

ANNA UNIVERSITY TIRUCHIRAPPALLI**Tiruchirappalli – 620 024****Regulation-2007****Curriculum****B.E. MECHANICAL ENGINEERING****SEMESTER VII**

S.No.	Subject Code	Subject	L	T	P	C
THOERY						
1	MG1301	Total Quality Management	3	0	0	3
2	ME1401	Finite Element Analysis	3	1	0	4
3	ME1402	Mechatronics	3	1	0	4
4	ME1403	Computer Integrated Manufacturing	3	1	0	4
5	GE1452	Process Planning and Cost Estimation	3	0	0	3
6	ME1004	Nuclear Engineering	3	0	0	3
PRACTICAL						
7	ME 1404	Computer Aided Simulation and Analysis Laboratory	0	0	3	2
8	ME 1405	Mechatronics Laboratory	0	0	3	2
9	HS 1301	Communication and Soft Skills Laboratory	1	0	3	100
TOTAL						25

SEMESTER VII

TOTAL QUALITY MANAGEMENT

(Common to Aeronautical, Automobile, Mechanical and Production)

L T P
3 0 0

UNIT I INTRODUCTION

9

Definition of quality – Dimensions of quality – Quality planning – Quality costs – Analysis techniques for quality costs – Basic concepts of Total Quality Management – Historical review – Principles of TQM – Leadership – Concepts – Role of senior management – Quality Council – Quality statements – Strategic planning – Deming philosophy – Barriers to TQM Implementation.

UNIT II TQM PRINCIPLES

9

Customer satisfaction – Customer perception of quality – Customer complaints – Service quality – Customer retention – Employee involvement – Motivation, empowerment, teams, recognition and reward – Performance appraisal – Benefits – Continuous process improvement – Juran trilogy – PDSA cycle – 5S – Kaizen – Supplier partnership – Partnering – Sourcing – Supplier selection – Supplier rating – Relationship development – Performance measures – Basic concepts– Strategy – Performance measure.

UNIT III STATISTICAL PROCESS CONTROL (SPC)

9

The seven tools of quality – Statistical fundamentals – Measures of central tendency and dispersion – Population and sample – Normal curve – Control charts for variables and attributes – Process capability – Concept of six sigma – New seven management tools.

UNIT IV TQM TOOLS

9

Benchmarking – Reasons to benchmark – Benchmarking process – Quality Function Deployment (QFD) – House of quality – QFD process – Benefits – Taguchi quality loss function – Total Productive Maintenance (TPM) – Concept – Improvement needs – FMEA – Stages of FMEA.

UNIT V QUALITY SYSTEMS

9

Need for ISO 9000 and other quality systems – ISO 9000:2000 quality system – Elements – Implementation of quality system – Documentation – Quality auditing – TS 16949 – ISO 14000 – Concept, requirements and benefits.

Total: 45

TEXT BOOKS

1. Dale H. Besterfield, “Total Quality Management”, Pearson Education, Inc. 2003.
2. James R. Evans and William M. Lidsay, “The Management and Control of Quality”, 5th Edition, South-Western, 2002.

REFERENCES

1. Feigenbaum, A.V., “Total Quality Management”, McGraw Hill, 1991.
2. Oakland, J.S., “Total Quality Management”, Butterworth Heineman, 1989.
3. Narayana V. and Sreenivasan, N.S., “Quality Management – Concepts and Tasks”, New Age International, 1996.
4. Zeiri, “Total Quality Management for Engineers”, Wood Head Publishers, 1991.

FINITE ELEMENT ANALYSIS
(Common to Automobile and Mechanical)

L T P
3 1 0

UNIT I INTRODUCTION**9**

Historical background – Matrix approach – Application to the continuum – Discretisation – Matrix algebra – Gaussian elimination – Governing equations for continuum – Classical Techniques in FEM – Weighted residual method – Ritz method.

UNIT II ONE DIMENSIONAL PROBLEMS**9**

Finite element modeling – Coordinates and shape functions – Potential energy approach – Galarkin approach – Assembly of stiffness matrix and load vector – Finite element equations – Quadratic shape functions – Applications to plane trusses.

UNIT III TWO DIMENSIONAL CONTINUUM**9**

Introduction – Finite element modelling – Scalar valued problem – Poisson equation – Laplace equation – Plane stress and plane strain conditions – Triangular elements – Element stiffness matrix – Force vector – Galarkin approach – Stress calculation – Temperature effects – Dynamics – Mass matrices.

UNIT IV AXI-SYMMETRIC CONTINUUM**9**

Axi-symmetric formulation – Element stiffness matrix and force vector – Galarkin approach – Body forces and temperature effects – Stress calculations – Boundary conditions – Applications to cylinders under internal or external pressures – Rotating discs.

UNIT V ISOPARAMETRIC ELEMENTS FOR TWO DIMENSIONAL CONTINUUM**9**

Isoperimetric formulation – The four node quadrilateral – Shape functions – Element stiffness matrix and force vector – Numerical integration – Element Stiffness matrix – Stress calculations – Four node quadrilateral for axi-symmetric problems.

L: 45 T:15 Total : 60

TEXT BOOKS

1. Chandrupatla, T.R. and Belegundu, A.D., "Introduction to Finite Elements in Engineering", 3rd Edition, Pearson Education, 2002.
2. David V. Hutton, "Fundamentals of Finite Element Analysis", McGraw-Hill International Edition, 2004.

REFERENCES

1. Rao, S.S., "The Finite Element Method in Engineering", Pergammon Press, 1989.
2. Logan, D.L., "A First Course in the Finite Element Method", 3rd Edition, Thomson Learning, 2002.
3. Robert D. Cook, David S. Malkucs and Michael E. Plesha, "Concepts and Applications of Finite Element Analysis" 4th Edition, 2003.
4. Reddy, J.N., "An Introduction to Finite Element Method", McGraw-Hill International Student Edition, 1985.
5. Zienkiewicz, O.C. and Taylor, R.L., "The Finite Element Methods, Vol.1", "The Basic Formulation and Linear Problems, Vol.1", 5th Edition, Butterworth Heineman, 2000.

MECHATRONICS

(Common to Mechanical and Production- VI Semester)

L T P**3 0 0****9****UNIT I MECHATRONICS, SENSORS AND TRANSDUCERS**

Introduction to mechatronics systems – Measurement systems – Control systems – Microprocessor based controllers. Sensors and transducers – Performance terminology – Sensors for displacement, position and proximity, velocity, motion, force, fluid pressure, liquid flow, liquid level, temperature and light sensors – Selection of sensors

UNIT II ACTUATION SYSTEMS**9**

Mechanical actuation systems – Cams – Gear trains – Ratchet and pawl – Belt and chain drives – Bearings – Electrical actuation systems – Mechanical switches – Solid state Switches – Solenoids – D.C Motors – A.C Motors – Stepper motors.

UNIT III SYSTEM MODELS AND CONTROLLERS**9**

Building blocks of Mechanical, Electrical, Fluid and Thermal Systems – Rotational systems – Transnational systems – Electromechanical systems – Hydraulic system– Mechanical systems. Continuous and discrete process controllers – Control mode – Two-Step mode – Proportional mode – Derivative mode – Integral mode – PID controllers – Digital controllers – Velocity control – Adaptive control – Digital logic control – Micro processors control.

UNIT IV PROGRAMMING LOGIC CONTROLLERS**9**

Programmable logic controllers – Basic structure – Input / Output processing – Programming – Mnemonics – Timers, internal relays and counters – Shift registers – Master and jump controls – Data handling – Analogs Input / Output – Selection of a PLC problem.

