non - preemptive and preemptive kernel with suitable diagrams and at least one application of each.   **[8]**

     b)   Explain interrupt and interrupt timings for foreground/background, non- preemptive and preemptive kernel.   **[8]**

Q3) a)   Explain, what is ready list in uCOSII? How uCOSII add the task in the ready list? How uCOSII remove a task from ready list?   **[8]**

     b)   Explain and describe TCB data structure in uCOSII.   **[8]**

OR

Q4) a)   Explain statistic task. What statistics it provides? How statistic task is initialized.   **[8]**

     b)   Explain uCOSII initialization i.e. OSInit() with necessary data structure. What is the limit on the size of the each pool?   **[8]**

Q5) a)   Explain event flag group data structure OS - FLAG - GRP and OS-FLAG -NODE.   **[10]**

     b)   Explain Mutual exclusion semaphore in uCOSII, and how it avoids the problem of Priority Inversion.   **[8]**

OR

P.T.O.

Q6) a) Write short note on [10]
   i) Semaphore management in uCOSII.
   ii) Mutual exclusion semaphore in uCOSII.
   iii) Event flag management in uCOSII.

   b) Explain relationship between event flag, group event flag nodes, and TCBs. [8]

SECTION - II

Q7) a) What are alternate uses of Message Queue in uCOSII? Explain with suitable example. [8]

   b) Explain Mailbox services and configuration in uCOSII. [8]

OR

Q8) a) What are alternate uses of Mailbox in uCOSII? Explain with suitable example. [8]

   b) Explain Message queue services and configuration in uCOSII. [8]

Q9) a) Explain memory management in uCOSII. [8]

   b) Explain, the requirements of processor to run uCOSII. Also define porting of uCOSII. [8]

OR

Q10) a) Why it is dangerous to use ANSI C compiler's functions for memory management in real time system? [8]

   b) What is testing of port? What are the steps to follow for testing of port? [8]

Q11) Assume appropriate data wherever necessary and consider the design and implementation of 'Application layer byte streaming on TCP/IP network' using uCOSII.

   a) Explain the application and define the tasks. [6]

   b) State the constraints and assign priorities to the defined tasks. [6]

   c) Enlist the services of uCOSII required and its use for implementation. [6]

OR

Q12) a) Define the real time system. What are the features of uCOSII satisfying the requirements of Real Time System? **[6]**

b) Assume appropriate data wherever necessary and consider the design and implementation of "Chocolate Vending Machine' by using uCOSII. **[6]**

    i) Explain the application and define the tasks.

    ii) State the real time constraints for the defined tasks.

c) Assume appropriate data wherever necessary and consider the design and implementation of "Temperature control system" by using uCOSII. **[6]**

    i) Explain the application and define the tasks.

    ii) State the real time constraints for the defined tasks.

◆◆◆

P1282

[3964]-286

B.E. (Printing)

FLEXIBLE PACKAGING

(2003 Course) (Elective - I) (408281) (Sem. - I)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

    1)   *Answers to two sections should be written separately.*

    2)   *Draw neat diagram wherever necessary.*

SECTION - I

Q1) a) Explain the fundamental requirements of packaging a liquid product.**[10]**

     b) Define the role of BOPP in Packaging. **[8]**

OR

Explain the characteristics and applications of Polyethylene.

Q2) Explain with neat diagram Blown-Film process. **[16]**

OR

Explain the Tenter Frame process for film making.

Q3) Explain in detail Boil-in-Bag technique for a product. **[16]**

OR

Write notes on (Any Two) :

a) Stand-up Pouches.

b) Skin-pack.

c) Bag-in-Box.

SECTION - II

Q4) Explain the difference between Shrink and Stretch wrapping techniques.**[18]**

OR

Answer the following :

a) Closures.

b) Adhesives in packaging.

Q5) Explain the materials and packaging methods for Chocolate products. **[16]**

OR

Mention the factors affecting Dairy products.

Q6) Explain the Rotogravure process for Flexible Packaging. **[16]**

OR

Explain the process and benefits of Flexo in Flexible Packaging.

✳ ✳ ✳

P1285

[3964]-305

B.E. (Chemical)
ENVIRONMENTAL ENGINEERING
(2003 Course) (Elective - I) (409341) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

    1)   *Answers to the two sections should be written in separate books.*
    2)   *Neat diagrams must be drawn wherever necessary.*
    3)   *Figures to the right indicate full marks.*
    4)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
    5)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a) The maximum 1hr. Co. level in Kolkatta reach 35 ppm. Calculate the equivalent concentration in terms of mass fraction (W_p) and milligrams per cubic meter at 25ºC and 1 atm. **[9]**

    b) A 100 mW power plant of 35% thermal efficiency is proposed. The plant burns 35% sulphur coal with a heating value of 6000 K cal/kg and emits 64000 m^3/min of flue gas. What is the concentration of SO_2 in the flue gas in ppm. Assume that the density of SO_2 is 1920 g/m^3. **[9]**

OR

Q2) Give the scavenging process for particulate and gaseous pollutants in detail. **[18]**

Q3) a) Draw a neat sketch of settling chamber and explain its working. **[4]**

    b) Explain photochemical smog. **[4]**

    c) Draw a neat sketch of fabric filter and explain its working. **[4]**

    d) A conventional cyclone with diameter 1.0m handles 3.0m^3/s of standard air carrying particles with a density of 2000 kg/m^3, For N_e = 6, determine the cut size. Inlet width = 0.25m and Inlet diameter = 0.5m. **[4]**

OR

Q4) a) Draw a neat sketch of venturi scrubber and explain its working. **[4]**

b) A multi tray settling chamber having 8 trays, including the bottom surface, handles 6 m^3/s of air at 20°C. The trays are placed 0.25m apart and the chamber is to be 1m wide and 4m long. What is the minimum particle size of density 2000 kg/m^3 that can be collected with 100% efficiency? What will be the efficiency of the settling chamber if 50 μm particles are to be removed?

   i) Laminar flow conditions within the chamber and the presence of no dust initially on trays must be assumed.

   ii) Check laminar flow assumption justified? If not what is the collection efficiency for 56 and 50 μm particles?

   $V_t = 30000 \, \rho_p d_p^2$, $\mu_g = 1.81 \times 10^{-5}$ kg/m.s **[12]**

Q5) Write short notes on : **[16]**

a) Ozone depletion.

b) Chemical pollution.

c) Effect of air pollution on human health.

d) Air pollution laws and standards.

OR

Q6) Write short note on : **[16]**

a) Pollution control by adsorption process.

b) Spray chambers.

c) Isokinetic sampling.

d) Fabric dust collector.

SECTION - II

Q7) What are the types of water pollutants and discuss their effects. **[16]**

OR

Q8) A typical wastewater treatment of industry discharges secondary effluent to the stream which is on the surface. In the summer, measurements are taken and found that maximum flow rate of 15000 m^3/day, a BOD of 40 mg/lit, DO is 2 mg/lit and temperature of 25°C. The upstream from the point of discharge of wastewater is found to have a minimum flow rate of 0.5 m^3/s, a BOD of 3 mg/lit, a DO of 8 mg/lit and a temperature of 22°C. The velocity of the mixture is 0.2 m/s from the flow regime, the reaction constant is estimated to be 0.4/day for 20°C condition. Draw a DO profile a 100 km reach of the stream below discharge. **[16]**

Q9) a) Discuss how least square method can be used to calculate the BOD constants for wastewater. **[6]**

b) The following BOD constants are obtained on a sample of untreated wastewater at 20ºC.

t days	2	4	6	8	10
BOD, mg/lit	11	18	22	24	26

   i) Plot a BOD curve. **[4]**
   ii) Compute the reaction rate constant K (base *e*) and the ultimate first stage of BOD (K_u) using least square method. **[8]**

OR

Q10) a) Define the terms and write analytical procedure in brief. **[9]**
   i) BOD
   ii) COD
   iii) TDS
   iv) TSS

b) Describe the water pollution generated by any two of the following : **[9]**
   i) Paper and pulp.
   ii) Tannery.
   iii) Electroplating.

Q11) Write short notes on : **[16]**

   a) Acid rain.

   b) Activated sludge process.

   c) Composting for disposal of solid wastes.

   d) Aerobic and anaerobic lagoons.

OR

Q12) Write short notes on : **[16]**

   a) Primary treatment for wastewater.

   b) MPN technique.

   c) Membrane separation.

   d) MPN technique.

✳ ✳ ✳

P1289

[3964]-320A

B.E. (Chemical)
PETROCHEMICAL ENGINEERING
(Sem. - II) (2003 Course) (Elective - II) (409348)

Time : 3 Hours]   *[Max. Marks : 100*
Instructions to the candidates:
1) *Answer Three questions from Section I and Three questions from Section II.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*

SECTION - I

Q1) With reactions involved, explain with diagram the process of hydrocracking.

[16]

OR

Q2) a) Explain any one method used for dewaxing of lube oil.   **[8]**

b) Describe with flowsheet the process of delayed coking.   **[8]**

Q3) Write in details alongwith neat diagram on oxidation dehydrogenation process for conversion of methanol to formaldehyde.   **[16]**

OR

Q4) Draw neat sketch and write in details about manufacture of ethylene oxide from ethylene and oxygen.   **[16]**

Q5) Explain in details and draw flowsheet for absorption method for production of LPG.   **[18]**

OR

Q6) a) Give classification of hydrocarbons.   **[9]**
b) Write in brief: Types, properties and applications of petroleum coke.

[9]

SECTION - II

Q7) Describe with flowsheet the process of indirect hydration for conversion of propylene to isopropanol. **[16]**

OR

Q8) Alongwith essential reaction steps, write in details about the production of ethylene glycol. **[16]**

Q9) Discuss in details the various types and uses of second generation intermediates used as solvents and formulating agents. **[16]**

OR

Q10) With neat diagrams, explain production of amines. **[16]**

Q11) Draw process flow diagrams and show various sources of power generation through refinery. **[18]**

OR

Q12) Explain properties, handling precautions and applications of following petrochemicals: **[18]**

a) Acetylene.

b) Ethylene oxide.

c) Acetic acid.

◆◆◆◆

P1290   **[3964]-330A**

B.E. (Petroleum Engineering)
PETROLEUM ECONOMICS
(Sem. - II) (2003 Course) (412391) (Elective - II)

Time : 3 Hours]   *[Max. Marks : 100*
Instructions to the candidates:
  1)   *Answers to the two Sections should be written in separate books.*
  2)   *Question 1 and 6 are compulsory. Attempt any one question from other questions each from section I and II*
  3)   *Use of graph paper is allowed.*
  4)   *Figures to the right indicate full marks.*
  5)   *Assume additional data if necessary.*

SECTION - I

Q1) a) Oil production history is given for a field which is under consideration for procurement. Details of production profile and spent expenditures are given in the following table. The company management is interested in redevelopment of this field and shall go for production up to an economic limit of 1000 BOPD.

The anticipated production beginning from year 14 is given in the table.

Year	Production, BOPD	Exploration costs, $ MM	Development costs, $MM	Operating costs,$MM
1		130		
2		130		
3			240	
4	7124		240	13
5	7124			13
6	7124			13
7	7124			13
8	13425			24.5
9	13425			24.5
10	10100			18.45
11	8878			16.2
12	7616			13.9
13	6410			11.7
	Redevelopment $ 50 MM			
14	8878			
15	7616			
16	6410			

Table 1for Q 1.A and Q 6 A.

P.T.O.

How much oil was produced during first contract and subsequently will be produced during second contract? What is the OOIP, if original recovery of oil was 24%? How much is the total recovery percent if additional anticipated oil production is taken into consideration? Calculate time required to reach economic limit after redevelopment. **[15]**

b) Explain any one decline curve with proper equations and diagram. **[10]**

Q2) a) Current oil price for the given project is $ 72.25. It is anticipated that the price will increase at a rate of general inflation, which is forecast to be at the rate of 4.25% per year for first three years and then drop to an annual rate of 3.75% thereafter.

The producible oil has lower API than that brand oil along with higher sulphar and TAN content, thus leading to a price differential of 7.25% with respect to brand oil.

Develop a forecast for oil price for brand oil and the oil under consideration for a span of eight years. **[7]**

b) Write notes on any two of the following **[18]**

    i) Crude oil benchmark blends and oil differential.

    ii) Oil price elasticity and effects on oil importing countries.

    iii) Reserves auditing.

    iv) National oil companies and International oil companies.

Q3) a) Three attractive proposals are submitted for the perusal of the management of an oil company. Risk and uncertainty factors are same for all proposals. **[15]**

Table 2 for Q 3 A

Details	A (MM $)	B(MM $)	C(MM $)
Initial investment	1.8	2.2	3.1
Working capital investment	18,000	20000	27,000
Salvage Value	1,80,000	2,20,000	3,00,000
Service life	5	5	5
Annual cash flows	Given below	7,60,000 constant	1.05 constant

Annual cash flow for A is $ 5,60,000, 6,00,000, 6,40,000, 6,90,000, and 7,00,000 for years 1,2,3,4 and 5 respectively.

Company demands

i) Minimum 12.5% Rate of Return (ROR) on initial capital investment,

ii) End of year costs and profit for time value of money interpretations.

Using above data, which proposal should be given preference by using

1) Rate of Return (ROR) on initial investment (Incremental analysis),

2) Minimum Payout period, and

3) Net Present Value (NPV).

b) Write notes on <u>any two</u> of the following   **[10]**

i) Investment Yardsticks,

ii) Components of break even analysis,

iii) Sensitivity Analysis.

iv) Time value of money.

SECTION - II

Q4) a) An oil and gas exploration and development company would have a collection of assets with an associated expected value and an uncertain level of risk. Consider the following investment opportunities that might be available to the company with a current interest in producing fields.

Asset	Opportunity	Total Investment (M = 10^6 $)
A	Wildcat well on exploration permit	$ 80 M
B	Exploration project adjacent to producing field	$ 40 M
C	Infill drilling prospect in producing field	$ 60 M

Table 3 for Q 4 A

If the current cash flow forecast indicates a budget of $ 80 M available to reinvest next year, which is the best way to spend money acknowledging the factors of uncertainty and risk.   **[10]**

i) 100% opportunity in C and 50% opportunity in B.

ii) 80% opportunity in C, 30% opportunity in B and 25% opportunity in A.

iii) 50% opportunity in C, 75% opportunity in B and 25% opportunity in A.

Justify your decision with suitable arguments for each alternative.

b) Initial cost of the completely installed reactor is $ 40,000 and its salvage value towards the completion of useful life is $ 4000. Service life of the reactor is 6 years. Calculate its depreciation using Straight line (SLD), Sum of years Digit (SYD) and Double Declining Balance (DDB) methods. Prepare a plot of book value against number of years and compare the results obtained with different methods. **[15]**

Q5) a) An oil and gas company is evaluating a drilling prospect based on data available on a wildcat well in a promising area of complex stratigraphic and heterogenic lithological control. **[15]**

❖ The leased area has an option of size variation from 50 Km^2 to 100Km^2 though a central potion of 70 Km^2 is considered as most promising for leasing.