UNIT V DESIGN OF MECHATRONICS SYSTEM**9**

Stages in designing mechatronics systems – Traditional and mechatronic design - Possible design solutions – Case studies of mechatronics systems – Pick and place robot – Automatic car park systems – Engine management systems.

Total: 45**TEXT BOOKS**

1. Bolton, W., “Mechatronics”, 2nd Edition, Pearson Education, 1999.
2. Michael B. Histan and David G. Alciatore, “Introduction to Mechatronics and Measurement Systems”, McGraw-Hill International Editions, 2000.

REFERENCES

1. Bradley, D. A., Dawson, D., Buru N.C. and Loader, A.J, “Mechatronics”, Chapman and Hall, 1993.
2. Dan Neculescu, “Mechatronics”, Pearson Education Asia, 2002.
3. Lawrence J. Kamm, “Understanding Electro – Mechanical Engineering”, An Introduction to Mechatronics, Prentice Hall of India Pvt. Ltd., 2000.
4. Nitaigour Premchand Mahadik, “Mechatronics”, Tata McGraw-Hill Publishing Company Ltd, 2003.

COMPUTER INTEGRATED MANUFACTURING
(Common to Aeronautical, Mechanical and Production)

L T P
3 0 0

UNIT I INTRODUCTION

8

The meaning and origin of CIM – The changing manufacturing and management scene – External communication – Islands of automation and software – Dedicated and open systems – Manufacturing automation protocol – Product related activities of a company – Marketing engineering – Production planning – Plant operations – Physical distribution – Business and financial management.

UNIT II GROUP TECHNOLOGY AND COMPUTER AIDED PROCESS PLANNING

10

History of group technology – Role of G.T. in CAD/CAM integration – Part families – Classification and coding – DCLASS and MICLASS and OPITZ coding systems – Facility design using G.T. – Benefits of G.T. – Cellular manufacturing. Process planning – Role of process planning in CAD/CAM integration – Approaches to computer aided process planning – Variant approach and generative approaches – CAPP and CMPP process planning systems.

UNIT III SHOP FLOOR CONTROL AND INTRODUCTION OF FMS

9

Shop floor control – Phases – Factory data collection system – Automatic identification methods – Bar code technology – Automated data collection system. FMS – Components of FMS – Types – FMS workstation – Material handling and storage systems – FMS layout – Computer control systems – Application and benefits.

UNIT IV CIM IMPLEMENTATION AND DATA COMMUNICATION

10

CIM and company strategy – System modeling tools – IDEF models – Activity cycle diagram – CIM open system architecture (CIMOSA) – Manufacturing enterprise wheel – CIM architecture – Product data management – CIM implementation software – Communication fundamentals – Local area networks – Topology - LAN implementations – Network management and installations.

UNIT V OPEN SYSTEM AND DATABASE FOR CIM

8

Open systems – Open system inter connection – Manufacturing automations protocol and technical office protocol (MAP /TOP)

Development of databases – Database terminology – Architecture of database systems – Data modeling and data associations – Relational data bases – Database operators – Advantages of data base and relational database.

Total: 45

TEXT BOOKS

1. Mikell P. Groover, “Automation, Production Systems and Computer Integrated Manufacturing”, Pearson Education, 2001.
2. Yorem Koren, “Computer Integrated Manufacturing System”, McGraw-Hill, 1983.

REFERENCES

1. Ranky, Paul, G., “Computer Integrated Manufacturing”, Prentice Hall International, 1986.
2. Roger Hanman, “Computer Intergrated Manufacturing”, Addison Wesley, 1997.
3. Mikell P. Groover and Emory Zimmers Jr., “CAD/CAM”, Prentice Hall of India Pvt.

Ltd., 1998.

4. Radhakrishnan, P., Subramanyan, S. and Raju, V., "CAD/CAM/CIM", 2nd Edition, New Age International (P) Ltd., 2000.

PROCESS PLANNING AND COST ESTIMATION

(Common to Mechanical and Production)

L T P
3 0 0

UNIT I WORK STUDY AND ERGONOMICS

9

Method study – Definition – Objectives – Motion economy – Principles – Tools and Techniques – Applications – Work measurements – Purpose – Use – Procedure – Tools and techniques – Standard time – Ergonomics – Principles – Applications.

UNIT II PROCESS PLANNING

9

Definition – Objective – Scope – Approaches to process planning – Process planning activities – Finished part requirements – Operating sequences – Machine selection – Material selection parameters – Set of documents for process planning – Developing manufacturing logic and knowledge – Production time calculation – Selection of cost optimal processes.

UNIT III INTRODUCTION TO COST ESTIMATION

7

Objective of cost estimation – Costing – Cost accounting – Classification of cost – Elements of cost – Simple problems.

UNIT IV COST ESTIMATION

8

Types of estimates – Methods of estimates – Data requirements and sources – Collection of cost – Allowances in estimation.

UNIT V PRODUCTION COST ESTIMATION

2

Estimation of material cost, labour cost and over heads – Allocation of overheads – Estimation for different types of jobs manufactured by casting, forging, welding and machining.

Total : 45

TEXT BOOKS

1. Sinha, B.P., "Mechanical Estimating and Costing", Tata McGraw-Hill, Publishing Co., 1995.
2. Phillip F. Ostwalal and Jairo Munez, "Manufacturing Processes and Systems", 9th Edition, John Wiley, 1998.

REFERENCES

1. Russell, R.S. and Taylor, B.W., "Operations Management", 4th Edition, PHI, 2003.
2. Chitale, A.V. and Gupta, R.C., "Product Design and Manufacturing", 2nd Edition, PHI, 2002.

NUCLEAR ENGINEERING

	L T P
	3 0 0
UNIT I NUCLEAR PHYSICS	9
Nuclear model of an atom – Equivalence of mass and energy – Binding – Radio activity – Half life – Neutron interactions – Cross sections.	
UNIT II NUCLEAR REACTIONS AND REACTION MATERIALS	9
Mechanism of nuclear fission and fusion – Radio activity – Chain reactions – Critical mass and composition – Nuclear fuel cycles and its characteristics – Uranium production and purification – Zirconium, thorium and beryllium.	
UNIT III REPROCESSING	9
Reprocessing: nuclear fuel cycles – Spent fuel characteristics – Role of solvent extraction in reprocessing – Solvent extraction equipment.	
UNIT IV NUCLEAR REACTOR	9
Nuclear reactors: types of fast breeding reactors – Design and construction of fast breeding reactors – Heat transfer techniques in nuclear reactors – Reactor shielding – Fusion reactors.	
UNIT V SAFETY AND DISPOSAL	9
Safety and disposal: Nuclear plant safety – Safety systems – Changes and consequences of accident – Criteria for safety – Nuclear waste – Types of waste and its disposal – Radiation hazards and their prevention – Weapons proliferation.	

Total: 45**TEXT BOOKS**

1. Thomas J.Cannoly, “Fundamentals of nuclear Engineering”, John Wiley, 1978.
2. Nag. P.K., Power Plant Engineering, 2nd Edition, Tata McGraw-Hill, 2002.

REFERENCES

1. Collier, J.G. and Hewitt, G.F., “Introduction to Nuclear Power”, Hemisphere publishing, 1987.
2. Wakil, M.M.El., “Power Plant Technology”, McGraw-Hill International, 1984.

COMPUTER AIDED SIMULATION AND ANALYSIS LABORATORY**L T P**
0 0 3**LIST OF EXPERIMENTS****A. Simulation 15**

1. Simulation of Air conditioning system with condenser temperature and evaporator temperatures as input to get COP using C /MAT Lab.
2. Simulation of Hydraulic / Pneumatic cylinder using C / MAT Lab.
3. Simulation of cam and follower mechanism using C / MAT Lab.

Analysis (Simple Treatment only) 30

1. Stress analysis of a plate with a circular hole.
2. Stress analysis of rectangular L bracket

3. Stress analysis of an axi-symmetric component
4. Stress analysis of beams (Cantilever, Simply supported, Fixed ends)
5. Mode frequency analysis of a 2 D component
6. Mode frequency analysis of beams (Cantilever, Simply supported, Fixed ends)
7. Harmonic analysis of a 2D component
8. Thermal stress analysis of a 2D component - Static
9. Conductive heat transfer analysis of a 2D component - Static
10. Convective heat transfer analysis of a 2D component - Static

Total: 45

(for a batch of 30 students)

LIST OF EQUIPMENTS**Computer System 30**

- 17" VGA Color Monitor
- Pentium IV Processor
- 40 GB HDD
- 256 MB RAM

Color Desk Jet Printer 01**Software**

- ANSYS Version 7 or latest 15 licenses
- C / MATLAB 15 licenses

MECHATRONICS LABORATORY

(Common to Mechanical and Production VI Semester)

**L T P
0 0 3****LIST OF EXPERIMENTS**

1. Design and testing of fluid power circuits to control
 - i. Velocity
 - ii. direction and
 - iii. force of single and double acting actuators
2. Design of circuits with logic sequence using Electro pneumatic trainer kits.
3. Simulation of basic Hydraulic, Pneumatic and Electric circuits using software.
4. Circuits with multiple cylinder sequences in Electro pneumatic using PLC.
5. Servo controller interfacing for open loop
6. Servo controller interfacing for closed loop
7. PID controller interfacing
8. Stepper motor interfacing with 8051 Micro controller
 - i. full step resolution
 - ii. half step resolution
9. Modeling and analysis of basic electrical, hydraulic and pneumatic systems using LAB VIEW
10. Computerized data logging system with control for process variables like pressure flow and temperature.

Total: 45

LIST OF EQUIPMENT

(For a batch of 30 students)

1. Basic Pneumatic Trainer Kit with manual and electrical controls - 1 each
2. Basic Pneumatic Trainer Kit with PLC control - 1 No.
3. HYDROSIM and PNEUMOSIM Software / Automation studio - 10 sets.
4. 8051 - Microcontroller kit with stepper motor and drive circuit LABVIEW software - 2 sets
5. LAB VIEW software with Sensors to measure Pressure, Flow rate, direction, speed, velocity and force. - 2 sets

HS1301 – COMMUNICATION AND SOFT SKILLS LABORATORY

(Common to All Branches)

L T P**1 0 3****UNIT I LISTENING AND SPEAKING PRACTICE IN COMMUNICATIVE FUNCTIONS**

Introductions and meetings – Talking about studies and/ or job – Expressing likes and dislikes – Describing daily routines and current activities – Talking about past states and events – Talking about future plans and intentions – Expressing preferences – Giving reasons – Expressing opinions, agreement and disagreement – Seeking and giving advice – Making suggestions.

UNIT II SPEAKING APPLICATIONS

Making an oral presentation – Preparing the presentation – Performing the presentation – Beginning – Language – Visual aids and body language – Voice – Ending – Questions – Telephone conversations – Group discussion and interview.

UNIT III UNDERSTANDING AND PREPARING FOR INTERNATIONAL ENGLISH LANGUAGE EXAMINATIONS

International English Language Testing System (IELTS) – Test of English as a Foreign Language (TOEFL) – Business English Certificate (BEC).

UNIT IV SOFT SKILLS (1)

Preparing for and dealing with change – Motivation, goal-setting and self-esteem – Managing time and stress – Career and life planning – Team work – Leadership traits.

UNIT V SOFT SKILLS (2)

Multiple intelligences – Learning styles and personality typing – Critical and creative thinking – People, cultures and self – Intercultural communication.

REFERENCES

1. Kamalesh Sadanand, and Susheela Punitha, “Spoken English: A Foundation Course” for Speakers of Indian Languages, Part 2 Audio CD, Hyderabad: Orient Longman, 2008.
2. Malcome Goodale, “Professional Presentations”, (VCD) New Delhi, Cambridge University Press, 2005.
3. Barbara Garside, Tony Garside, “Essential Telephoning in English” (Audio CD), Cambridge, Cambridge University Press, 2002.
4. Hari Mohan Prasad, Rajnish Mohan, “How to Prepare for Group Discussion and Interview” (Audio Cassette) Tata McGraw-Hill Publishing.

5. "International English Language Testing System Practice Tests", CUP.
6. "Business English Certificate Materials", Cambridge University Press.
7. "Understanding the TOEFL", Educational Testing Services, Princeton, US.
8. Interactive Multimedia Programs on Managing Time and Stress.
9. Robert M. Sherfield, "Developing Soft Skills" New Delhi: Pearson Education, 4th Edition, 2009.

L: 15 P: 45 Total: 60

List of activities that are to be carried out: (15 sessions x 3 periods = 45)

Lab session # 1: Listening and speaking practice exercises with communicative functions.

Learning material: the ACD of Spoken English: A Foundation Course for Speakers of Indian Languages (Orient Longman, 2008)

Lab session # 2: Practice with more advanced communicative functions. Learning material: the ACD of Spoken English: A Foundation Course for Speakers of Indian Languages (Orient Longman, 2008)

Lab session # 3: Pronunciation exercises with Oxford Advanced Learners' Dictionary of Current English or any other standard Dictionary

Lab session # 4: Making an oral presentation in English. Learning Material: Professional Presentations VCD (Cambridge University Press)

Lab session # 5: Listening to telephone conversations in English and completing the tasks.

Learning material: Essential Telephoning in English ACD (Cambridge University Press)

Lab session # 6: Giving an exposure to and practice with model group discussion and interviews.

Learning material: How to Prepare for Group Discussion and Interview Audio Cassette (McGraw-Hill)

Lab session # 7: Giving insights into the format and the task types in the IELTS (International English Language Testing System). Learning Material: Objective IELTS, Intermediate Level (CUP)

Lab session # 8: Understanding the format and the task types in the TOEFL (Test of English as a Foreign Language). Learning Material: Understanding the TOEFL (Educational Testing Services, Princeton)

Lab session # 9: Administering the BEC (Business English Certificate) Diagnostic Test.

Learning Material: BEC Practice Materials (British Council, Chennai)

Lab session # 10: Completing the steps involved in Career, Life Planning and Change

Management. Learning Material: Developing Soft Skills (Pearson Education)

Lab session # 11: Setting goals and objectives exercises. Learning Material: Developing Soft Skills (Pearson Education)

Lab session # 12: Prioritizing and time planning exercises. Learning Material: Managing Time Multimedia Program CD

Lab session # 13: Taking a Personality Typing/ Psychometric Test Learning Material: 200

Psychometric Test prepared by the CUIC, Anna University Chennai

Lab session # 14: Critical and creative thinking exercises.

Lab session # 15: Improving body language and cross-cultural communication with pictures.

Learning material: Body Language (S. Chand and Co.)