❖ The net pay thickness also show variation from 20 M to 40 M with a thickness of 30 M particularly in the central part is treated as most likely to be oil bearing.

❖ Recovery in the proposed area is anticipated between 500 bbl/Km - M to 1500 bbl/Km - M with 1000 bbl/Km- M recovery is most likely.

❖ Well spacing is 10 Km^2 per well and approximate development cost is around $ 2 MM. The net revenue is assumed to be $ 15/bbl after taxes.

Experts in the company feels that in the complex area like this, development cost would show marked variation than anticipated.

❖ Engineer's estimate that the development cost would be $ 1.5 MM/well and under abnormal circumstances, the cost would raise even up to $ 4 MM Rs/well.

❖ The probability of $ 2 MM/well, $ 1.5 MM/well and $ 4MM/well is 0.60, 0.15 and 0.25 respectively.

❖ Experts also feel that the probability of drilling a dry well is 0.850 and if hydrocarbons are discovered then the probability of finding minimum, most likely and maximum reserves would be 10%, 75% and 15% respectively out of remaining 0.150.

Management of the company has also kept an option of either leasing out the property to other company and obtain Overriding Royalty Interest (ORI) on the net revenue earned. Or participate in the project with reducing working interest (35%) and proportional risk.

❖ If company management is opting out of risk and would like to enjoy only ORI then the NPV for finding minimum, most likely and maximum would be 0.123, 3.12 and 17.25 respectively.

❖ In case of 35% WI, all relevant values are proportionally decreased.

Decision has to be based on Expected Monetary Value (EMV).

Construct decision tree showing all alternatives available, solve the same and justify your answers with proper calculations.

What is your preferred decision?

b) Write notes on <u>any two</u> of the following   **[10]**

i) Reserves accretion and discovery of field size scenario in past 20 years.

ii) Profitability in projects and equivalence of field size in different countries within the frame work of production sharing contract.

iii) Petroleum Accounting system.

Q6) a) Use only the production i.e time span of 1 to 13 years given in Table 1 for the calculations involved in this question.   **[20]**

Following are the assumptions for the calculations:

i) Oil price is $ 72/bbl and is constant throughout the project tenure.

ii) Royalty is 10% per year on annual production,

iii) Cost recovery is 100% on net revenue.

iv) Government share in profit Petroleum is 60%.

v) Hurdle rate is 12% , and

vi) Income tax is 30%,

Prepare a tabular form giving details of annual production, cumulative production , expenditure, gross revenue, royalty, net revenue, cost recovery, profit petroleum, government share and operator share, tax, profit, for operator, NPV for operator BFIT and AFIT.

Calculate distribution of one barrel or equivalent $ 72 using the assumptions given above. Show this calculation for each deduction.

How much is the profit for contractor and total share of government in the calculation of one barrel?

b) Give a generalized classification scheme of petroleum fiscal system.

   **[5]**

◆◆◆

P1292

[3964]-340A

B.E. (Petrochemical)

CATALYSIS TECHNOLOGY AND FLUIDIZATION ENGINEERING

(Elective - II) (2003 Course) (412411) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Answer any 3 questions from each section.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of logarithmic tables, slide rule, Mollier Charts, electronic pocket calculator and steam table is allowed.*
6) *Assume Suitable data, if necessary.*

SECTION - I

Q1) a) Discuss and explain how catalyst speeds up a chemical reaction. **[6]**

b) Name three different catalyst supports. What are the characteristic feature of the supports? **[6]**

c) Name various means and ways by which a catalyst can be deactivated - discuss all of them. **[6]**

Q2) a) Differentiate between physical adsorption and Chemisorption. **[6]**

b) Consider the catalytic gas phase reaction: **[10]**

$$A + B \rightarrow C + D$$
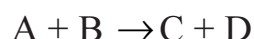
Where all the reactants and products are strongly adsorbed. Derive the rate expression considering Langmuir - Hinshelwood mechanism in terms of partial pressure of the respective components.
If some inert gas Helium is also present, and it is also strongly adsorbed on the surface, write down the modified rate expression.

Q3) a) Write down important properties of a catalyst sample to be suitable for industrial applications - Elaborate on each of them. **[6]**

b) What are Zeolites? Why they are used heavily now - a - days? Discuss the shape selectivity of Zeolites and its applications. **[6]**

c) What is Sintering? Explain with help of neat sketch. **[4]**

Q4) a) Write down important assumptions for Langmuir Adsorption Isotherm and derive it. **[5]**

b) Write a short note on Hydrodesulfurization reactor and its catalysts. **[5]**

c) Spray drying produces spherical particles of 2 microns diameter. Calculate the external surface area considering nonporous particle. What size of particle will be needed to provide external surface area of 100 m²/g? Density of particles is 2.0 g/cm³. **[6]**

Q5) An indigenously developed catalyst when studied with nitrogen adsorption at –195.8°C, data obtained for 25.4g of catalyst sample: **[16]**

Pressure (mm Hg)	8	50	130	258	442	507
Volume adsorbed (cm³)	52	66	81	97	137	159

Estimate surface area of catalyst (in square meters per gm unit.)

SECTION - II

Q6) a) With help of neat diagram explain various fluidization regimes and discuss their importance. **[8]**

b) Differentiate between group of particles as classified by Geldart. Provide appropriate examples of each group. **[8]**

Q7) a) Explain the process of fluidization with help of neat diagram. Discuss the minimum superficial gas velocity and its significance. **[6]**

b) With help of rough sketch discuss various types of gas distributor for fluidized bed - Compare their performances. **[6]**

c) Discuss the advantages of fluidized bed system. **[6]**

Q8) a) With help of neat diagram explain the 2 - phase model of fluidized bed reactors. **[6]**

b) Discuss the bubble movement through the fluidized bed with help of neat sketches. In this context highlight contribution of Davidson. **[6]**

c) Write a short note on production of Polyethylene in a Fluidized Bed Reactor. **[4]**

Q9) a) Explain operations of various types of fluidized bed dryers - provide representative diagrams. **[8]**

b) Discuss the working of modern fluidized bed catalytic cracker unit with help of neat sketch. **[8]**

Q10) Write short notes on (Any Four): **[16]**

a) Bubbling Fluidized Bed.

b) Pneumatic Conveying.

c) Quality of Fluidization.

d) Fluidized Bed Heat Transfer.

e) Scale Up of Fluidized Bed System.

f) Disadvantages of Fluidization.

♦♦♦♦

P1293

[3964]-340C

B.E. (Petrochemical Engineering)

PETROLEUM EXPLORATION AND PRODUCTION OPERATIONS

(Sem. - II) (2003 Course) (Elective - II) (412411)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

 1) *Answers to the two sections should be written in separate answer books.*
 2) *Question No. 4 and 8 are compulsory. Out of remaining solve <u>any two</u> from each Section.*
 3) *Draw neat diagrams wherever necessary.*

SECTION - I

Q1) Describe important physical and chemical properties of crude oil and natural gas. **[15]**

Q2) a) List and explain in two lines important reservoir rock properties. **[5]**

 b) Describe a typical petroleum system with respect to source rock, reservoir rock, cap rock, trap and timing. **[10]**

Q3) Explain the geochemical aspects of transformation of organic matter into hydrocarbon in a sedimentary basin. **[15]**

Q4) Write short notes on <u>any four</u> of the following: **[20]**

 a) Reservoir drive mechanisms,

 b) Reserves estimation,

 c) Geophysical methods used in oil exploration,

 d) Types and uses of oil well logging surveys and

 e) Geological risk analysis.

SECTION - II

Q5) With the help of neat sketches, describe important components of a land rig. **[15]**

Q6) List and explain with the help of neat sketches various methods of oil well completion. **[15]**

Q7) a) Explain important EOR methods. **[10]**

b) Draw sketches to show important offshore drilling units. **[5]**

Q8) Write short notes on <u>any four</u> of the following: **[20]**

a) Factors that balance demand and supply of petroleum,

b) India's hydrocarbon potential,

c) Importance of natural gas for Indian industry,

d) Environmental impact of oil spills in offshore area,

e) Applications of microbiology in oil industry and

f) Refineries in India.

◆◆◆◆

P1295

[3964]-346

B.E. (Polymer)

RUBBER TECHNOLOGY

(2003 Course) (Elective - I) (409366) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

    1)   *Answer three questions from Section I and three questions from Section II.*

    2)   *Answers to the two sections should be written in separate books.*

    3)   *Neat diagrams must be drawn wherever necessary.*

    4)   *Figures to the right indicate full marks.*

    5)   *Your answers will be valued as a whole.*

    6)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

    7)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   What are the molecular requirements for a polymer to exhibit elastomeric properties?   **[8]**

    b)   Explain the thermodynamic theory for rubber elasticity.   **[8]**

OR

Q2) a)   What are the steps involved while using raw rubber and latex for processing?   **[8]**

    b)   With the help of suitable diagram explain the stress-strain behaviour for raw & vulcanized rubber.   **[8]**

Q3) a)   List the various types of C-blacks & differentiate between them.   **[6]**

    b)   Describe the role of following in rubber compounding.   **[8]**

        i)   Antioxidants

        ii)   Fillers &

        iii) Tackifiers.

    c)   Discuss the use of textiles as reinforcements in rubber products.   **[4]**

OR

Q4) a) What are "peptizers"? Explain the need for its addition, mechanism of functioning & level of addition. Give 2 examples of the same. **[6]**

b) Discuss the different types of vulcanising agents used with rubbers. **[6]**

c) What is the role of accelerators & activators w.r.t. rubber? Give 2 examples of each. **[6]**

Q5) a) What is "vulcanisation"? Write a reaction to show vulcanisation in case of natural rubber. **[4]**

b) State the factors affecting the rate of vulcanisation **[6]**

c) Explain in detail soluble and non-soluble sulphur as a vulcanising agent.**[6]**

OR

Q6) a) What is mastication? Why is it necessary? How is it carried out? Discuss mastication curve w.r.t natural rubber. **[8]**

b) Draw & explain the cure curve for rubbers. **[8]**

SECTION - II

Q7) a) Describe the process of injection molding of rubbers. **[8]**

b) List the different types of roll arrangements used in calendaring of rubbers. Explain roll chambering. **[8]**

OR

Q8) a) Name and differentiate between the types of extruders used with rubbers. Explain their working w.r.t rubbers. **[8]**

b) Explain the process of compression molding w.r.t rubbers. **[8]**

Q9) a) Differentiate between radial & cross ply tyres. **[6]**

b) Explain the various steps in making of a conveyor belt. **[6]**

c) Explain the construction of a rubber hose with a neat sketch. Explain the purpose and formulation of different layers. **[6]**

OR

Q10) a) Differentiate between the 3 main classes of cellular rubber. What tests would you carry out on rubber foams? **[6]**

b) Explain the process for manufacture of rubber gloves. **[6]**

c) List the various components forming a tyre structure & explain the function of each component. **[6]**

Q11) a) Define "permanent set" & explain the method to determine permanent set in tension. **[5]**

b) With neat diagrams explain the procedure to measure volume & surface resistivity. **[6]**

c) Which tests would you carry out for the following products : **[5]**
   i)   Tyres.
   ii) Seals & Gaskets.

<div align="center">OR</div>

Q12) a) State 2 applications in which the rubber product is tested for abrasion. Explain the procedure to carry out the test. **[6]**

b) List the tests carried out on unvulcanised rubbers. Explain any one of them. **[6]**

c) What is "rebound resilience" Explain test to measure it. **[4]**

<div align="center">✴ ✴ ✴</div>

P1300

[3964]-368

B.E. (Computer Engineering)
MULTIMEDIA SYSTEMS
(2003 Course) (Elective - I) (410445) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section I & Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section II.*
2) *Answers to the two sections should be written in separate answer sheets.*
3) *Neat diagrams should be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of electronic pocket calculator is allowed.*
6) *Assume suitable data if necessary.*

SECTION - I

Q1) a) What is Multimedia? Describe any four softwares used in Multimedia Industry.   **[9]**

b) How is multimedia used in Business Communications? Explain this with an example.   **[9]**

OR

Q2) a) Describe the hardware requirement for a Multimedia System with a suitable diagram.   **[8]**

b) What is Multimedia Authoring? State and explain various Authoring Tools.   **[10]**

Q3) a) State and Describe any two Image Enhancement techniques.   **[8]**

b) Compare Lossy Compression technique with Lossless Compression technique. Explain Shannon-Fano compression algorithm.   **[8]**

OR

Q4) a) What is Histogram? Explain with example how it is useful in Image Processing.   **[8]**

b) Write short note on JPEG.   **[8]**

Q5) a) What is Sound Card? Explain its principle and working. **[8]**

b) Explain audio file formats - .WAV and .VOC. **[8]**

OR

Q6) a) Describe a CD-ROM in terms of : **[8]**

    i) The layers in it.

    ii) Layout of tracks.

    iii) Lands and pits on it.

b) Compare **[8]**

    i) Digital Audio and MIDI

    ii) MPEG-I and MPEG-II.

SECTION - II

Q7) a) What is a hypertext? Explain this with a diagram. Also describe three major elements of hypertext. **[8]**

b) Briefly explain four features of Digital Video. Also explain why it is increasingly used in current applications. Explain two differences in the functions of DVD and a CD-ROM. **[8]**

OR

Q8) a) What are Annotations? Explain the role of annotations in the applications of hypertext, with an example. **[8]**

b) Explain the various broadcast - video standards. **[8]**

Q9) a) What is Virtual Reality? How does the multimedia techniques are used to implement the Virtual reality? **[8]**

b) State and describe the elementary tools of virtual reality. **[8]**

OR

Q10) a) Which are the types of nodes in VRML? Write a script for implementing dining table using VRML. **[8]**

b) Explain Head Mounted Displays and their use in multimedia applications.

[8]

Q11) a) Discuss the basic concept of animation and methods of controlling the
animation.   **[9]**

b) What is rendering? Explain different rendering algorithms in animation.**[9]**

<div align="center">OR</div>

Q12) Write short notes on :   **[18]**

a) 2D & 3D animation.

b) Animation on Web.

c) Flip Book Animation.

<div align="center">✳ ✳ ✳</div>

P1301

[3964]-390A

B.E. (Information Technology)
ARTIFICIAL INTELLIGENCE
(Sem. - II) (2003 Course) (Elective - II) (410451)

Time : 3 Hours]   *[Max. Marks : 100*
Instructions to the candidates:
  1) *Answers to the two sections should be written in separate sheet.*
  2) *Use of logarithmic tables, slide rules and electronic pocket calculator is allowed.*
  3) *Neat diagrams must be drawn wherever necessary.*
  4) *Figures to the right indicate full marks.*
  5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) List and explain typical problem characteristics and problem solving approach in detail. **[8]**

  b) What is Hill Climbing method? Explain the algorithm and its variants.