MG1301

TOTAL QUALITY MANAGEMENT

UNIT I INTRODUCTION

PART- A

(1 MARK)

1. The statement of an organization's commitment to quality is

- (A) Policy (B) Vision (C) Mission (D) Principle

2. Which of the following is not a defect metric?

- (A) Location (B) Cause (C) Time to fix (D) All the above

3. Quality improvement programs may require the product itself to be changed.

- (A) True (B) False

4. The basis upon which adherence to policies is measured is

- (A) standard (B) Requirement (C) Expected result (D) Value

5. Which of the following does not form a part of a workbench?

- (A) Standards (B) Quality attributes (C) Quality control (D) Procedures

6. The focus on the product is highest during

- (A) a walkthrough (B) checkpoint review (C) an inspection (D) All the above

7. During an inspection, inspectors normally make suggestions on correcting the defects found.

- (A) True (B) False

8. There are _____ numbers of function types.

- (A) 2 (B) 3 (C) 4 (D) 5

9. The Quality manager will find it difficult to effectively implement the QAI Quality Improvement Process, unless his organization is willing to accept the Quality principles as

- (A) The organization's policy (B) A challenge (C) The corporate vision (D) All the above

10. Baselines measure the _____ change.

- (A) situation prior to (B) Expectation of benefits of (C) Effects of (D) Desirability of

11. Modifying existing standards to better match the need of a project or environment is

- (A) Definition (B) Standard for a standard (C) tailoring (D) Customization

12. Malcolm Bald ridge National Quality Award has the following eligibility categories/dimensions

- (A) Approach (B) Deployment (C) Results (D) Manufacturing service & small business

13. The term "benchmarking" means

- (A) Comparing with past data from your organization
-
- (B) Comparing with the results of a market survey
-
- (C) Comparing with the results of a customer survey
-
- (D) none of the above

14. The activity which includes confirming understanding, brainstorming and testing ideas is a

- (A) Code walkthrough (B) Inspection (C) Review (D) Structured walkthrough

15. The following can be considered to measure quality

- (A) Customer satisfaction (B) Defects (C) Rework (D) All the above

16. The objective of TQM is

- (A) to improve process (B) To improve profitability
-
- (C) All of the above (D) None of the above

17. System Test Plan will not include

- (A) Approach (B) Pass/Fail criteria (C) risks (D) Suspension and Resumption criteria

18. The following is NOT a category in MBNQA criteria

- (A) Leadership (B) HR Focus (C) Quality management (D) Information and Analysis

19. The following are types of listening are

- (A) Descriptive listening (B) Compensation listening
(C) Apprehensive listening (D) All of the above

20. Complaints must be resolved within

- (A) An hour (B) four minutes (C) A day (D) Four hours

ANSWER

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	D	B	A	B	B	B	C	D	A	C	D	D	C	D	A	C	C	C	B

PART: B

(2 MARKS)

21. Define Total Quality?

(A.U/APRIL/MAY2008)(NOV/DEC 2011)

TQM is an enhancement to the traditional way of doing business. It is the art of managing the whole to achieve excellence. It is defined both a philosophy and a set of guiding principles that represent the foundation of a continuously improving organization. It is the application of quantitative methods and human resources to improve all the processes within an organization and exceed customer needs now and in the future. It integrates fundamental management techniques, existing improvement efforts, and technical tools under a disciplined approach.

22. Define Quality?

Quality = Performance x Expectations

23. What are the Dimensions of Quality?

(A.U, NOV/DEC 2007)

- Features
- Conformance
- Reliability
- Durability
- Service
- Response
- Aesthetics
- Reputation

24. Give the Basic Concepts of TQM? (APRIL/MAY2008)

A committed and involved management to provide long-term top-to-bottom organizational support. An unwavering focuses on the customer, both internally and externally. Effective involvement and utilization of the entire work force. Continuous improvement of the business and production process. Treating suppliers as partners. Establish performance measures for the processes.

25. Give the Principles of TQM? (A.U, NOV/DEC2007)

- Constancy of purpose: short range and long range objectives aligned
- Identify the customer(s); Customer orientation
- Identification of internal and external customers
- Continuous improvement

- Workflow as customer transactions
- Empower front-line worker as leader
- Quality is everybody's business

26. Give the Obstacles associated with TQM Implementation? (A.U, APRIL/MAY/08)

- Lack of management commitment
- Inability to change organizational culture
- Improper planning
- Lack of continuous training and education
- Ineffective measurement techniques and lack of access to data and results.
- Paying inadequate attention to internal and external customers.
- Inadequate use of empowerment and teamwork.

27. Give the Analysis Techniques for Quality Costs? (A.U/NOV/DEC2007)

- Trend Analysis
- Pareto Analysis

28. Define Quality Costs? (A.U, NOV\DEC 2008)

Quality Costs are defined as those costs associated with the non-achievement of product or service quality as defined by the requirements established by the organization and its contracts with customers and society.

29. Give the primary categories of Quality cost? (A.U, NOV\DEC 2008)

- Preventive cost category Appraisal cost category
- Internal failure cost category External failure cost category

30. Give the typical cost bases? (A.U, APRIL/MAY2008)

- Labor
- Production
- Unit
- Sales

31. How will you determine the optimum cost? (A.U, NOV/DEC 2007)

- Make comparison with other organizations
- Optimize the individual categories
- Analyze the relationships among the cost categories

32. State the Quality Improvement Strategy? (A.U/NOV/DEC 2007)

Reduce failure costs by problem solving. Reduce appraisal costs where appropriate and in a statistically sound manner. Continuously evaluate and redirect.

33. Define Quality Planning?

A quality plan sets out the desired product qualities and how these are assessed and define the most significant quality attributes. It should define the quality assessment process. It should set out which organizational standards should be applied and, if necessary, define new standards.

34. Give the Objectives of TQM? (A.U/NOV/DEC2007)

To develop a conceptual understanding of the basic principles and methods associated with TQM; To develop an understanding of how these principles and methods have been put into effect in a variety of organizations; To develop an understanding of the relationship between TQM principles and the theories and models studied in traditional management; To do the right things, right the first time, every time.

35. What is needed for a leader to be effective? (A.U/APRIL/MAY2008)

To be effective, a leader needs to know and understand the following: People, paradoxically, need security and independence at the same time. People are sensitive to external rewards and punishments and yet are also strongly self-motivated. People like to hear a kind word

of praise. People can process only a few facts at a time; thus, a leader needs to keep things simple. People trust their gut reaction more than statistical data.

People distrust a leader's rhetoric if the words are inconsistent with the leader's actions.

36. What is the important role of senior management?

- i) Listening to internal and external customers and suppliers through visits, focus groups and surveys.
- ii) Communication.
- iii) To drive fear out of the organization, break down barriers, remove system roadblocks, anticipate and minimize resistance to change and in general, change the culture.

37. What are the general duties of a quality council? (A.U/NOV/DEC2007)

- (i) Develop, with input from all personnel, the core values, vision statement, mission statement, and quality policy statement.
- (ii) Develop the strategic long-term plan with goals and the annual quality improvement program with objectives.
- (iii) Create the total education and training plan.
- (iv) Determine and continually monitor the cost of poor quality.

38. What does a typical meeting agenda contain after establishing the TQM? (A.U/APRIL/MAY2008)

- i) Progress report on teams
- ii) Customer satisfaction report
- iii) Progress on meeting goals
- iv) New project teams
- v) Recognition dinner
- vi) Benchmarking report

39. What are the various quality statements? (A.U/NOV/DEC2007)

- * Vision Statement
- * Mission Statement
- * Quality Policy Statement

40. Give the basic steps to strategic quality planning? (A.U/NOV\DEC 2008)

- Customer needs
- Customer positioning
- Predict the future
- Gap analysis
- Closing the gap
- Alignment
- Implementation

41. What is a quality policy? (A.U/APRIL/MAY2008)(NOV/DEC 2011)

The Quality Policy is a guide for everyone in the organization as to how they should provide products and service to the customers. The common characteristics are Quality is first among equals. Meet the needs of the internal and external customers. Equal or exceed the competition. Continually improve the quality. Include business and production practices. Utilize the entire work force.

PART – C

(16 MARKS)

42. What is quality cost? Explain the techniques used for Quality cost? (A.U/APRIL/MAY2008)

43. Explain the principles of TQM? (A.U/NOV/DEC 2007) (A.U/APR/MAY 2006)

44. Explain Deming Philosophy? (A.U/APRIL/MAY2008)
45. Explain the barriers to TQM implementation? (A.U/NOV/DEC2007 & 2011)
46. Explain the concepts of Leadership? (A.U/APRIL/MAY2008)
 (i) Brief out the categories and elements of quality cost (NOV/DEC 2011)
 (ii) What are the benefits of TQM (NOV/DEC 2011) (NOV/DEC 2012)
47. Why is TQM considered as everyone's responsibility? What measures are taken to involve everyone in the organization?
48. What are the quality costs? Discuss them in detail. (MAY/JUNE 2013)
49. Discuss the principle of TQM in detail. (MAY/JUNE 2013)
50. What are the barriers to TQM implementation? How are they overcome? (MAY/JUNE 2013)

UNIT II

TQM PRINCIPLES

PART – A

(1 MARK)

51. Quality Assurance personnel must not be involved in changing work products.
(A) True (B) False
52. The purpose of cost-of -quality computations is to show how much is being spent for the quality control and quality assurance program.
(A) True (B) False
53. The method by which release from the requirements of a specific standard may be obtained for a specific situation is a
(A) Tailoring (B) Customization (C) Force Field Analysis (D) waver
54. Measures designed to minimize the probability of modification, destruction, or inability to retrieve software or data is
(A) Preventive security (B) Corrective security
(C) Protective security (D) none of the above
55. Quality assurance is a function responsible for
(A) Controlling quality (B) managing quality (C) Inspections (D) removal of defects
56. The word management in quality assurance describes many different functions, encompassing
(A) Policy management (B) Human resources management, safety control
(C) All of the above (D) None of the above
57. Malcolm Bal ridge National Quality Award is an annual award to recognize U.S. companies which excel in
(A) Quality achievement (B) Quality management
(C) Both of the above (D) None of the above
58. with defined process in SEI's process model, organization will achieve the foundation for major and continuing process.
(A) True (B) False
59. Statistical process control help to identify the _____ of process problems which are causing defects.
(A) Root cause (B) Nature (C) Person/persons involved (D) All of the above
60. Statistical methods are used to differentiate random variation from
(A) Standards (B) Assignable variation (C) Control limits (D) Specification limits

- 61. Random causes of process problems can be _____ eliminated.**
 (A) Sometimes (B) Never (C) Rarely (D) Always
- 62. Complexity measurements are quantitative values accumulated by a pre-determined method for measuring complexity of a**
 (A) Software engineering process (B) software product (C) Data base (D) Project team
- 63. Function points provide an objective measure of the application system -----that can be used to compare different kinds of application systems.**
 (A) Size (B) Complexity (C) Performance (D) Operation easy
- 64. Function point analysis requires information on hardware and software for the application system.**
 (A) True (B) False
- 65. The process of evaluating overall project performance on a regular basis to provide confidence that the project will satisfy the relevant quality standards is called:**
 (A) Quality Assurance (B) Quality Control (C) Quality Planning (D) Quality Review
- 66. The process of monitoring specific project results to determine if they comply with relevant quality standards is called**
 (A) Quality Assurance (B) Quality Control (C) Quality Planning (D) Quality Review
- 67. A histogram ordered by frequency of occurrence that shows how many results were generated by each identified cause is:**
 (A) Statistical Histogram (B) Juran Histogram (C) Fishbone Diagram (D) Pareto Diagram
- 68. Tools and techniques used during the Quality planning process include:**
 (A) Benefit / cost analysis (B) Benchmarking (C) Quality audits (D) a and b
- 69. The overall intentions and direction of an organization with regard to quality as formally expressed by top management is a:**
 (A) Quality Plan (B) Quality Statement (C) Quality Policy (D) TQM
- 70. CIP is:**
 (A) Continuous improvement process (B) A sustained, gradual change
 (C) a and b (D) all of the above

ANSWER

51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70
A	B	D	A	B	D	B	A	B	B	D	B	A	B	A	B	D	D	C	D

PART B

(2 MARKS)

71. What is a mission statement? (APR/MAY 2006)

The mission statement answers the following questions: who we are, who are the customers, what we do, and how we do it.

72. What is a vision statement? (APRIL/MAY 2008)

The vision statement is a declaration of what an organization should look like five to ten years in a future.

73. What are the important factors that influenced purchases? (APR/MAY 2006)

- Performance Features
- Service Warranty
- Price Reputation

74. Give the need for a feedback in an organization? (NOV/DEC2007)

- Discover customer dissatisfaction.
- Discover relative priorities of quality.
- Compare performance with the competition.
- Identify customer's needs.
- Determine opportunities for improvement.

75. List the tools used for feedback? (APRIL/MAY2008)

- Comment cards Surveys
- Focus groups Toll-free telephone lines
- Customer visits Report cards
- The internet Employee feedback

76. What are the activities to be done using customer complaints? (APRIL/MAY2008)

- investigate customer's experience both positive and negative,
- Develop procedures for complaint resolution .
- Analyze complaints.
- Work to identify process and material variations and then eliminate the root cause.
- Establish customer satisfaction measures and constantly monitor them.
- Provide a monthly complain report to the quality council.
- Identify customer's expectations

77. What are the elements of customer service? (NOV/DEC2007)

- Organization
- Customer care
- Communication
- Front-line people
- Leadership

78. Define Customer Retention? (APRIL/MAY2008) (NOV\DEC 2008)

Customer retention represents the activities that produce the necessary customer satisfaction that creates customer loyalty, which actually improves the bottom line. It is the nexus between the customer satisfaction and the bottom line.

79. Define Employee Involvement?

Employee involvement is a means to better meet the organization's goals for quality and productivity at all levels of an organization.

80. State Maslow's Hierarchy of Needs? (APRIL/MAY2008)

- Survival
- Security
- Social
- Esteem
- Self-actualization

81. State Frederick Herzberg's Two-factor theory? (APRIL/MAY2008)

Herzberg found that people were motivated by recognition, responsibility, achievement and the work itself.

82. What does an employee want? (NOV\DEC 2008)

- | | |
|------------------|------------------|
| Interesting work | Appreciation |
| Involvement | Job security |
| Good pay | Promotion/growth |

Good working conditions Loyalty to employees

83. What are the concepts to achieve a motivated work force? (APRIL/MAY2008)

- a. Know thyself
- b. Know your employees
- c. Establish a positive attitude
- d. Share the goals
- e. Monitor progress
- f. Develop interesting work
- g. Communicate effectively
- h. Celebrate success

84. Define Empowerment? (NOV\DEC 2008)

Empowerment means invest people with authority. Its purpose is to tap the enormous reservoir of creativity and potential contribution that lies within everyworker at all levels.