  [8]

OR

Q2) a) Explain in detail Min Max Search with alpha and beta cutoffs. **[10]**
  b) What is Generate and Test Method? Explain with example. **[6]**

Q3) a) Express following sentences by the propositional calculus, **[10]**

  i)   This information is not good.

  ii) His car is red or brown.

  iii) Jane will catch the train only if she hurries.

  iv) If he was there, then he must have heard it.

  v)   If Peter is in the forest, then Tom must be in the forest as well.

  b) Write a note on Fuzzy Logic indicating advantages. **[8]**

OR

Q4) a) Explain the process of Resolution in Predicate logic with example. **[12]**
  b) Write a note on Frame representation. **[6]**

Q5) a) What is Waltz's algorithm? Explain with example. **[10]**

  b) How constraint satisfaction can be used to solve the problem in Crypt - arithmetic Domain. **[6]**

P.T.O.

Q6) a) What is NLP? Detail all the steps involved. **[10]**

    b) Explain perception confined to vision and speech recognition. **[6]**

SECTION - II

Q7) a) Explain in detail the Hierarchical planning by an example. **[8]**

    b) Solve any block problem by Goal Stack Planning. **[8]**

OR

Q8) a) Explain the various components of planning. **[8]**

    b) What is Nonlinear planning? Write the complete algorithm. **[8]**

Q9) a) Detail the Supervised, Unsupervised and Semi - Supervised learning.

    [9]

    b) Comment on Failure - driven learning, learning by being told and learning by exploration. **[9]**

OR

Q10) a) Give various applications of ANN. **[8]**

    b) Write in detail a note on perceptron Networks and Back - propagation.

    [10]

Q11) a) Justify how does prolog qualify itself as an AI language. **[8]**

    b) Draw and explain ideal architecture of expert system. **[8]**

OR

Q12) a) Comment on Expert system Shells. **[8]**

    b) Explain the process of building a specific Expert system with Knowledge engineering tools. Compare it with spreadsheet. **[8]**

◆◆◆

P1302

[3964]-395

B.E. (Biotechnology) (Semester - I)

ENVIRONMENTAL BIOTECHNOLOGY

(2003 Course) (416281) (Elective - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Answer to the two sections should be written in separate answer books.*
2) *Draw diagrams wherever necessary.*
3) *Maximum marks for each question is given in parentheses.*

SECTION - I

Q1) Why is it important to understand the biological characteristics of water? What are coliform bacteria? What is the significance of MNP test?   **[18]**

OR

Q2) a) What is meant by BOD and COD? What is their significance in the waste water treatment?   **[9]**

   b) Draw a neat schematic representation of a typical waste water treatment system.   **[9]**

Q3) Describe the selection criteria for a biological treatment of waste water. Enlist the evaluation parameters for biological treatment of waste water.   **[16]**

OR

Q4) Explain the different types of suspended growth biological treatment based on aeration mechanisms. Highlight the significance of each.   **[16]**

Q5) What is a Biotower? Explain the principle and application in waste water treatment?   **[16]**

OR

Q6) Explain the applications of aerated lagoons and oxidation ditches in waste water treatment? What are their advantages and limitations?   **[16]**

SECTION - II

Q7) a) Differentiate between unit operation and unit process with suitable examples. **[9]**

b) Why is sampling carried out? What are the different sampling techniques? **[9]**

OR

Q8) a) Describe the characteristics of effluent from paper and pulp industry.**[9]**

b) Elaborate the significance of UASB system in effluent treatment. **[9]**

Q9) Classify waste with reference to the nature of hazard? Why is it important to minimize hazardous waste? **[16]**

OR

Q10) a) Explain the role of bioremediation in removal of oil spills. **[8]**

b) What are the aerobic and anaerobic degradation processes for hydrocarbons? **[8]**

Q11) Write short notes on ANY TWO : **[16]**

a) Solid waste composting.

b) Applications of land farming.

c) Significance of bioremediation.

✳ ✳ ✳

P1305

[3964]-402
B.E. (Biotechnology)
FOOD BIOTECHNOLOGY
(2003 Course) (Sem. - II) (416286) (Elective - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:
1) *Answer three questions from section I and three questions from section II.*
2) *Answer to the two sections should be written in separate answer books.*
3) *Neat diagrams should be drawn whenever necessary.*
4) *Figures to the right indicate full marks.*

SECTION - I

Q1) a) Explain the concept of water activity of foods. Classify the different classes of food on basis of their a_w values and elaborate how it decides the type of spoilage micro organism. What are the different factors which affect the water activity requirements of micro organisms? **[10]**

b) Explain the various extrinsic parameters which dictate the spoilage of food. **[6]**

OR

Q2) a) Describe in detail any two methods used for raw material preparation in the food industry. Also state the effects these methods have on the characteristics of food. **[10]**

b) What are the different mechanisms which lead to the spoilage of food? **[6]**

Q3) a) Describe the process of blanching. **[8]**

b) What is the principle of preservation using microwave radiations? How is it different from irradiation using gamma rays? To what classes of food can these techniques be applied? **[8]**

OR

Q4) Write notes on the following topics: **[16]**

a) Hydrostatic pressure cooking.

b) Difference between canning and aseptic processing.

c) Modified atmosphere storage.

d) Preservation using chemical additives.

Q5) Discuss in detail the application of algae as a source of food. Describe the industrial processes for the production of agar and alginate derived from algae. Also state their uses in the food industry. **[18]**

OR

Q6) a) What are the different substrates used for production of butanol from food wastes? Discuss in detail the procedure of recovery of butanol from this process. **[9]**

b) What are single cell oils and their potential applications in the food industry? Discuss in brief how they are produced using micro organisms. **[9]**

SECTION - II

Q7) a) What is solid state fermentation? Discuss in detail solid state fermentative process for production of any one class of commercially important food product. **[8]**

b) Describe the process of beer making using fermentation. **[8]**

OR

Q8) Write notes on the following (any two): **[16]**

a) Solid state bio processing.

b) Mushroom production.

c) Cereal based fermented products of India.

Q9) Describe the various applications of pectinases in the food industry. **[18]**

OR

Q10) a) What is the role of enzymes in the bakery industry? Explain giving suitable examples. **[9]**

b) Describe in detail the use of enzymes in fruit juice technology. **[9]**

Q11) a) What are the characteristics of solid wastes generated from the food industry? How are they treated? **[8]**

b) Give an overview of the chemical methods used for treating food wastes. **[8]**

OR

Q12) What is meant by biological methods of treating wastes? Describe the different biological processes used for treating wastes from the food industry. **[16]**

◆◆◆◆

P1306

[3964]-403

B.E. (Biotechnology)
BIOMATERIALS
(2003 Course) (416286) (Sem. - II) (Elective - II)

Time : 3 Hours]   *[Max. Marks : 100*
Instructions to the candidates:
  1)   Answer to two sections should be written in separate answer books.
  2)   Draw diagrams wherever necessary.
  3)   Maximum marks for each question is given in parentheses.

SECTION - I

Q1) What are biotextiles and biofabrics? Describe their medical applications.

   What classes of biomaterials are used in their fabrication?   **[16]**

OR

Q2) Describe the biomedical application of smart materials.   **[16]**

Q3) a) How are stimuli - responsive polymers different from general polymers?
         Discuss their biomedical applications.   **[9]**

   b) Describe the properties of one biomaterial each which have been
       extensively used in   **[9]**

       i)   Immobilization techniques and

       ii) Protein purification with respect to their application.

OR

Q4) Describe the properties and biomedical applications of three natural
     polysaccharides.   **[18]**

Q5) a) What is meant by targeted drug delivery? Discuss the application of
         Pullulan in targeted drug delivery.   **[8]**

   b) Describe the synthesis of polylactic acid starting from lactic acid
       highlighting the intermediary products.   **[8]**

OR

Q6) a) Describe the different types of membrane reactors and their application
         in biocatalytic processes.   **[8]**

   b) Describe the microbial production of PHA from Ralstonia eutropha.**[8]**

                                                                    P.T.O.

SECTION - II

Q7) a) A cancer patient has a bone tumor that is going to be removed from the leg, and which will require a metal implant to replace the missing tissue and restore the patient's ability to walk. The surgeon asks you whether it is better to remove an entire section of the bone, or if he should leave half of the cross section intact and implant only a half cylinder adjacent to remaining bone instead of a full cylinder of metal. What do you advise, and why? **[9]**

b) Describe the role of osteointegration and osteoinduction in bone tissue replacement. **[9]**

OR

Q8) a) What are the characteristics of bioadhesives? What are the applications of bioadhesive drug delivery systems? **[9]**

b) Describe the role of collagen in soft tissue replacement. **[9]**

Q9) Enlist the important properties of biomaterials for cardiovascular applications. List all cardiovascular applications of biomaterials. What materials are used in each of these applications and what properties define their respective application? **[16]**

OR

Q10) What are scaffolds? Explain their role in tissue engineering? What materials are used in the making of scaffolds? **[16]**

Q11) Describe the different methods for the synthesis of nanoscale structures of carbon and describe the structures of nanoscale carbon. **[16]**

OR

Q12) Describe the optical properties of Quantum dots and enumerate their applications in biomedicine. **[16]**

◆◆◆◆

P1318

[3964]-331

B.E. (Petrochemical)

REFINING OPERATIONS

(2003 Course) (Sem. - I) (412401)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

    1)   Attempt any three questions from each section.

    2)   Answers to the two sections should be written in two separate answer books.

    3)   Figures to the right indicate full marks.

    4)   Use of steam tables and electronic calculator is allowed.

    5)   Assume suitable data wherever necessary.

SECTION - I

Q1) a) Discuss why crude desalting is needed. **[4]**

    b) Explain in brief the process details of crude desalting. **[12]**

Q2) Explain in detail the engineering considerations involved in performance of atmospheric distillation unit. **[18]**

Q3) Discuss pertinent specifications of any four fuel products. **[16]**

Q4) Write Notes :

    a) Vacuum Devices. **[5]**

    b) Structured Packings. **[5]**

    c) Outlets for Naphtha. **[6]**

SECTION - II

Q5) Explain growing demand for hydrogen in crude processing. Also discuss how refineries manage to meet this demand. **[16]**

Q6) Discuss the various options available for residue processing in crude refining. Describe any one of them in brief. **[18]**

Q7) Explain in detail how elemental sulphur is produced in modern refineries. **[16]**

Q8) Write Notes (Any Two) :

    a) LOBS Production. **[8]**

    b) Olefins from refinery. **[8]**

    c) Delayed Coking. **[8]**

✳ ✳ ✳

P1319

[3964]-284

B.E. (Printing)

ELECTRONIC IMAGE SETTING

(Sem. - I) (2003 Course) (408285)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

    1)   *All questions are compulsory.*

    2)   *Write answers to different sections on separate answer sheets.*

SECTION - I

Q1) Write short notes on following :   **[16]**

    a)   Vector images.

    b)   Raster Images.

<div align="center">OR</div>

    What is peculiarity of software programmes used for graphics and those used for page layout in terms of data handling?   **[16]**

Q2) Explain Portable Document Format and any three types of PDF files.   **[16]**

<div align="center">OR</div>

Which file format will you recommend if the file is to be made ready for :**[16]**

    a)   Web viewing?

    b)   Document distribution.

Justify the answers.

Q3) a)   Explain working of internal drum imagesetters with neat diagram.

    b)   Explain beam deviation technologies used for capstan imagesetters.**[18]**

<div align="center">OR</div>

What is RIP? Explain the functions and significance of those functions available in RIP.   **[18]**

SECTION - II

Q4) Explain Flat Bed Platesetter with neat diagram. **[16]**

OR

Explain the different light sources used for platesetters. **[16]**

Q5) Explain fundamental steps used in digital image processing with flowchart diagram. **[18]**

OR

Write short notes on : **[18]**

a) Spreads.

b) Chokes.

c) PS.

Q6) Explain following types of color CRT : **[16]**

a) Shadow mask CRT.

b) Beam penetration CRT.

OR

Explain following types of inherent memory devices: **[16]**

a) Plasma panel.

b) Laser Scan Display.

✸ ✸ ✸

P1322

[3964]-342

B.E. (Polymer Engineering)
POLYMER PROCESSING OPERATIONS - I
(2003 Course) (409362) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Answer any three questions from Section I and any three from Section II.*
2) *Answers to the two sections should be written in separate books.*
3) *Draw neat diagrams wherever necessary.*
4) *Numbers to the right indicate full marks.*
5) *Assume suitable data if necessary.*
6) *Use of logarithmic table, electronic pocket calculators is allowed.*

SECTION - I

Q1) a) Explain different types of winders with advantages and disadvantages used in film production.   **[8]**

b) What are the different calibration systems used for pipes. Explain in detail with neat diagrams.   **[8]**

c) Explain the merits of gear pump/melt pump in case of extrusion.   **[2]**

OR

Q2) a) With neat sketch, explain tubing extrusion line using vacuum sizing. **[8]**

b) Explain constructional features of a blown film die with neat diagram. **[8]**

c) Explain the importance of capstan.   **[2]**

Q3) a) Explain in detail the following terms :   **[12]**
   i)   Parison sag.
   ii) Shark skin effect.
   iii) Melt fracture.

b) Explain the effect of molecular weight and MWD in blow molding. **[4]**

OR

Q4) a) Compare the single stage and two stage injection stretch blow molding process. **[8]**

b) Draw a cycle time chart for continuous extrusion blow molding for single station and single parison machine. Explain in short different operations involved. **[8]**

Q5) a) Write a note on Twin sheet forming and Diaphragm forming. **[8]**

b) Explain the significances of Biot Number in case of thermoforming of thick and thin sheet. **[8]**

OR

Q6) Write a note on the followings : **[16]**

a) Process Control in thermoforming.

b) Plug assist vacuum forming.

c) Texturing with reference to thermoforming.

d) Free Blowing.