Empowerment is an environment in which people have the ability, the confidence, and the commitment to take the responsibility and ownership to improve the process and to initiate the necessary steps to satisfy customer requirements within well-defined boundaries in order to achieve organizational goals.

85. What are the three conditions necessary to create the empowered environment?

- Everyone must understand the need for change.
- The system needs to change for the new paradigm
- The organization must enable its employees.

86. What are the types of teams? (NOV/DEC2007)

- Process improvement team
- Cross-functional team
- Natural work teams
- Self-directed/self-managed work teams

87. What are the characteristics of successful teams? (APRIL/MAY2008)

- | | |
|------------------------------|----------------------------------|
| 1. Sponsor | Team charter |
| 2. Training | Ground rules |
| 3. Accountability | Well-defined decision procedures |
| 4. Resources | Trust |
| 5. Effective problem solving | Open communication |
| 6. Appropriate leadership | Balanced participation |
| 7. Team composition | Clear objectives |

88. What are the decision-making methods? (NOV/DEC2007)

- | | |
|---------------------------|------------------------|
| 1. Non decision | Unilateral decision |
| 2. Handclasp decision | Minority-rule decision |
| 3. Majority-rule decision | Consensus |

89. What are the stages of team development? (NOV\DEC 2008)

- Forming
- Storming
- Norming
- Performing
- Adjourning

90. Give some common team problems? (APRIL/MAY2008)

- Floundering
- Dominating participants
- Unquestioned acceptance of opinions as facts
- Attribution
- Wanderlust : digression and tangents
- Overbearing participants
- Reluctant participants
- Rush to accomplish
- Discounts and “plops”
- Feuding team members

91. What are the common barriers to team progress? (APRIL/MAY2008)

- Insufficient training
- Incompatible rewards and compensation
- First-line supervisor resistance
- Lack of planning
- Lack of management support

92. Give the steps involved in training process? (APR/MAY 2006)

- 1st. Make everyone aware of what the training is all about.
- 2nd. Get acceptance.
- 3rd. Adapt the program.
- 4th. Adapt to what has been agreed upon.

93. Define Recognition and Reward? (APRIL/MAY2008)

Recognition is a form of employee motivation in which the organization publicly acknowledges the positive contributions an individual or team has made to the success of the organization.

Reward is something tangible to promote desirable behavior. Recognition and reward go together to form a system for letting people know they are valuable members of the organization.

94. What are the types of appraisal formats? (APR/MAY 2006)

- Ranking
- Narrative
- Graphic
- Forced choice

95. What are the benefits of employee involvement? (APRIL/MAY2008)

- Employee Involvement improves quality and increases productivity because Employees make better decisions
- Employees are more likely to implement and support decisions they had a part in making.
- Employees are better able to spot and pinpoint areas for improvement.
- Employees are better able to take immediate corrective action.
- Employee involvement reduces labor/management hassle by more effective communications and cooperation.
- Employee involvement increases morale by creating a feeling of belonging to the organization.
- Employees are better able to accept change because they control the work environment..

96. What are the basic ways for a continuous process improvement? (NOV/DEC2007)

- Reduce resources
- Reduce errors
- Meet or exceed expectations of downstream customers
- Make the process safer

- Make the process more satisfying to the person doing it.

97. What are the three components of the Juran Trilogy? (APRIL/MAY2008)

- Planning
- Control
- Improvement

98. What are the steps in the PDSA cycle? (NOV/DEC2007)

The basic Plan-Do-Study-Act is an effective improvement technique.

- i) Plan carefully what is to be done
- ii) Carry out the plan
- iii) Study the results
- iv) Act on the results by identifying what worked as planned and what didn't.

99. What are the phases of a Continuous Process Improvement Cycle?

- a) Identify the opportunity
- b) Analyze the process
- c) Develop the optimal solutions
- d) Implement
- e) Study the results
- f) Standardize the solution
- g) Plan for the future

100. Define 5S? (APRIL/MAY2008)

5S Philosophy focuses on effective work place organization and standardized work procedures. 5S simplifies your work environment, reduces waste and non-value activity while improving quality efficiency and safety.

Sort – (Seiri) the first S focuses on eliminating unnecessary items from the workplace.

Set In Order (Seiton) is the second of the 5Ss and focuses on efficient and effective storage methods.

Shine: (Seiso) Once you have eliminated the clutter and junk that has been clogging your work areas and identified and located the necessary items, the next step is to thoroughly clean the work area.

Standardize: (Seiketsu) Once the first three 5S's have been implemented, you should concentrate on standardizing best practice in your work area.

Sustain: (Shitsuke) This is by far the most difficult S to implement and achieve. Once fully implemented, the 5S process can increase morale, create positive impressions on customers, and increase efficiency and organization.

101. What is a Kaizen? (APRIL/MAY2008)

Kaizen is a Japanese word for the philosophy that defines management's role in continuously encouraging and implementing small improvements involving everyone. It is the process of continuous improvement in small increments that make the process more efficient, effective, under control and adaptable.

102. What are the three key elements to a partnering relationship? (NOV\DEC 2008)

- Long-term commitment
- Trust
- Shared vision

103. What are the three types of sourcing? (APRIL/MAY2008)

- Sole sourcing
- Multiple sourcing
- Single sourcing

104. What are the ten conditions for the selection and evaluation of suppliers? (APR/MAY 2006)

- I. The supplier understands and appreciates the management philosophy of the organization.
- II. The supplier has a stable management system.
- III. The supplier maintains high technical standards and has the capability of dealing with future technological innovations.
- IV. The supplier can supply precisely those raw materials and parts required by the purchaser, and those supplied meet the quality specifications.
- V. The supplier has the capability to produce the amount of production needed or can attain that capability.
- VI. There is no danger of the supplier breaching corporate secrets.
- VII. The price is right and the delivery dates can be met. In addition, the supplier is easily accessible in terms of transportation and communication.
- VIII. The supplier is sincere in implementing the contract provisions.
- IX. The supplier has an effective quality system and improvement program such as ISO/QS 9000.
- X. The supplier has a track record of customer satisfaction and organization credibility.

105. What are the four phases of inspection? (APR/MAY 2006)

- i. 100% inspection
- ii. Sampling
- iii. Audit
- iv. Identity check

106. What are the objectives of Performance measures? (APRIL/MAY2008)

- i. Establish baseline measures and reveal trends.
- ii. Determine which processes need to be improved.
- iii. Indicate process gains and losses.
- iv. Compare goals with actual performance.
- v. Provide information for individual and team evaluation.
- vi. Provide information to make informed decisions.
- vii. Determine the overall performance of the organization.

107. What are the characteristics used to measure the performance of a particular process? (NOV\DEC 2008)

- i. Quantity
- ii. Cost
- iii. Time
- iv. Accuracy
- v. Function
- vi. Service

108. Give the six basic techniques for presenting performance measures? (APRIL/MAY2008) (APR/MAY 2006)

- a) Time series graph
- b) Control chart

- c) Capability index
- d) Taguchi's Loss Function
- e) Cost of poor quality
- f) Malcolm Baldrige National Quality Award

109. Give the usage of an effective recognition and reward system? (NOV/DEC2007)

Serves as a continual reminder that the organization regards quality and productivity as important. Offers the organization a visible technique to thank high achievers for outstanding performance. Provides employees a specific goal to work toward. It motivates them to improve the process. Boosts morale in the work environment by creating a healthy sense of competition among individuals and teams seeking recognition.