SECTION - II

Q7) a) Explain the followings : **[8]**

　i)　Reaction Injection Molding

　ii)　Structural foam Injection Molding.

b) Explain the advantages and disadvantages of Gas assisted injection molding. **[6]**

c) Write a short note on "Sandwich Molding". **[4]**

OR

Q8) a) Discuss the differences between thermoplastic and thermoset injection molding. **[6]**

b) With the help of neat sketch explain the process of gas injection molding. **[6]**

c) Explain the breathing techniques used in thermoset Injection molding.**[6]**

Q9) a) State and explain different stages of compression molding with neat diagram. **[8]**

b) Explain in brief design consideration in compression mold design. **[8]**

OR

Q10) a) Explain flow cure relationship for compression molding process. **[6]**

b) Explain positive, semi positive and flash type of mold with neat sketch.**[10]**

Q11) a) Explain dielectric preheating and Infrared preheating in detail. **[8]**

b) Discuss the advantages and disadvantages of transfer molding process.**[8]**

OR

Q12) a) Discuss the followings : **[8]**
   i)   Integral pot type.
   ii) Separate pot type transfer molding.

b) Trouble shooting in Transfer Molding. **[8]**

✳ ✳ ✳

P1326

[3964]-136

B.E. (Mechanical Engineering)
ENERGY MANAGEMENT
(Sem. - II) (2003 Course) (Elective - II) (402050)

Time : 3 Hours] [*Max. Marks : 100*

Instructions to the candidates:
1) *Answer any three questions from each section.*
2) *Answer to the two Sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of electronic pocket calculator is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) What are the Principles of Energy Management? **[8]**

b) Discuss environmental impacts due to conventional energy use. **[8]**

OR

Q2) a) Discuss the relevance of renewable energy for national energy security policy. **[8]**

b) List out and explain energy efficiency benefits for process industry. **[8]**

Q3) a) What are the basic components of an Energy Audit? **[8]**

b) State and explain the functions of measuring instruments used for energy audit. **[8]**

OR

Q4) a) What is the importance of life cycle cost concepts in the financial analysis of projects? And explain the term 'Time Value of Money'. **[8]**

b) Determine the future worth (accumulated total) at the end of seven years in an account that earns 5%/yr if Rs. 600 deposit is made today and Rs.1000 deposit is made at the end of year two? **[8]**

Q5) a) Discuss the following terms for the efficient operation of compressed air system: **[9]**

i) Quality of air.
ii) Capacity control of compressor.
iii) Piping layout.

b) Determine the potential energy savings associated with reducing the amount of excess air to an optimum level for a natural gas - fired steam boiler. **[9]**

P.T.O.

Q6) a) List out the Energy Conservation opportunities in Steam systems. **[6]**

b) What are the benefits of condensate recovery? **[6]**

c) What is a Steam Trap? Discuss the importance of sizing of steam trap to provide proper condensate drainage. **[6]**

SECTION - II

Q7) a) How will a change in the speed of the driving motor result in lower energy requirements? **[6]**

b) What possible improvement measures you would look for in general lighting system. **[6]**

c) Discuss 'Demand Side Management'. **[6]**

OR

Q8) a) State different desirable properties and selection criteria of refractory material. **[9]**

b) Write short notes on: **[9]**
   i) Economic thickness of insulation.

   ii) Insulating materials.

Q9) a) Explain Waste Heat Recovery techniques. **[8]**

b) What is cogeneration? Explain the concept of topping cycle and bottoming cycle. **[8]**

OR

Q10) a) Define and explain different terms used in performance assessment of water pumps. **[8]**

b) Explain the following terms for waste heat recovery. **[8]**
   i) Economizer.
   ii) Air - preheater.

Q11) a) State different conservation opportunities in refrigeration systems. **[8]**

b) Explain the importance of maintenance of heat exchanger surface in HVAC and refrigeration systems. **[8]**

OR

Q12) a) Suggest minimum ten tips for energy conservation in thermal power plant. **[8]**

b) Discuss in brief different energy efficient technologies in electrical systems used in pumps and Compressors. **[8]**

◆◆◆◆

P822

[3923]-406

M.Sc - II

INORGANIC CHEMISTRY

CH - 431 : Material Science

(Sem. - IV) (2008 Pattern) (New)

Time : 3 Hours] *Max. Marks : 80*

Instructions to the candidates:

    1)   *All questions are compulsory.*

    2)   *Neat diagrams must be drawn wherever necessary.*

    3)   *Figures to the right indicate full marks.*

    4)   *Use of logarithmic tables and calculator is allowed.*

Q1)   Attempt any FOUR of the following: **[20]**

    a)   What is photoconductivity? Explain the phenomenon of photoconductivity with the help of band energy level diagram.

    b)   What are nanoparticles? Explain the size dependent properties of nanoparticles.

    c)   Explain the different types of plots of α vs T in solid state reactions.

    d)   Explain the different types of superconductors.

    e)   Explain the atomic model of diffussion. Give the diffussion mechanism in solids.

    f)   What are three main types of synthetic fibres used to produced fibre - reinforced plastic composite materials?

Q2)   Attempt any FOUR of the following: **[20]**

    a)   Derive the expression $x = \dfrac{C}{T - \nu c} = \dfrac{C}{T - \theta}$

    b)   What are biomaterials? Explain the classification of biomaterials.

    c)   Explain the working mechanism of n - p - n transistor?

    d)   What is Hysteresis loop? Saturation magnetisation of FCC iron is 1750 kA / m^2. Calculate the net magnetic moment per iron atom in the crystal. Given lattice parameter of BCC iron is 2.87A°

    e)   In germanium energy gap is 0.75 eV. What is the wavelength at which it starts absorption of light?

Q3) Attempt any FOUR of the following: [20]

   a) What is Luminiscence? Explain the different types of Luminiscence.

   b) Explain the peilter and seebeck effect on the basis of energy level diagram of two dissimilar metals.

   c) What is the difference between normal and inverse spinel? Give applications of magnetic materials.

   d) Explain the synthesis of super conducting materials?

   e) Explain the hysteresis loops.

   f) With the help of flow sheet explain the sol - gel process.

Q4) Write short notes on: (any four) [20]
   a) Crystal growth.

   b) Schottky and Frenkel defect.

   c) Flotz zone method for synthesis of pure silicon.

   d) The Kirkendall effect.

   e) Bioactive glass.

   f) Macro defect free cement.

◆◆◆

P1331   **[3964]-232**

B.E. (Electronic)
BIO - MEDICAL ELECTRONICS
(Sem. - II) (2003 Course) (404211)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Answers to the two sections should be written in separate books.*
2) *Neat diagrams must be drawn wherever necessary.*
3) *Figures to the right indicate full marks.*

SECTION - I

Q1) a) For a typical cell explain biopotential, action potential, resting potential depolarization and repolarization. **[9]**

b) Explain sodium pump. **[9]**

OR

Q2) a) Explain the different transducers used for biomedical application with reference to following parameters
    i)   Force.
    ii) Pressure.
    iii) Temperature. **[10]**

b) Describe the different temperature sensors used in medical applications. **[8]**

Q3) a) Explain circulatory system for human heart. **[8]**

b) Find Cardiac output **[8]**
    i)   When patient with heart rate is 60 beats per minute, if stroke volume is 40 ml/beat.
    ii) When stroke volume is 80 ml and heart rate is 95 beats per minute.

OR

Q4) a) Explain working of mercury based sphiggmo - manometer with necessary diagram. Also show how one measures systolic and diastolic pressure using korotkoff sound. **[8]**

b) Draw a typical ECG waveform. Show all nomenclature and explain the origin of the waveform in heart. **[8]**

Q5) a) Explain the concept of phonocardiography with the help of basic heart sound diagram. **[8]**

b) Explain which parameters can be identified by Echo - cardiogram. **[8]**

OR

Q6) a) What are the objectives of patient monitoring system? With the help of block diagram. Explain bedside monitoring system. **[8]**

b) Explain the R - wave inhibited R - wave triggered pacemaker. **[8]**

SECTION - II

Q7) a) Draw the basic schematic of colorimeter and explain the basic colorimeter analysis. **[9]**

b) Explain the working of flame photometer with the help of neat diagram. **[9]**

OR

Q8) a) Which problems occur during the measurement of PO_2. **[8]**

b) Draw & explain the working of pulse oximeter. Also state the advantages of pulse oximeter. **[10]**

Q9) a) Draw the schematic diagram of EEG machine. Explain the working of EEG machine in detail. **[8]**

b) Sketch & explain the 10 - 20 system of EEG. **[8]**

OR

Q10) a) Explain the four major types of continuous rhythmic sinusoidal EEG activity? **[8]**

b) Draw the block diagram of EMG machine and explain its working in detail? **[8]**

Q11) a) Explain the laser applications in medical field. **[8]**

b) Explain the working of standard X - ray machine with help of appropriate block schematic. **[8]**

OR

Q12) a) Explain the working of MRI machine with neat diagram. **[8]**

b) Compare MRI & CT machine. **[8]**

◆◆◆◆

P1333

[3964]-329

B.E. (Petroleum)
PETROLEUM PRODUCTION ENGINEERING - II
(2003 Course) (412389) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Answer Q.No. 1 or Q.No. 2, Q.No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6, from Section - 1and Q.No. 7 or Q.No. 8, Q.No. 9 or Q.No 10, Q.No. 11 or Q.No. 12 from Section - II.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Figures to the right indicate full marks.*
5) *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Find out the depth for point of gas injection in continuous gas life. Use the following data.

Depth = 8700ft. Expected rate = 970 bbls/day. Tubing size = $2\frac{3}{8}$ inch. P_{wh} = 200 psig, SBHP = 2750 psig. P. I. = 2.5, solution GOR = 260, SCF/STB, Sp. Gravity of injection gas = 0.68, S/C available pressure = 950 psig, °API = 41, S/C Temp. = 122 °F, B.H. Temp. = 221 °F.

265 psi/1000 ft = flowing gradient of FBHP. 22.5 psi/1000 ft = casing pressure gradient. Subtract 100 psi from point of balance.   **[10]**

b) Draw the schematic sketch of any one type of gas lift valve and derive the equation to calculate the opening pressure under operating conditions.   **[08]**

OR

Q2) a) Following are the typical well conditions. Categorize the suitable parameters to select ESP, Gas lift - Continuous, Intermittent. PCP, Hydraulic - Jet, Reciprocating, as per applications, in a tabular form. GOR, PI, BHP - High/Low
Applications in handling of viscous fluid, paraffin, solids handling capability. Offshore, deviated hole, high and low volume lift capability - poor/fair/good/excellent/not applicable.   **[12]**

b) It was desired to produce 630 bbls of oil per day from a well using gas lift. The optimum GLR at the operating point is 3070 SCF/STB. The formation oil has a gravity of 32° API and a GLR of 350 SCF/STB. Calculate the required gas injection rate. Also explain, 'how the potential of gas lift is controlled by gas injection rate'.   **[06]**

P.T.O.

Q3) **a)** Draw the schematic sketch of flow regimes, in a sequence, commonly encountered in, gas wells having water loading problem. Explain the working principle and operation cycle of 'plunger lift system' used in such wells. **[10]**

b) Draw the typical pump performance characteristics used in ESP and explain. **[06]**

OR

Q4) Draw the schematic sketch of subsurface layout of ESP components and their assembly. Calculate TDH and total HP, if pump with 0.39HP/stage is available and each stage can provide a head of 25 feet.

Given Data:

It was expected to produce water of Sp. Gravity 1.07 (No gas) at the rate of 1300 bbls/day from 5350 ft deep well. The static liquid level = 2300 ft.

Casing = 5½ inch O.D. Tubing = $2\frac{3}{8}$ inch O.D. T = 154 °F. During the test on this water well it was seen that, it is producing 800 bbls/day with liquid level at 3000 ft in the csg., which then stabilized to above 2300 ft. Use 100 ft safety in setting pump. Tubing friction is given as 30.5 ft/1000 ft. At the surface there is 2300 ft of 2.0 inch flow line with an increase in elevation = 39 ft., with friction = 30.5 ft/1000ft. **[16]**

Q5) **a)** What is 'cyclic load factor'? What is it's relationship with SRP horsepower? Draw the variation of RMS current to average current against torque loading during SRP cycles. **[06]**

b) What is the role of counterbalance in SRP? Derive an equation to calculate Ideal counterbalance effect.

Also state, true/false – 'Buoyancy forces in both the strokes and frictional force during down stroke are increasing the overall load on the prime mover of SRP'. **[10]**

OR

Q6) **a)** If the maximum stress should be within the allowable working stress, check the following SRP string and give your comments. **[12]**

Given:

Well depth = 7,900 ft, Sp. Gravity of fluid = 0.88, Plunger diameter = $2\frac{1}{4}$ inch, Pumping speed = 18 SPM and Stroke length = 54 inch. Sucker rods are available in 25 ft lengths. Allowable working stress = 45,000 psi. You can use the expression.

Wf = 0.433 G (L.Ap − 0.294. Wr) to calculate fluid weight in lbs. Percentage length and wt. per unit length of each section of the tapered rod string is,

1 inch rods = 36.9% = 2.9 lb/ft
7/8 inch rods = 36.0 % = 2.22 lb/ft.
3/4 inch rods = 27.1% = 1.63 lb/ft.

b) Draw the neat schematic sketch of subsurface pumping cycle of SRP.
Indicate various components of it. **[04]**

SECTION - II

Q7) a) How will you calculate expected productivity of oil or gas wells? If the
inflow model and calculations are correct, write the reasons for low
productivity. List the various methods available to evaluate factors affecting
well productivity. **[08]**

b) What is the basis to decide, ALT and well stimulation job? Compare and
explain the criteria's to evaluate and improve the well productivity using
these methods. **[08]**

OR

Q8) Following are the oil and gas well production problems. Discuss the workover
operations and or procedure in brief, to solve these problems. **[16]**

a) low productivity.

b) excess gas production.

c) sand production.

d) scale deposition.

Q9) a) State the Inflow and Outflow expressions applicable at any two nodes
of the wellbore and explain them in brief. **[04]**

b) Draw the schematic graphs for any four the following, **[12]**

i) Choke performance curves.

ii) Vertical lift performance curves with operating point.

iii) Vertical lift performance curves without operating point (TPR above IPR).

iv) Wellhead pressure Vs flow rate to indicate operating point of S/C
flow line.

v) Pressure drop across the sandface Vs flowrate for specific tubing
profile and perforation with operating point.

OR

Q10) Given Data :

Ts = 100°F, γ_g = 0.83, $\in$ = 0.0006 inch, H = 11,800 ft, T_R = 259°F, μ_g = 0.012 Cp, r_e = 1138 ft, r_w = 0.50ft., S = 0, h = 20 ft., Perforation diameter = 0.7 inch., z = 0.97, Gravel permeability = 41 darcys., Screen O.D. = 3.06 inch., Hole diameter =12.25 inch, 4,8 and 12 perforations per foot are to be checked.

Q_{sc} Mscfd	Pwfs. Psia	ΔP psi (d = 2.441)
25,000	5650	500
20,000	5500	1500
15,000	5400	2230
10,000	5300	3090
5,000	5150	3740

Refer the given relevant data and bottom hole flowing pressure Vs gas flow rate readings and pressure drop in 2.441 inch tubing against the said flow rate. Find out the operating points to optimize the perforation sizing, flow capacity and pressure loss across the sandface. **[16]**

Q11) a) Explain with proper reasoning. 'Each pump requires a minimum pressure at it's suction flange'. **[04]**

b) Define NPSH and explain how to calculate NPSH available for the given system. **[04]**

c) Following data is available, **[10]**
Single phase liquid flow rate = 1130 bpd.
Pressure drop allowable = 700 psi.
Maximum oil flow velocity = 18 ft/sec.
Minimum oil fow velocity = 4 ft/sec.
Corrosion and groove depth = 0.06 inch.
Rated line, internal pressure = 1500 psi.
Pipe outside diameter = 2.375 inch.
S = allowable stress = 20,000 psi.
E = 1 = weld joint factor.
Y = 0.4 = factor for ferrous material.
$T_0 1$ = manufacturer's allowance = 12.5%
Using the velocity criteria get the exact ID of pipe line and with reference to the applicable standard calculate wall thickness in inches.

OR

Q12) a)   State and explain Bernoulli's theorem, its equation and utility in pipe line design calculations in brief. **[04]**

b)   Write the six important pipe line design considerations. **[04]**

c)   State and explain any two standard equations to calculate pressure drop in liquid or gas or two phase flow through horizontal pipe line. Write the assumptions if any, for these equations. **[10]**

◆◆◆◆

P1340

[3964]-375

B.E. (Computer)
HIGH PERFORMANCE NETWORKS
(410451) (2003 Course) (Elective - II) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

    1)   *Answer Q.No. 1 or Q.No. 2, Q.No. 3 or Q.No. 4, Q.No. 5 or Q.No. 6, from Section - 1 and solve Q.No. 7 or Q.No. 8, Q.No. 9 or Q.No 10, Q.No. 11 or Q.No. 12 from Section - II*

    2)   *Answers to the two sections should be written in separate books.*

    3)   *Neat diagrms must be drawn wherever necessary.*

    4)   *Figures to the right indicate full marks.*

    5)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain in details the significance of carrier extension in Giga Ethernet Half Duplex operation? **[8]**

    b) Differentiate between 10,100 and 1000 Mbps Ethernet based on MAC characteristics. **[8]**

OR

Q2) a) Does Gigabit Ethernet supports Flow Control? If yes explain. **[8]**

    b) Explain in short about Full Duplex Gigabit Ethernet Operational parameters. **[4]**

    c) Discuss in short about 1000 BASE - X Family with suitable applications. **[4]**

Q3) a) Define the terms CIR, Bc, Be. What are their significance in congestion control? **[6]**

    b) What is Multilink PPP? What are its advantages? Write a sample configuration which enables this option. **[6]**

    c) Draw the LAPE Protocol Frame Format. What is the significance of DLCI. **[6]**

OR

Q4) a) An organization decides to use ISDN to provide Internet facility to all its users. Draw the topological diagram with necessary devices require to design and implement this network. **[6]**

    b) Comment about the use and significance of LAPD protocol. **[6]**

    c) Differentiate between Frame relay and ATM. **[6]**

Q5) a) Which ATM Adaptation Layer will you choose for supporting the following applications. **[6]**

    i) Circuit emulation.

    ii) Compressed Video.

    iii) Classical IP over ATM.

b) Explain in short what is Cell rate De - Coupling? **[2]**

c) Compute the optimum window size when a packet size is 53 bytes, the RTT is 60 ms and bottleneck bandwidth is **[8]**

    i) 1.5 Mbps (T1 trunk speed).

    ii) 155 Mbps (OC-3 trunk speed).

<p align="center">OR</p>

Q6) a) What are the functions of Transmission Convergence (TC) sub layer? Draw the cell delineation state diagram. **[8]**

b) Comment on the various B - ISDN Physical layer characteristics at User - network interface. **[8]**

<p align="center"><u>**SECTION - II**</u></p>

Q7) a) List and explain various xDSL types (At least 4 points). **[8]**

b) Comment on the significance of DMT modulation in ADSL network.

    [8]

<p align="center">OR</p>

Q8) a) Draw and Explain a typical ADSL equipment configuration. **[8]**

b) Differentiate between ADSL and cable modem. **[8]**

Q9) a) What is Quality of Service? Describe any 4 ATM QOS parameters.

    [8]

b) Describe the terms Expedited Forwarding and Assured Forwarding. **[8]**

<p align="center">OR</p>

Q10) a) Describe the functions of following components of MPLS network. **[8]**

    i) LER

    ii) LSR

    iii) LDP

    iv) LSP

b) Describe the working of MPLS. **[8]**

Q11) a) Why WIFi standard can not use CSMA/CD protocol? What is the solution Adopted. Explain. **[10]**

b) Describe in short the various distribution services used in 802.11 standard. **[8]**

OR

Q12) a) Differentiate between 802.11 and 802.16 standard. **[6]**

b) Describe the importance of OFDM in WiMax. **[6]**

c) Comment on the various Service Flows (QOS) supported in WiMax. **[6]**

◆◆◆◆

P1350

[3964]-207

B.E. (Electrical)

ILLUMINATION ENGINEERING

(Elective - I) (403143) (2003 Course) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Answer 3 questions from Section - I and 3 questions from Section - II.*
2) *Answers to the two sections should be written in separate books.*
3) *Neat diagrams must be drawn wherever necessary.*
4) *Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*
5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Deduce the relation to find the illumination at any point on the plane surface due to light source suspended at a height 'h' meters from the plane surface. **[8]**

b) Enlist various effects of bad lighting. Explain methods of controlling natural light. **[8]**

OR

Q2) a) Explain the properties of light. **[8]**

b) State and explain the laws of illumination. **[8]**

Q3) Explain any three with sketch. **[18]**

a) L.E.D.   b) LASERS.

c) Metal halide lamp.   d) Sox lamp.

OR

Q4) a) What is stroboscopic effect? How it can be avoided? **[6]**

b) Describe the construction and working of mercury vapour lamp with sketch. **[6]**

c) Enlist advantages of gas discharge lamp over incandescent lamp. **[6]**

Q5) a) Explain the following with neat sketches **[8]**

     i)   Secular reflection.

     ii)   Diffused reflection.

   b) Explain starting gear and dimming for **[8]**

     i)   Sodium vapour lamp.

     ii)   Metal halide lamp.

OR

Q6) a) What are the types of lighting fixtures according to installation type?**[8]**

   b) Discuss the importance of reflectors and refractors with reference to illumination. **[8]**

SECTION - II

Q7) a) What is polar curve? Describe its types. How it is helpful to illumination engineer. **[8]**

   b) Discuss the factors of good lighting design in detail. **[8]**

OR

Q8) a) What is glare? Discuss the type of glare and the remedies over them.**[8]**

   b) Explain the terms : **[8]**

     i)   Beam factor.

     ii)   Waste light factor.

     iii) Payback Period.

     iv) Space height ratio.

Q9) a) What is energy efficient lighting? Give its advantages. Which are the difficulties related with energy efficient lighting. **[8]**

   b) Explain with suitable example : **[8]**

     i)   Payback calculation.

     ii)   life cycle coasting.

OR

*Q10)*a) Give the comparison between different types of light sources with reference to their lumens per watt and life. **[8]**

b) Write short notes on : **[8]**

   i) Street lighting.

   ii) Flood lighting.

*Q11)*a) Write notes on Emergency lighting scheme for **[8]**

   i) Central system.

   ii) Stand alone system.

b) Explain the components of day light factor with neat diagram. **[5]**

c) Explain photo voltaic lighting. **[5]**

OR

*Q12)*Write short notes on following : **[18]**

a) Cold lighting.

b) Switching control of lighting.

c) O.F.C.

❖❖❖❖

P1351

[3964]-126

B.E. (Mech.)

MATERIALS ENGINEERING AND THEIR PROCESSING

(Elective - I) (402045) (2003 Course) (Sem. - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

  1)   *Answer any three questions from each section.*

  2)   *Answers to the two sections should be written in separate books.*

  3)   *Neat diagrams must be drawn wherever necessary.*

  4)   *Figures to the right indicate full marks.*

  5)   *Assume suitable data, if necessary.*

SECTION - I

Q1) Solve the following :

  a) Draw Fe-Fe$_3$C phase equilibrium diagram and label all phases, temperatures & compositions. State and explain the phase transformation reactions that occurs in Fe-Fe$_3$C phase diagram.   **[8]**

  b) Explain the effects of alloying elements on Fe-Fe$_3$C phase diagram and TTT curves. Explain the heat-treatment of 18:4:1 steel.   **[8]**

OR

Q2) Solve the following :

  a) Explain the phenomenon of weld decay. How it can be minimised? **[6]**

  b) A slowly cooled plain carbon steel has proeutectoid ferrite to be 10% of its eutectoid ferrite. What is the carbon content of the steel?   **[6]**

  c) Explain Austempering heat treatment.   **[4]**

Q3) Solve the following :

  a) Draw a TTT curve for eutectoid steel and explain its significance. **[4]**

  b) Distinguish between Annealing and Normalising.   **[4]**

  c) Define hardening. State advantages and disadvantages of flame hardening.
                                                                              [4]

  d) Explain the principle of carburising. Explain the post carburising heat-treatment.   **[4]**

OR

Q4) Solve the following (Any four) :

a) Draw microstructures of the following : **[4]**
    i)   Eutectoid steel in Anneated condition.
    ii)   0.4% carbon steel in hardened condition.

b) Show Annealing, normalising & hardening temperatures on a part of Fe-Fe$_3$C diagram. **[4]**

c) Distinguish between carburising and nitriding. **[4]**

d) Show martempering heat treatment cycle on TTT curve. Label all temperatures and phases. **[4]**

e) Explain the mechanism of austonite to martensite transformation. **[4]**

Q5) Solve the following :

a) Explain the effects of cooling rate, silicon content & casting thickness on graphitisation of cast iron. **[6]**

b) Draw the microstructures of Gray, malleable and S.G. irons & state their properties. **[6]**

c) Give chemical composition and one application of the following (Any three) : **[6]**
    i)   Cartridge brass.
    ii)   Gun metal.
    iii)   Invar.
    iv)   Duralumin.

<div align="center">OR</div>

Q6) Solve the following :

a) Explain the malleablizing heat treatment. State advantages & applications. **[6]**

b) Explain the production of S.G. iron. State advantages & applications of S.G. iron. **[6]**

c) Suggest suitable material for the following & justify in brief. (Any two) : **[6]**
    i)   Cylinder block.
    ii)   Piston.
    iii)   Gears for two wheelers.
    iv)   Super heater tubes.

<div align="center">

SECTION - II

</div>

Q7) Solve the following :

a) Distinguish between the particle reinforced and fiber reinforced composites. **[4]**

b) Explain the effects of the following on properties of composites (Any two). **[4]**

    i)   Orientation of fibers.

    ii)   Amount of fibers.

    iii)   Type of Fibers.

c) Explain the properties of refractories with examples. **[4]**

d) Explain with neat sketch the Pultrusion process. **[4]**

<div align="center">OR</div>

Q8) Solve the following :

a) Suggest suitable matrix & fiber materials for the following. **[6]**

    i)   Piston ring.

    ii)   Hull of ship.

    iii)   Tennis racket.

    iv)   Automobile fender.

b) Explain the characteristics of the following fibers (Any three) : **[6]**

    i)   Glass.

    ii)   Graphite.

    iii)   Boron.

    iv)   Aramid.

c) State the properties and applications of the following (Any two) : **[4]**

    i)   Epoxies.

    ii)   Phenolics.

    iii)   Silicones.

Q9) Solve the following :

a) Distinguish between chromate and phosphate coatings. **[4]**

b) Explain with neat sketch principle & advantages of PVD coating. **[4]**

c) State advantages & disadvantages of DLC coating. **[4]**

d) Explain adhesive & abrassive wear with examples. **[4]**

<div align="center">OR</div>

Q10) Solve the following :

a) Distinguish between the followings : **[9]**

    i)   Oxide and phosphate coating.

    ii)   Plating and electroless plating.

    iii)   PVD and CVD coatings.

b) A forming die of tool steel (H_{13}) is to be coated to improve the life. Suggest the suitable material & method of coating. Give the reason for your choice. **[7]**

Q11) Solve the following :

a) Define nanocluster. State the advantages and applications of nanostructured materials. **[4]**

b) Define fullerense. Explain the effect of carbon atoms on the fullerense. **[4]**

c) Explain the Arc discharge method used for the production of carbon nanotubes. State the applications of carbon nanotubes. **[6]**

d) Enlist the materials used in dentistry and state the properties required. **[4]**

OR

Q12) Solve the following :

a) Compare carbon and boron nanotubes with respect to structure, mechanical and electrical properties. **[6]**

b) Explain the phenomenon of super conductivity. How it is affected by the magnetic field? **[6]**

c) State the properties of heat resistant materials. State the materials to be used for steam turbine and give reason for your choice. **[6]**

✳ ✳ ✳

P1353

[3964]-228
B.E. (Electronics)
ADVANCED COMMUNICATION ENGINEERING
(Sem. - I) (404205) (2003 Course) (Elective - I)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1)   *Answers to the two sections should be written in separate books.*

2)   *Neat diagrams must be drawn wherever necessary.*

3)   *Figures to the right indicate full marks.*

4)   *Use of logarithmic tables, slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.*

5)   *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   Explain microwave characteristics.   **[6]**

      b)   Give the principle of operation and application of Reflex Klystron, TWT.   **[12]**

<div align="center">OR</div>

Q2) a)   Compare types of Magnetrons and give their applications.   **[6]**

      b)   Give the gain and radiation pattern of Horn antennas and parabolic reflectors.   **[6]**

      c)   Discuss in detail the types of cavity resonators.   **[6]**

Q3) a)   A silicon n-p-n transistor operates in common-base mode at 300°K and has the following parameters :   **[10]**

           Silicon intrinsic density : $n_i = 1.5 * 10^{10}$ cm^{-3}

           Acceptor density in base region : $N_a = 5 * 10^{16}$ cm^{-3}

           Donor density in emitter region : $N_d = 5 * 10^{18}$ cm^{-3}

           Hole lifetime : $\tau_p = 1$ μs

           Electron lifetime : $\tau_n = 1$ μs

           Cross section : $A = 10^{-4}$ cm^2

           Base width : $W = 10^{-3}$ cm

           Emitter length : $L_E = 10^{-2}$ cm

Determine :

i) The mobilities μ_n and μ_p.

ii) The diffusion coefficients D_n and D_p.

iii) The emitter efficiency factor γ.

iv) The transport factor β.

v) The current gain α.

b) Describe current-voltage characteristics of MESFET. **[6]**

OR

Q4) a) A coplanar strip line carries an average power of 250 Mw and a peak current of 100Ma. Determine the characteristics impedance of the coplanar strip line. **[4]**

b) A microstrip line is constructed of a perfect conductor and a lossless dielectric board. The relative dielectric constant of the fiberglass-epoxy board is 5.23 and the line impedance is 50Ω. Calculate the line inductance and line capacitance. **[4]**

c) Discuss principle of operation of BJT. **[8]**

Q5) a) Discuss delay line cancellers. **[6]**

b) Explain basic principle of Radar. **[4]**

c) What should be the pulse repetition frequency of radar in order to achieve a maximum unambiguous range of 60 nmi. If the radar has a peak power of 800 mw, what is its average power? **[6]**

OR

Q6) a) Explain Radar Range Equation. **[4]**

b) What are the types of tracking Radar systems? **[4]**

c) What are Delay line cancellers? **[8]**

Q7) a) Explain a digital optical fibre link with the help of a neat block schematic diagram. **[8]**

b) A manufacturer wishes to make a silica core step index fibre with V = 75, and a numerical aperture NA = 0.30 to be used at 820 nm. If n_1 = 1.458, what should be the core size and cladding index? **[4]**

c) Explain principle, concept and applications of OTDR for optical fibre communication. **[6]**

OR

Q8) a) Explain absorption and scattering losses in a fibre. **[8]**

b) Derive the equation for numerical aperture. **[8]**

c) Significance of optical power budgeting. **[2]**

Q9) a) Explain GSM architecture. **[6]**

b) What is the significance of Fixed channel assignment? **[4]**

c) Compare different multiple access techniques. **[6]**

OR

*Q10)*a) If there are 50 channels in a cell to handle all the calls and the average is 100s per call, how many calls can be handled in this cell with a blocking probability of 2 percent. **[4]**

b) Explain : **[12]**

i) Cell splitting.

ii) Channel assignment.

iii) Handover.

iv) Spread spectrum technology.