110. How will you improve the performance appraisal system?

- Use rating scales that have few rating categories.
- Require work team or group evaluations that are at least equal in emphasis to individual-focused evaluations.
- Require more frequent performance reviews where such reviews will have a dominant emphasis on future planning.
- Promotion decisions should be made by an independent administrative process that draws on current-job information and potential for the new job.
- Include indexes of external customer satisfaction in the appraisal process.
- Use peer and subordinate feedback as an index of internal customer satisfaction.
- Include evaluation for process improvement in addition to results.

111. What are the typical measurements frequently asked by managers and teams? (NOV/DEC2010)

- | | |
|---|---|
| <input type="checkbox"/> Human Resource | <input type="checkbox"/> Customers |
| <input type="checkbox"/> Production | <input type="checkbox"/> Research & Development |
| <input type="checkbox"/> Suppliers | <input type="checkbox"/> Marketing/Sales |
| <input type="checkbox"/> Administration | |

112. What are the criteria to evaluate the performance measures? (APR/MAY 2006)

- Simple
- Few in number
- Developed by users
- Relevance to customer
- Improvement
- Cost
- Visible
- Timely
- Aligned

PART – C

(16 MARKS)

113. Explain Juran trilogy for Continuous Process Improvement? (APR/MAY 2006)

114. Explain the PDSA cycle? (APRIL/MAY2008) (APRIL/MAY2007) (MAY/JUNE 2013)

115. Explain Kaizen principle? (APRIL/MAY2010)

116. Explain how the employee will be involved in doing a process? (NOV/DEC2007)

(i) Discuss about employee involvement (NOV/DEC2011)

(ii) Explain various continuous process improvement strategies (NOV/DEC2011) (NOV/DEC 2012)

117. Draw the customer's satisfaction organizational diagram and discuss. (MAY/JUNE 2013)

118. How can the customer complaints used to improve the quality of products and services? What are the various avenues available? (MAY/JUNE 2013)

UNIT III

STATISTICS PROCESS CONTROL

PART: A

(1MARK)

119. The practice of ceasing mass inspections and ending awards based on price is credited

(A) Edward Deming (B) Philip Crosby (C) Juran (D) Pareto

120. The concept of making a giant leap forward followed by a period of maturity is:

(A) Innovation (B) Continuous improvement (C) Just in time (D) Paradigm

121. The concept that it is easier and less costly to do the work right the first time is called:

(A) Zero defects (B) Continuous improvement (C) DTRTRTFT (D) The customer is

122. The ability of a product to be used for different purposes at different capacities and under different conditions determines its:

(A) Usability (B) Flexibility (C) Operability (D) Availability

123. Which of the following is not considered a cost of nonconformance to quality?

(A) Scrap (B) Rework (C) Expediting (D) Process control

124. What percentage of sales is estimated to be the cost of non-quality?

(A) 3-5% (B) 12-20% (C) 30-40% (D) 6-8%

125. A series of consecutive points on the same side of the average is called

(A) Run (B) Trend (C) Outliers (D) Cycle

126. 80% of the problems are found in 20% of the work is a concept of:

(A) Edward Deming (B) Philip Crosby (C) Juran (D) Pareto

127. A structured tool, usually industry or activity specific, used to verify that a set of required steps has been performed is called:

(A) Quality Policy (B) Check list (C) Trend analysis (D) Pareto diagram

128. A tool that analyzes the Input to a process to identify the causes of errors is called:

(A) Cause and effect diagram (B) Scatter diagram (C) Ishikawa diagram (D) a and c

129. The concept of zero inventories is called:

(A) Six sigma (B) Continuous improvement (C) Just in Time (D) Zero defects

130. Quality assurance is

(A) top management's intention regarding quality

(B) functions determining implementation of the quality policy

(C) actions to provide confidence of satisfying quality requirements

(D) all of the above

131. Quality is

(A) zero defects (B) a problem (C) a specification (D) a cost

132. Which are the best two charts to show trends in a process?

(A) Pareto and Control (B) Control and Run (C) Histogram and Run (D) Gantt and Pert

133. The pillars of quality is (are)

(A) Quality is free (B) Doing it right the first time (C) Zero defects (D) B and C

134. When a product or service completely meets a customer's requirements:

- (A) quality is achieved (B) cost of quality is high
 (C) cost of quality is low (D) the customer pays the minimum price
135. **The process of determining that technical processes and procedures are being performed in conformance with scope requirements and quality plans is called quality**
 (A) management (B) assurance (C) process review (D) control
136. **Quality is often influenced by all of the following except:**
 (A) fabrication processes and methods (B) supervision (C) inspection (D) cost of materials
137. **The _____ of a product or service mostly affects its reliability and maintenance characteristics.**
 (A) design (B) concept (C) fabrication (D) performance
138. **Poor quality in a design project is likely to directly affect _____ costs.**
 (A) manufacturing / building (B) advertising (C) overhead (D) A and D

ANSWER:

119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138
A	A	C	B	D	B	A	D	B	D	C	C	C	B	D	A	C	C	A	D

PART B**(2 MARKS)****139. Define Statistics? (APRIL/MAY2008)**

Statistics is defined as the science that deals with the collection, tabulation, analysis, interpretation, and presentation of quantitative data.

140. What is a measure of central tendency? (APR/MAY 2006)

A measure of central tendency of a distribution is a numerical value that describes the central position of the data or how the data tend to build up in the center. There are three measures in common in use in quality viz, the average, the median and the mode.

141. What is Measures of dispersion?

Measures of dispersion describe how the data are spread out or scattered on each side of the central value. The measures of dispersion used are range and standard deviation.

142. What is a normal curve? (APR/MAY 2006)

The normal curve is a symmetrical, unimodal, bell-shaped distribution with the mean, median and mode having the same value.

143. What is the use of the control chart? (APRIL/MAY2008)

The control chart is used to keep a continuing record of a particular quality characteristic. It is a picture of process over time.

144. Give the objectives of the attribute charts? (APRIL/MAY2010)

- _ Determine the average quality level.
- _ Bring to the attention of management any changes in the average.
- _ Improve the product quality.
- _ Evaluate the quality performance of operating and management personnel.
- _ Determine acceptance criteria of a product before shipment to the customer.

145. Define Six Sigma Problem Solving Method? (APRIL/MAY2008)

Define - improvement opportunity with an emphasis on increasing customer satisfaction.
 Measure - determine process capability (Cp/ Cpk) & dpmo (defects per million opportunities).

Analyze - identify the vital few process input variables that affect key product output variables (“Finding the knobs”).

Improve - Make changes to process settings, redesign processes, etc. to reduce the number of defects of key output variables.

Control - Implement process control plans, install real-time process monitoring tools, standardize processes to maintain levels.

146. What are the new seven management tools? (APRIL/MAY2008)

- i. Affinity Diagram
- ii. Interrelationship Digraph
- iii. Tree Diagram
- iv. Matrix Diagram
- v. Prioritization Matrices
- vi. Process Decision Program Chart
- vii. Activity Network diagram

147. Give the seven tools of quality? (APRIL/MAY2008)

- Pareto Diagram
- Process Flow Diagram
- Cause-and-Effect
- Diagram Check Sheets
- Histogram
- Control Charts
- Scatter Diagrams

148. Give the usage of C&E diagrams? (NOV\DEC 2008)

- Analyze actual conditions for the purpose of product or service quality improvement,
- more efficient use of resources, and reduced costs.
- Eliminate conditions causing nonconformities and customer complaints.
- Standardize existing and proposed operations.
- Educate and train personnel in decision-making and corrective-action activities.