*Q11)*a) Explain Kepler's three laws of Planetary motion. **[8]**

b) A satellite at a distance of 40,000 km from a point on the earth's surface radiates a power of 10W from an antenna with a gain of 17 Db in the direction of the observer. Find the flux density at the receiving point and the power received by an antenna at this point with an effective area of 10 m². **[8]**

OR

*Q12)*a) Explain spot beam and its significance. **[6]**

b) What is the Satellite Communication Link Design Procedure. **[10]**

❖ ❖ ❖ ❖

P1355

[3964]-135

B.E. (Mechanical & Mech. Sandwich)
COMPUTATIONAL FLUID DYNAMICS
(Sem. - II) (2003 Course) (Elective - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

    1)   *Assume suitable data, if required.*

    2)   *Figures to the right indicate full marks.*

    3)   *Use of calculator is allowed.*

SECTION - I

Q1) a)   Explain models of flow using control volume & state. What are conservation & non-conservation form of governing equations.   **[6]**

     b)   Derive a partial differential form of continuity equation from infinitesimally small element fixed in space.   **[10]**

OR

Q2) a)   Derive the governing equation of energy in conservation or non conservation form.   **[10]**

     b)   Explain uses of CFD in today's automotive design with suitable examples.   **[6]**

Q3) a)   Solve the equation $\dfrac{dy}{dx} = \sqrt{x+y}$ subject to $x = 0$, $y = 1$ to find y at $x = 0.2$ taking h = 0.1.   **[8]**

     b)   Solve the system of equations   **[10]**

$$u' = -3u + 2v. \quad u(0) = 0$$
$$v' = 3u - 4v. \quad v(0) = 1/2$$

with $h = 0.2$ on the interval $[0, 1]$

P.T.O.

Q4) a) Solve the equation [6]

$$\frac{d^2y}{dx^2} - y^2\frac{dy}{dx} = x$$

subject to the conditions at $x = 1$, $y = 2$, $\frac{dy}{dx} = 1$ & calculate y at $x = 1.2$ taking $h = 0.2$.

b) Find the solution of boundary value problem [12]
   $u'' = u + x$, $x \in [0, 1]$
   $u(0) = 0$, $u(1) = 0$
   using shooting method. Use the forth order Taylor series method to solve initial value problem with $h = 0.2$.

Q5) a) What is artificial viscosity. Discuss some aspects of artificial viscosity. [6]

b) What is a CFL condition? State its importance. [10]

Q6) a) Illustrate how eigenvalue method is used to classify following equations i.e. hyperbolic or elliptic [10]

$$\left(1 - M_\infty^2\right)\frac{\partial u'}{\partial x} + \frac{\partial v'}{\partial y} = 0 \text{-------}(1)$$

$$\frac{\partial u'}{\partial y} - \frac{\partial v'}{\partial x} = 0 \text{------------}(2)$$

b) What is a consistant difference equation? State its importance in the solution. [6]

SECTION - II

Q7) a) Explain the methodology of Explicit, Implicit and Semi-implicit computation schemes. Illustrate these schemes with suitable example. [12]

b) Discuss the two dimensional transient problem and its solution algorithm. [6]

OR

Q8) a) Explain with suitable example the hydrodynamically and thermally developing and developed flows. **[10]**

b) Give solution algorithm for 2 dimensional channel flow. **[6]**

Q9) Explain in detail the Mac Cormach method and its application for 1D and 2D compressible flows. **[16]**

OR

*Q10)*Write notes on : **[16]**

a) Stability of solution and its criteria.

b) Nozzle flow.

c) Quasi-steady flows.

*Q11)*Explain MAC formulation and the important ideas on which its algorithm is based. Discuss the stability considerations and higher order up wind differencing involved. Illustrate the method by suitable example. **[16]**

OR

*Q12)*Write notes on : **[16]**

a) Navier-stokes equations.

b) Finite volume method.

❖ ❖ ❖ ❖

P1356

[3964]-138

B.E. (Mechanical)

RELIABILITY ENGINEERING

(2003 Course) (Elective - II) (402050) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

    1)   *Answer three questions from each Section.*

    2)   *Attempt Q1 or Q2, Q3 or Q4, Q5 or Q6 from Section - I.*

    3)   *Attempt Q7 or Q8, Q9 or Q10, Q11 or Q12 from Section - II.*

    4)   *Neat diagrams must be drawn wherever necessary.*

    5)   *Assume suitable data, if necessary.*

    6)   *Figures to the right indicate full marks.*

    7)   *Use of non-programmable electronic calculators is allowed.*

SECTION - I

Q1) a)   The following failure data is collected for a group of 100 accelerometers. Find Failure density, hazard rate and reliability and also plot the results.**[10]**

Time interval (hrs)	1	2	3	4	5	6	7	8	9	10
No. of failures	21	13	9	7	6	6	5	7	11	15

    b)   Explain availability and maintainability of a system. The data is collected for a CNC machining center in a plant as follows : Calculate operational availability and inherent availability of the plant : **[8]**

         Mean time before failure : 65 Hrs

         Mean time to repair : 10 Hrs

         Administrative logistic time : 125% of MTTR

         Calculate the operational availability and inherent availability of the CNC machining center in a plant.

<div align="center">OR</div>

Q2) a) A machinist produced 100 shafts according to the specifications. During inspection, the diameters of 85 shafts were found to be within the tolerance limits and 15 were found to be outside the tolerance band. If 6 shafts are randomly selected, find the probability of finding the diameter of at least one shaft falling outside the tolerance limits. **[8]**

b) Find the reliability and MTBF of an engine for an operating time of 500 hrs if the rate is 4 per 10^6 hour. **[5]**

c) For a system the mean time between failure is 90 hrs and down time of system is 10 hrs. Find the system unavailability. For a mission time of 50 hrs what will be Reliability of the system. **[5]**

Q3) a) Ten identical components are connected in parallel to achieve the system reliability of 0.92. Determine the reliability of each component. How much additional number of components to be added in parallel to increase the reliability upto 0.98. **[8]**

b) Explain the total probability theorem with suitable example. **[4]**

c) State the distributions used in probability theory. Explain any one in detail. **[4]**

OR

Q4) a) Explain the central limit theorem & skewness coefficient. **[6]**

b) Explain failure rate-time curve with its distinct regions of failure. Also explain the causes of failure and unreliability. **[10]**

Q5) a) In a life test on the sample of 20 electric bulbs, they failed at the following test hours. **[8]**

840	1060	1225	1331
861	1100	1251	1348
901	1137	1270	1362
939	1184	1296	189
993	1200	1314	1401

Determine the MTTF of these bulbs and reliability at 1300 hrs.

b) i) In a Parallel system if we need at least one out of 4 units to operate for the successful working of the system, determine the expression for reliability in terms of λ and t.

ii) If the failure rate λ for above parallel system is considered as 0.005 and mission time 100 hrs find the reliability of the system. **[8]**

OR

Q6) a) Fig. 1 shows a system configuration. The block shows elements of system and the reliability values of each element are given as R(A) = 0.96, R(B) = 0.94, R(C) = 0.99, R(D) = 0.85, R(E) = 0.90 & R(F) = 0.92. Find the system reliability. **[8]**
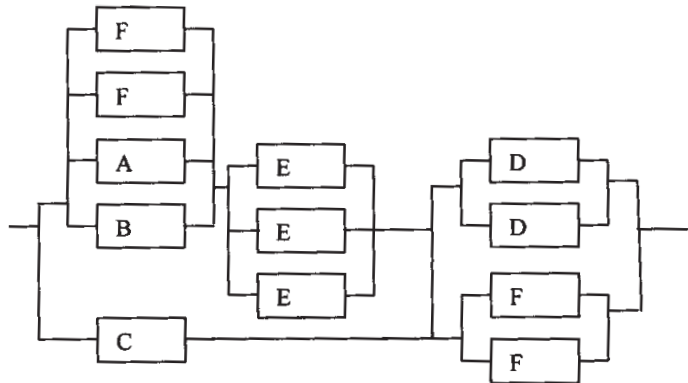
Fig. 1

b) Fing. 2 shows a reliability block diagram for the system. R(1) = 0.88, R(2) = 0.95, R(3) = 0.92, R(4) = 0.80, R(5) = 0.90, find the system reliability using conditional probability method. **[8]**

Fig. 2
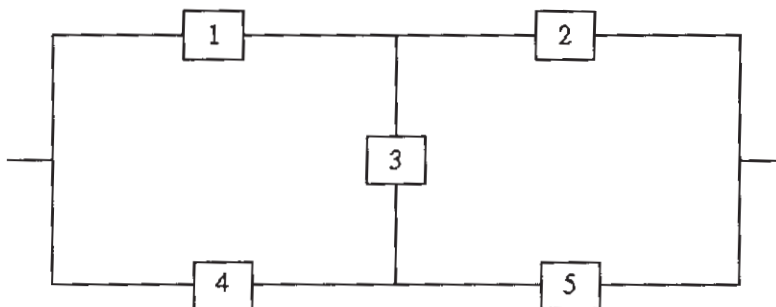
SECTION - II

Q7) a) What are the different types of loads considered in designing any machines or structures? Explain those in brief. **[8]**

b) The mean strength and the standard deviation of a bolted joint are 3000 kg/cm^2 and 250 kg/cm^2 respectively. The joint is loaded such that stress induced has a mean value of 2500 kg/cm^2 with a standard deviation of 50 kg/cm^2. Assuming that shear strength and the induced stresses are independent and normally distributed, find out the probability of survival of the bolted joint. Extract of data from statistical table is given below : **[8]**

Z	1.2	1.3	1.4	1.5	1.6	1.7	1.8
$\phi(z)$	0.8849	0.9032	0.9192	0.9331	0.9452	0.9550	0.9640

OR

Q8) a) Find the reliability and the corresponding central factor of safety of a system for which μ_s = 35000 kg/cm² and μ_L = 30000 kg/cm². σ_s = 3000 kg/cm² and σ_L = 1000 kg/cm² and S & L follows normal distribution. The table shows normal variant (z) and $\Phi(z)$. **[8]**

Z	1.56	1.58	1.60
$\Phi(z)$	0.9406	0.9429	0.9452

b) Derive an expression for reliability using load-strength interaction. **[8]**

Q9) a) Explain the fatigue failure and factors considered for fatigue design of mechanical components. **[8]**

b) Explain the magnified loading and sudden death testing for a system. **[8]**

OR

Q10) a) Explain the procedure involved in FMECA. Also give the typical FMECA form. **[8]**

b) In a short sample life testing of a system the following data is recorded. **[8]**

Component	1	2	3	4	5	6	7	8	9	10
MTTF(Hrs)	10	12	15	24	28	30	35	38	40	45

Plot the variation of reliability against time using i) Mean and ii) Median Ranking Method.

Q11) a) Explain various symbols used in construction of Fault tree diagram. **[8]**

b) The fault tree diagram is shown in Fig. 3. The failure probabilities of the elements are as given below. E1 = E2 = 0.01, E3 = E4 = 0.002, E5 = E6 = 0.1. Find out the failure probability of top event and system reliability. **[10]**
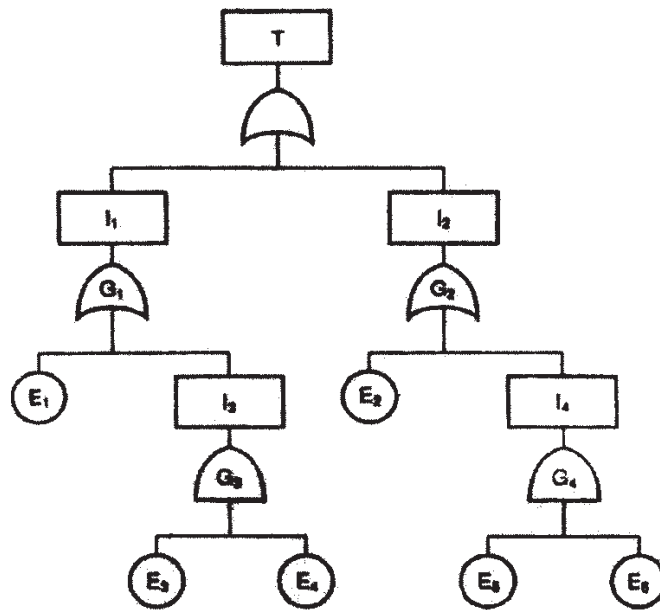
Fig. 3

OR

Q12)a) Fig. 4 shows reliability block diagram of a system the reliabilities of each elements are given as R(A) = 0.92, R(B) = 0.90, R(C) = 0.98, R(D) = 0.86 & R(E) = 0.95. Find the system reliability. Also state tie sets and cut sets for the system. **[10]**

Fig. 4

b) Fig. 5 shows a reliability block diagram for a system. Construct a fault tree diagram for this system. If all the elements are having failure probability of 0.1, calculate system failure using fault tree analysis.**[8]**

Fig.5

❖ ❖ ❖ ❖

P1357

[3964]-150-B
B.E. (Mech. S/W)
NON-CONVENTIONAL ENERGY SOURCES
(Sem. - II) (402065) (Theory) (2003 Course) (Elective - II)

Time : 3 Hours]   *[Max. Marks : 100*

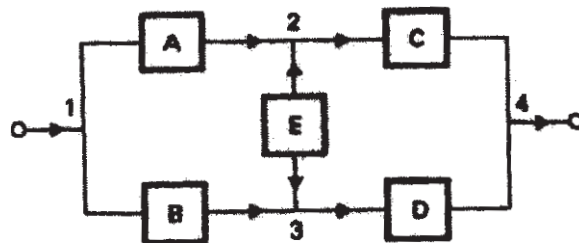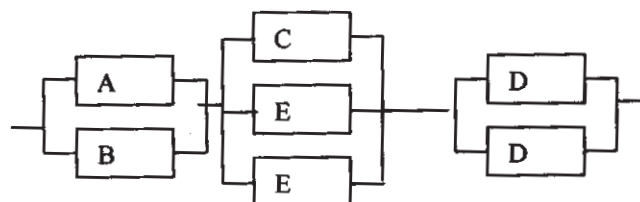*Instructions to the candidates:*

1) Answer three questions from Section - I and three questions from Section - II.
2) Answers to the two sections should be written in separate books.
3) Neat diagrams must be drawn wherever necessary.
4) Figures to the right indicate full marks.
5) Use of logarithmic tables, slide rule, Mollier chart, electronic pocket calculator and steam tables is allowed.

SECTION - I

Q1) a) Discuss the merits and demerits of alternative energy sources over the currently used energy sources. **[8]**

    b) Define solar constant. What are the reasons for variation in solar radiation reaching the earth than received at the outside of the atmosphere? **[9]**

OR

Q2) a) Define Altitude angle, Surface Azimuth angle, Solar azimuth angle, Hour angle. Determine the local solar time and declination at a location latitude 23° 15'N, longitude 77°30'E at 12.30 IST on June 19. Equation of time correction is given from standard table or chart = – (1'01"), take standard time longitude = 82°30'. **[9]**

    b) What is Beam & Diffuse radiation? Explain tilt factors for Beam radiation, Diffuse radiation & reflected radiation. **[8]**

Q3) Explain the working of conventional liquid flat plate collector with neat sketch. Give the energy balance for the absorber plate and define the instantaneous collector efficiency. Explain briefly the various loss coefficients. **[17]**

OR

Q4) a)	Discuss in brief the applications of solar air heating.	**[6]**

b)	What is the significance of selective surface used in flat plate collectors? Enlist some selective surfaces.	**[4]**

c)	Why collector heat removal factor important in the model for flat plate collector?	**[7]**

Q5) a)	Write the limitations of flat plate collectors and advantages of concentrating solar collectors. State the different types of concentrator used with neat sketches.	**[8]**

b)	Explain the working of solar pond and effect of various parameters on its performance.	**[8]**

OR

Q6) Write short notes on :	**[16]**

a)	Solar still.

b)	Heliostats.

c)	Materials for concentrators and reflecting surfaces.

d)	Pyrheliometer.

SECTION - II

Q7) What is the basic principle of solar photovoltaic (PV) power generation? What are the main elements of a PV system? What are the advantages and disadvantages of photovoltaic solar energy conversion?	**[17]**

OR

Q8) What is the basic principle of wind energy conversion? Describe the main consideration in selecting a site for wind generators. Explain with neat sketch wind electric generation system.	**[17]**

Q9) Explain the features of geothermal energy, its application, advantages and disadvantages.	**[17]**

*Q10)*a) What is the basic principle of Ocean Thermal Energy Conversion (OTEC). **[4]**

b) Explain how we get the energy from tides with neat sketches. **[6]**

c) What is fuel cell? Explain the principle of operation of fuel cell. **[7]**

*Q11)*a) Describe floating dome type of biogas plant. State advantages and limitations of floating drum type and fixed dome type biogas plant.**[8]**

b) Explain the methods of obtaining energy from biomass. **[8]**

OR

*Q12)*Write short notes on following : **[16]**
   a) Biogas for diesel engine.
   b) Biomass gasification.
   c) Micro Hydel power plant.
   d) Environmental protection norms ISO 14000.

❖ ❖ ❖ ❖

P1358

[3964]-163

B.E. (Production)

ERGONOMICS AND HUMAN FACTORS IN ENGINEERING

(Sem. - II) (411090) (2003 Course) (Elective - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

   1)   *Figures to the right indicate full marks.*

   2)   *Neat diagrams must be drawn wherever necessary.*

   3)   *Assume suitable data, if necessary.*

   4)   *Answer three questions from Section - I and three questions from Section - II.*

SECTION - I

Q1) a)   Explain the basis for ergonomics problem identification.   **[9]**

     b)   What is biomechanics? Explain in brief.   **[9]**

Q2) Write short notes on (any four) :   **[16]**

     a)   Reflectance.

     b)   Control of noise at source.

     c)   Discomfort glare.

     d)   WBGT.

     e)   Requirements for designing a safe product.

OR

Q3) a)   Explain in detail Manual Materials Handling Task design.   **[8]**

     b)   Explain in detail concept of percentiles used in anthropometric calculations.   **[8]**

Q4) a)   Write a note on Multifunction Hand Control devices.   **[8]**

     b)   What is MAP? What are the factors affecting MAP?   **[8]**

OR

Q5) a) Explain by how many means the body temperature is controlled in cold working conditions. **[8]**

b) Explain any four principles of arranging components in a physical space. **[8]**

SECTION - II

Q6) What is Maynards Operation Sequencing Technique. Discuss its elements and types in brief. **[16]**

OR

Q7) What is WFS? Explain MTM1 in details. **[16]**

Q8) a) What are leaning curves. Discuss in details. **[8]**

b) What is Control Response Ratio? Explain its significance in HFE. **[8]**

OR

Q9) What are the principles used in design of Hand Tool Devices? Explain in detail. **[16]**

Q10) a) Explain in brief Human Factors Application in System Design. Elaborate any two phases in detail. **[12]**

b) Explain the concept of design for shift work. **[6]**

❖ ❖ ❖ ❖

P1359

[3964]-235

B.E. (Electronics Engineering)
ROBOTICS & INDUSTRIAL AUTOMATION
(404212) (2003 Course) (Elective - II) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Attempt : Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6 in Section - I & Q.No.7 or Q.No.8, Q.No.9 or Q.No.10, and Q.No.11 or Q.No.12 in Section - II.*

2) *Answers to the two sections should be written in separate books.*

3) *Neat diagrams must be drawn wherever necessary.*

4) *Figures to the right indicate full marks.*

5) *Use of electronic pocket calculator is allowed.*

6) *Assume suitable data, if necessary.*

SECTION - I

Q1) a)   Explain the terms work envelope and work volume for the following types of robot.   **[10]**

  i)   Cartesian Robot.

  ii)   Cylindrical Robot.

  iii)   Spherical Robot.

  Explain the significance of these terms with respect to industrial applications.

 b)   Explain the terms :   **[8]**

  i)   Fixed Automation.

  ii)   Flexible Automation.

  iii)   Programmable Automation.

  State the application area of each.

OR

Q2) a)   Define & explain in brief the following terms :   **[10]**

  i)   DOF   ii)   Precision.

  iii)   Accuracy.   iv)   Tool orientation.

  v)   Reach & stoke.

 b)   What is SCARA robot? Explain the application in which it is most suitable.   **[8]**

P.T.O.

Q3) a) Explain the concepts of robot arm kinematics & dynamics with the help of block diagrams. **[8]**

b) Explain the Direct approach for obtaining inverse solution. **[8]**

OR

Q4) a) Sketch neat Joint & link diagram, and define the terms : **[8]**

i) Joint angle.   ii) Joint distance.

iii) Link length.   iv) Link twist angle.

Name the variable parameters for the revolute and prismatic joints.

b) Construct the link co-ordinate diagram using D-H algorithm for any suitable robot configuration and compute the arm matrix T_{Base}^{Tool} (q).**[8]**

Q5) a) Explain the working of the following types of grippers. **[8]**

i) Vacuum type.   ii) Magnetic type.

b) Discuss basic operational characteristics of following proximity sensors.

i) Inductive sensor.   ii) Hall effect sensor.   **[8]**

iii) Capacitive sensor.   iv) Ultrasonic sensor.

OR

Q6) a) Explain the concept of end effector, tool frame, tool point, roll, pitch, yaw with the help of neat diagram. **[8]**

b) Which sensor can be used along with the gripper to sense whether the object is falling? Explain the working principle. **[8]**

SECTION - II

Q7) a) Explain how straight line motion can be achieved using an articulated robot. **[10]**

b) What is trajectory planning in robotics? Explain different steps in trajectory planning. **[8]**

OR

Q8) a) A joint of 6 axis robot goes from initial angle of 20° to final angle of 80° in 5 seconds. Using a third degree polynomial, calculate the joint angles at intervals of 1 second. Also calculate joint velocities & accelerations. Plot the joint angles, velocities and accelerations from 0 to 5 second. **[10]**

b) Explain the types of motion that are used while motion planning. **[8]**

Q9) a) Draw neat sketch of robotic system employing computer vision & explain. **[8]**

b) Explain different structured illumination techniques used in robot vision system. **[8]**

OR

Q10) a) Name different segmentation techniques used in robot vision system. Explain any one of them in detail. **[8]**

b) How vision sensors can be categorized according to their dimensionality? Discuss any one type with neat diagram. **[8]**

Q11) a) What is Task planning in robotics? Explain in detail. **[8]**

b) Describe the functional relationship between actuating element and signal transduction unit of MEMS as Microsensor & Microactuator. **[8]**

OR

Q12) Write notes on : **[16]**
   a) Robot Intelligence.
   b) Teach pendant.
   c) Perspective Transformation.
   d) Nano Robot.

❖ ❖ ❖ ❖

P1360

[3964]-315

B.E. (Chemical)

COMPUTER AIDED PROCESS CONTROL

(2003 Course) (Elective - II) (Sem. - II) (409348)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1)   Answer three questions from Section - I and three questions from Section - II.

2)   Neat diagrams must be drawn wherever necessary.

3)   Figures to the right indicate full marks.

4)   Your answers will be valued as a whole.

5)   Use of logarithmic tables slide rule, Mollier charts, electronic pocket calculator and steam tables is allowed.

SECTION - I

Q1) a)   Explain the active and passive applications of computers in process control.   **[8]**

b)   With neat block diagram explain the elements of computer-aided process control system.   **[8]**

OR

Q2) a)   Distinguish between the approaches for controlling batch and continuous processes.   **[8]**

b)   Explain working of Direct Digital Control (DDC) systems.   **[8]**

Q3) a)   Explain the distinguishing characteristics of MIMO systems as compared to SISO systems. State the state-space and transfer function model forms of a MIMO system.   **[8]**

b)   Draw block diagram of a 2×2 MIMO process. Derive the expression for RGA of this process. Explain the properties of RGA used for interaction analysis and loop pairing.   **[8]**

OR

Q4) a) Define controllability and observability of MIMO system. State mathematical conditions to predict observability and controllability.**[8]**

b) A 2 × 2 system has transfer function matrix $G = \begin{bmatrix} 4 & 1.2 \\ 3 & 1.0 \end{bmatrix}$

Find RGA and comment on pairing of input-output variables. **[8]**

Q5) a) Find the transfer function model G of a MIMO system having state-space model. **[9]**

$$\dot{X} = \begin{bmatrix} -2 & 0 & 1 \\ 1 & -2 & 0 \\ 1 & 1 & -1 \end{bmatrix} X + \begin{bmatrix} 1 \\ 0 \\ 1 \end{bmatrix} U$$

$$Y = [2 \ 1 \ -1] \ X$$

Find the poles and zeros of G and comment on stability of the process.

b) For the example in Q.5 (a) check controllability and observability of the system. **[9]**

OR

Q6) Write short notes on the following : **[18]**
   a) Heirarchical computer control systems.
   b) HMI.
   c) Decoupling of control loops.

SECTION - II

Q7) a) Explain analog interfaces used in computer control systems. **[8]**

b) Describe communication heirarchy used in computer control system.**[8]**

OR

Q8) a) Describe ISO reference model for communication between open system.**[8]**

b) Explain features and parts of process control software. **[8]**

Q9) a)   Describe the components of DCS system.   **[8]**

      b)   Explain basic structure of PLC.   **[8]**

                                    OR

*Q10)*a)   Explain DCS software configuration.   **[8]**

      b)   Explain PLC architecture.   **[8]**

*Q11)*Write short notes on the following :   **[18]**
      a)   Control of centrifugal pump.
      b)   Temporal heirarchy of control structures.
      c)   Antisurge controller.

                                    OR

*Q12)*a)   Describe steps followed in control system design.   **[9]**

      b)   Describe MIMO control system for heat exchanger.   **[9]**

                              ❖ ❖ ❖ ❖

P1361

[3964]-374

B.E. (Computer Engineering & I.T.)
EMBEDDED SYSTEMS
(410451) (2003 Course) (Elective - II) (Sem. - II)

Time : 3 Hours] *[Max. Marks : 100*

Instructions to the candidates:

1) *Answers to the two sections should be written in separate answer books.*

2) *In section - I attempt : Q.No.1 or Q.No.2, Q.No.3 or Q.No.4, Q.No.5 or Q.No.6*
In section - II attempt : Q.No.7 or Q.No.8, Q.No.9 or Q.No.10, Q.No.11 or Q.No.12.

3) *Neat diagrams must be drawn wherever necessary.*

4) *Figures to the right indicate full marks.*

5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) With the help of neat diagram, describe different components of embedded systems. **[6]**

b) Explain different modes of operations in ARM7. **[6]**

c) Name the area of applications for the following processors : **[4]**
   i) ASSP.   ii) ASIC.

OR

Q2) a) What are the different characteristics of embedded systems? Explain. **[6]**

b) Classify different embedded systems. Also list application areas of embedded systems. **[6]**

c) Explain different interrupts and their vector addresses of ARM7. **[4]**

Q3) a) It is required to design a voice data acquisition system. For this application select the appropriate processor based on : **[6]**
   i) Instruction cycle time.
   ii) Bus width.
   iii) MIPS.
   iv) On-chip RAM / ROM / EEPROM / Flash memory.
   v) On-chip cache.
   vi) Number of interrupts.

P.T.O.

b) What are the advanced architectural units of a processor structure? Name two examples of processor having these features. **[6]**

c) Explain the process of converting asm program into a file for ROM image. Give example. **[6]**

OR

Q4) a) It is required to design an adaptive cruise control system. For this application select the appropriate processor based on : **[6]**
i) Instruction cycle time.
ii) Bus width.
iii) MIPS.
iv) On-chip RAM / ROM / EEPROM / Flash memory.
v) On-chip cache.
vi) Number of interrupts.

b) What are the essential characteristics of a processor structure? **[6]**

c) Draw memory map for 8 bit microcontroller connected with 8KB SRAM and 4KB EPROM. **[6]**

Q5) a) How does host recognize the device insertion in USB protocol? **[6]**

b) Explain with neat diagram, the 4 × 4 keypad interface with a microcontroller of your choice or with Parallel ports device such as 8255. **[6]**

c) Explain the different steps involved in writing UART device driver. **[4]**

OR

Q6) a) Explain with the help of neat diagram, the LCD interface with a microcontroller of your choice. **[6]**

b) Compare arbitration in 12C and CAN protocols. **[6]**

c) Explain with the help of different timings, minimum and maximum interrupt latency period for RTOS tasks. Also give details about $T_{Deadline}$. **[4]**

SECTION - II

Q7) a) How 'Embedded C' is different than 'C' used for desktop systems? Explain. **[8]**

b) With the help of neat diagram, explain software development cycle for embedded system. **[8]**

OR

Q8) a) When do you use Java as programming language for embedded system? What are the disadvantages of Java? **[8]**

b) What are the different debugging tools used in embedded systems? Give details. **[8]**

Q9) a) With the help of neat diagrams, compare the following scheduling models of RTOS, based on worst-case latency : **[10]**

i) Co-operative Round Robin.

ii) Cooperative ordered list.

iii) Cooperative Time slicing (rate monotonic).

b) What are the different ways to handle interrupts in RTOS environment? **[8]**

OR

Q10) a) Explain the significance of task scheduling in RTOS. Also explain preemptive scheduling model used in RTOS. **[10]**

b) Describe the different features of embedded Linux. **[4]**

c) Differentiate between RTOS and desktop OS based on the following points : **[4]**

i) Interrupt handling. ii) Task scheduling.

Q11) a) Discuss different features of MicroC/OS-II. Which type of RTOS is it?**[6]**

b) Design a contact based smart card system for banking application. Discuss the details of required hardware and required software design issues. **[10]**

OR

Q12) a) Discuss different applications where Vx Works is used. Also list its features. **[6]**

b) Given : An application for sending application layer byte streams on a TCP / IP network.
Discuss different tasks and their functions along with their synchronization. **[10]**

❖ ❖ ❖ ❖

P1578   **[3964]-236**

B.E. (Electronics)

SYSTEM PROGRAMMING AND OPERATING SYSTEMS

(2003 Course) (Elective - II) (404212) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1)   Solve Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6, Q.7 or Q.8, Q.9 or Q.10, Q.11 or Q.12.

2)   Answers to the two sections should be written in separate books.

3)   Neat diagrams must be drawn wherever necessary.

4)   Figures to the right indicate full marks.

SECTION - I

Q1) a) What are different component of system software.   **[8]**

b) Mention different data structure used for language processing which data structure used for searching?   **[8]**

OR

Q2) a) What are phases of compliers? Explain in brief.   **[8]**

b) Define following terms :   **[8]**
    i)   System software.
    ii)   Loaders.
    iii) Preprocessor.
    iv)   Linker.

Q3) a) What are the feature of Pass-I assemblers.   **[8]**

b) What is Macro? Explain data structures used for Pass-I & Pass-II Macro processor.   **[10]**

OR

Q4) a) Explain macro expansion with suitable example of nested macro.   **[8]**

b) Explain different data structures used in Pass-I & Pass-II assembler.**[10]**

Q5) a) What is basic functions of loaders. Explain absolute loader in detail.**[8]**

b) What is program relocation? With suitable example & data structure explain the relocatable code.   **[8]**

OR

Q6) a) Explain what are different data structure used by Pass-I loader. **[8]**

b) Explain dynamic linking loader. **[8]**

SECTION - II

Q7) a) What is deadlock? Explain & compare various techniques to handle deadlock. **[8]**

b) Explain different state of task & explain how it is synchronized. **[8]**

OR

Q8) a) Explain any two scheduling policies in details. **[8]**

b) What is semaphore? 'How' it is used for synchronization. Explain. **[8]**

Q9) a) What is virtual memory? Explain different techniques used for virtual memory in brief. **[10]**

b) Explain in detail directory structure of operating system. **[8]**

OR

Q10) a) Describe paging technique. Explain the steps of page fault handling in a virtual memory system. **[8]**

b) Explain : **[10]**
   i) Swapping.
   ii) File sharing.

Q11) a) Explain in detail physical locs. **[8]**

b) What is device driver? Explain device driver for serial port. **[8]**

OR

Q12) a) Explain IO time, access time & transfer time for magnetic tape & disks. **[8]**

b) Explain driver for parallel port. **[8]**

✷ ✷ ✷

P1579

[3964]-292

B.E. (Printing)

STUDY OF MATERIAL AND PACKAGE DESIGN

(2003 Course) (Elective - II) (408287) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

1) *Attempt any three questions from Section - I and Section - II.*
2) *Answers to the two sections should be drawn in separate books.*
3) *Figures to the right indicate full marks.*
4) *Neat diagrams must be drawn wherever necessary.*
5) *Assume suitable data, if necessary.*

SECTION - I

Q1) a) Explain the basic principle of Rigid Packaging. Explain primary, secondary distribution package and Unit load packaging.

b) State the major difference between paper and plastic packaging.

[18]

OR

a) What are the various types of raw materials used for rigid packaging, explain each with their advantage and disadvantage.

b) Mention the properties of paper and paper board required for packaging.

Q2) Solve a or b.   [16]

a) Explain following types of paper and paper board used for packaging.
   i) Chipboard.
   ii) Container board.
   iii) Waxed paper.
   iv) Corrugated Medium.

OR

b) Explain following appearance properties of paper required for packaging.
   i) Surface smoothness.
   ii) Opacity.
   iii) Rub Resistance.
   iv) Surface Structure.

Q3) Explain the term flute. Explain various types of flute profile used for corrugated board with their application. **[16]**

OR

Explain various stages of manufacturing of Corrugated Boxes.

SECTION - II

Q4) Explain the process of making Jigged die stepwise in detail. **[18]**

OR

Explain the universal type carton making with their application.

Q5) Explain environmental view on carton recycling. **[16]**

OR

Calculate the following for universal carton.
Total weight of paper required, cost per carton from following data.
a) L × B × H : 14" × 8" × 12".
b) Paper 180GSM, 18B.F.
c) 3Ply.
d) 6000Qty.
e) Paper cost: Rs. 18 per kg. and conversion cost Rs. 7 per kg.

Q6) Write short notes on : **[16]**
a) Bursting strength tester.
b) Vibration Tester.

OR

a) Compression Tester.
b) Cobb Tester.

✳ ✳ ✳

P1580

[3964]-316

B.E. (Chemical)
FOOD TECHNOLOGY
(2003 Course) (Elective - II) (409348) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:

    1)   *Attempt any three questions from Section I and Section II.*

    2)   *Answers to the two sections should be written in separate books.*

    3)   *Figures to the right indicate full marks.*

    4)   *Neat diagrams must be drawn wherever necessary.*

    5)   *Assume suitable data if necessary.*

SECTION - I

Q1)   a)   How taste can be defined using various physical and chemical parameters for product confirmation?   **[9]**

      b)   Explain various machines used for property determinations in food processing.   **[9]**

OR

Q2)   a)   Discuss the reasons why food processing industry has not grown in India as much as it was expected to be?   **[9]**

      b)   Give status of manufacture of fruits, vegetables and other food stocks in India and compare with other countries in the world? Discuss also food processing scenario in India and compare with other countries.   **[9]**

Q3)   a)   How you will classify cleaning operation (post harvesting). Compare and give applications of each type.   **[10]**

      b)   Define water activity and List water activities of at least 5 common food items?   **[6]**

OR

Q4)   a)   Explain with neat schematic diagram colour sorter machine.   **[8]**

      b)   What is sorting? What is grading? How grading is essential in food and what is importance of uniform grading procedure world wide?   **[8]**

Q5) a) What is sterilization? What are different methods of sterilization? **[10]**

b) Discuss manufacture of butter and cheese. **[6]**

OR

Q6) a) Explain with diagram different equipments for extraction of oil from oil seeds? Give their merits and demerits. **[10]**

b) Explain foots removal from oil seeds. **[6]**

SECTION - II

Q7) a) Discuss preservatives used in manufacture of jams and jellies. **[8]**

b) Explain role of pectin and sugar in jam and jellies manufacture. Discuss the quantities to be added in the jam and jellies manufacture? **[10]**

OR

Q8) a) Compare manufacture of Jams and Jellies. **[8]**

b) Give tests to confirm that Jam is ready. **[5]**

c) Give pectin contents of various fruits. **[5]**

Q9) a) Explain size reduction equipments used for processing of grains. **[6]**

b) Discuss with neat flow-sheet manufacture of biscuits. **[10]**

OR

Q10) a) Discuss heat transfer methods used in food processing? Compare them. **[10]**

b) Explain role of freezing in food preservation. Discuss with example temperature and shelf life. **[6]**

Q11) a) Write short note on enrobing operation. **[6]**

b) Explain common packaging materials and material of construction of cans. **[6]**

c) Discuss role of advertising in process food. **[4]**

OR

Q12) a) Discuss modern packing materials and their characteristics. **[6]**

b) How you can control oxygen level and moisture content in packed foods using modern packaging materials. **[10]**

✳ ✳ ✳

P1581

[3964]-339

B.E. (Petrochemical Engineering)
NATURAL GAS TECHNOLOGY
(412408) (2003 Course) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:
  1) *Answers to the two sections must be written in separate answer books.*
  2) *Attempt three questions from each section.*
  3) *Figures to the right indicate full marks.*
  4) *Neat diagrams should be drawn wherever necessary.*
  5) *Use of a non - programmable calculator is allowed.*
  6) *Assume suitable data if necessary.*

SECTION - I

Q1) a) Discuss the oil reserves and gas reserves with respect to production and utilization.   **[8]**

  b) Elaborate on formation of natural gas reservoirs.   **[8]**

Q2) a) Discuss measurements taken during sampling.   **[6]**

  b) Explain in detail dry gas, wet gas and associated gas.   **[8]**

  c) Elaborate on heating value of natural gas.   **[4]**

Q3) a) Explain in detail hydrate structures.   **[8]**

  b) Discuss phase diagram for hydrate formation.   **[8]**

Q4) Write short notes on :   **[16]**
  a) Hydrate inhibitors.
  b) Hydrate formation during drilling.
  c) Water content of natural gas.
  d) Kinetics of hydrate formation.

SECTION - II

Q5) a) Explain in detail solvent absorption for natural gas.   **[8]**

  b) Give different properties of a suitable solvent.   **[8]**

Q6) a) Elaborate on pipeline transport systems for natural gas.   **[8]**

  b) Explain the reciprocating compressor.   **[6]**

  c) With the help of a diagram, discuss the Pitot tube for flow measurement.
                                                                            [4]

Q7) a) Describe with flow sheet, Fisher Tropsch synthesis process. **[6]**

b) Discuss LNG transport Chains. **[6]**

c) Elaborate on Multiphase transport of natural gas. **[4]**

Q8) Write short notes on : **[16]**

a) Natural gas storage.

b) LNG carriers.

c) Natural gas liquefaction.

d) Design of pipeline transport installations.

◆◆◆

P1614

[3964]-148

B.E. (Mechanical Sandwich)
INDUSTRIAL ENGINEERING
(2003 Course) (402065) (Elective - II) (Sem. - II)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:
  1) *Answers to the two sections should be written in separate books.*
  2) *Neat diagrams must be drawn wherever necessary.*
  3) *Figures to the right indicate full marks.*
  4) *Assume Suitable data wherever necessary.*

SECTION - I

Q1) a) Define and Explain Industrial Engineering. What is its Importance? **[8]**

b) Describe Contributions made by FW Taylor to today's scientific management. **[8]**

OR

Q2) a) Define Method Study. What are its Objectives? Explain. **[8]**

b) Describe with suitable examples, following **[8]**

   i) Operation process chart.

   ii) String diagram and flow diagram.

Q3) a) Explain with examples concept of work measurement in Industrial Engineering. **[8]**

b) Define Time study and explain various steps involved in Time study. **[8]**

OR

Q4) a) What is performance rating? Why it is required to rate the worker? Explain. **[8]**

b) Explain the following terms **[8]**

   i) Predetermined Time Standards.

   ii) Mini Most and Maxi Most.

Q5) a) What is Ergonomics? Discuss its scope and importance in Industrial Engineering. **[10]**

b) Explain Man Machine System. **[8]**

OR

Q6) Write Short note on the following. (Any Three) **[18]**

    a) Need of Anthropometry.

    b) Principles of workplace design.

    c) Ergonomics and safety.

    d) Important Body Dimensions.

SECTION - II

Q7) What are essential characteristics of problem that can solve by LP? What is the objective function? Explain with suitable examples. **[16]**

OR

Q8) a) Distinguish between Maximization and Minimization problems. **[8]**

    b) At what average rate must a clerk at super market work in order to ensure probability of 0.90 So that the customer will not wait for more than 12 minutes? It is assumed that there is only one counter at which customer arrives in a poisson fashion at average rate of 15 per hour. The length of service by the clerk has an exponential distribution. **[8]**

Q9) a) What do you understand by the term "Facility planning"? Explain its scope. **[8]**

    b) Explain the various methods for evaluating location alternatives. **[8]**

OR

Q10) What do you understand by Material Handling? Explain its importance. List out symptoms of bad material handling practices. **[16]**

Q11) a) What do you mean by aggregate planning? What are different goals of it? Explain. **[8]**

    b) Explain in brief following with regards to Hierarchical planning. **[10]**

        i) Control performance.

        ii) Maintain performance.

OR

Q12) Write short note on the following. (Any thee) **[18]**

    a) Job shop Scheduling.

    b) MRP

    c) JIT

    d) Sequencing decisions in single machine flow shop.

    e) PPC.

♦♦♦♦

P1615

[3964]-340B

B.E. (Petrochemical Engineering)
BIOCHEMICAL ENGINEERING
(Sem. - II) (2003 Course) (Elective - II) (412411)

Time : 3 Hours]   *[Max. Marks : 100*

Instructions to the candidates:
  1) *Answer any three questions form section I and three questions from section II.*
  2) *Answers to the two sections should be written in separate books.*
  3) *Neat diagrams must be drawn wherever necessary.*
  4) *Figures to the right indicate full marks.*

SECTION - I

Q1) a) What are carbohydrates and how are they classified? Mention functions of carbohydrates. **[12]**

  b) Write a note on enzyme technology and enlist important industrial applications of hydrolytic and nonhydrolytic enzymes. **[6]**

Q2) a) Write a note on amino acids and primary, secondary and tertiary structure of proteins. **[12]**

  b) Differentiate between DNA and RNA. **[4]**

Q3) a) Mention what is biotechnology and state important areas of applications of biochemical engineering. **[10]**

  b) Mention important types of cells and differentiate between them. **[6]**

Q4) Write a notes on: **[16]**
  a) Immobilization of enzymes.
  b) Nucleosides and nucleotides.
  c) Lipids.
  d) Biotechnology tree.

SECTION - II

Q5) Discuss in details:
  a) Scale up criteria in fermenter design. **[6]**
  b) Heat and mass transfer resistances in fermentation model. **[6]**
  c) Power requirement calculation in gas - liquid mixed reactor. **[6]**

Q6) Write notes on : **[16]**

a) Bioseparations.

b) Monod Kinetics.

Q7) Explain in detail the difference in competitive and noncompetitive inhibition with particular reference to their relevance in reaction kinetics. **[16]**

Q8) Substrate A and enzyme E flow through a CSTR having volume of 6.0 lit from the inlet (C_{Ao}) and exit (C_A) concentrations and flow rates given below. Find the pertinent parameters in Michaelis - Menten kinetics. **[16]**

C_{Bo} mol/lit	C_{Ao} mol/lit	C_A mol/lit	v lit/hr
0.02	0.2	0.04	3.0
0.01	0.3	0.15	4.0
0.001	0.69	0.60	1.2

◆◆◆◆