149. Define Six Sigma? (APRIL/MAY2008)

Six-Sigma is a business process that allows organizations to drastically improve their bottom line by designing and monitoring every day business activities in ways that minimize waste and resources while increasing customer satisfaction. It is achieved through continuous process measurement, analysis & improvement.

150. What are the various histogram shapes? (NOV\DEC 2008)

- _ Symmetrical
- _ Skewed right
- _ Skewed left
- _ Peaked
- _ Flat
- _ Bimodal
- _ Plateau distribution
- _ Comb distribution
- _ Double peaked distribution

151. Differentiate Population & Sample? (APRIL/MAY2008)

Population represents the mathematical world and Sample represents the real world. A population frequency distribution is represented by a smooth curve whereas a sample frequency distribution is represented by a histogram.

152. Give the sources of variation? (APR/MAY 2006)

- _ Equipment
- _ Material
- _ Environment
- _ Operator

153. Define Run chart? (APRIL/MAY2008) (NOV/DEC2007)

A run chart is a very simple technique for analyzing the process in the development stage or, for that matter, when other charting techniques are not applicable.

154. Define Control chart? (APRIL/MAY2010)

Control chart is a means of visualizing the variations that occur in the central tendency and the dispersion of a set of observations.

155. What are the various patterns of scatter diagrams? (APRIL/MAY2008)

- _ Positive correlation
- _ Negative correlation
- _ No correlation
- _ Negative correlation may exist
- _ Correlation by stratification
- _ Curvilinear relationship

156. What is the procedure for constructing the tree diagram? (APR/MAY 2006)

Choose an action –oriented objective statement from the interrelationship diagram, affinity diagram, brainstorming, team mission statement, and so forth.

Using brainstorming, choose the major headings.

Generate the next level by analyzing the major headings.

157. Give atleast five standard formats of matrix diagram? (NOV/DEC2007)

- L-shaped T-shaped
- Y-shaped C-shaped
- X-shaped

158. What are the benefits of an activity network diagram? (NOV/DEC2007)

- A realistic timetable determined by the users.
- Team members understand the role in the overall plan.
- Bottlenecks can be discovered and corrective action taken.

PART C

(16 MARKS)

159. Explain the QC or SPC tools? (APRIL/MAY2008) (APRIL/MAY2009)

160. Explain the Seven Management Tools?

161. Plot the control chart for variables and attributes? (APRIL/MAY2008, 2010)

(i) Explain the concepts of Six Sigma? (NOV/DEC 2011)

(ii) How to draw an activity network diagram? Give example (NOV/DEC 2011) (NOV/DEC 2012)

162. How is cause and effect diagram used? Give an example. (MAY/JUNE 2013)

163. How is different histogram shapes interpreted? (MAY/JUNE 2013)

164. Explain the step by step method of drawing interrelationship diagram with an example. How is the diagram used? (MAY/JUNE 2013)

UNIT IV**TQM TOOLS****PART A****(1 MARK)**

165. From the project perspective, quality attributes:

- (A) can be objective or subjective in nature
- (B) are specific characteristics for which a product is designed, built, and tested
- (C) B and C
- (D) A and B

166. Some organizations today are using "six sigma", to set the upper and lower limits on control charts rather than the traditional sigmas.

- (A) two
- (B) three
- (C) four
- (D) five

167. The quality management tool that can be described as "a diagram that rank and displays defects in order of frequency of occurrence (from left to right)" is a:

- (A) control chart
- (B) vertical bar chart
- (C) histograms
- (D) Pareto chart

168. From the project manager's perspective, quality management is _____ limited to assessing the attributes of the tools provided to do the work.

- (A) always
- (B) usually
- (C) not
- (D) seldom

169. The primary responsibility for establishing design and test specifications should rest

- (A) purchasing
- (B) engineering
- (C) manufacturing
- (D) quality control

170. Which of the following is least likely to contribute to developing an effective project team supportive of quality?

- (A) Commitment to the project
- (B) Team member flexibility
- (C) Frequent turnover of personnel
- (D) Team interest in workmanship

171. Which of the following is least likely to contribute to developing an effective project team supportive of quality?

- (A) Commitment to the project
- (B) Team member flexibility
- (C) Frequent turnover of personnel
- (D) Team interest in workmanship

172. Primary responsibility for quality management in the project rests with the:

- (A) project engineer
- (B) purchasing agent
- (C) quality manager
- (D) project manager

173. The ISO 9000 series is:

- (A) a set of instructions for preparing control charts
- (B) a set of guidelines for quality
- (C) a set of forms and procedures to ensure quality
- (D) an international standard that describes a recommended quality system

174. Unless evidence indicates otherwise, a process is assured to be

- (A) in control
- (B) out of control
- (C) working at full capacity
- (D) working at less than full capacity

175. Which of the following statements best characterizes the quality management practice called benchmarking?

- (A) The ISO term for progress measurement
- (B) Comparing planned project practices to those of other projects
- (C) A technique used to test certain types of electronic equipment
- (D) The difference between grade and quality

176. Quality management is defined as the process of ensuring that a project meets the of the project's clients, participants, and shareholders.

- (A) specifications and statements of work (B) legal and financial obligations
(C) expectations and desires (D) needs and expectations

177. The primary components of quality management are quality _____.

- (A) inspections, certifications, and validations (B) philosophy, assurance, and control
(C) form, fit, and function (D) reliability, maintainability, and availability

178. Quality assurance is defined as the managerial process that determines _____ that provide the customers with performance standards and feedback on the performance

- (A) time, scope, cost, and resources (B) human resources, dollars, materials, and duration
(C) time, location, duration, and completion (D) organization, design, objectives

179. Quality control is the technical processes that _____ the project's progress against the performance standards.

- (A) inspect, certify, and verify (B) examine, analyze, and report
(C) inspect, examine, and determine (D) identify, measure, and report

180. Statistical Process Control uses diagrams called "Control Charts." These charts depict horizontal, parallel lines to represent _____ standard deviations.

- (A) six (B) five (C) four (D) three

181. When data is plotted on the control charts, the data is of two types: R and -bar. The R data represent points of a _____ while the X-bar data represent points of a (n) _____.

- (A) random sample; cross-matrix sample (B) real sample; simulated sample
(C) 100 percent sampling; 10 percent sampling (D) sampling run; average of several runs

182. The cost of quality has been argued as being primarily driven by the workers. When items were produced that did not meet the customers' expectations, the workers were "found" to be at fault. Current thinking is that management has at least _____ percent of the responsibility for the cost of quality.

- (A) 85 (B) 75 (C) 65 (D) 55

183. A quality program within a project should be based on _____ of errors to improve productivity along with quality levels.

- (A) early correction (B) late detection (C) late correction (D) prevention

184. The highest point of Maslow's hierarchy of needs is:

- (A) physiological satisfaction. (B) attainment of survival.
(C) need for association. (D) esteem.

ANSWERS

165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184
D	B	D	C	D	C	C	D	C	A	B	D	B	D	B	D	D	A	D	D

PART: B

(2 MARKS)

185. Define Benchmarking? (APRIL/MAY2008)

Benchmarking is a systematic method by which organizations can measure themselves against the best industry practices. The essence of benchmarking is the process of borrowing ideas and adapting them to gain competitive advantage. It is a tool for continuous improvement.

186. Enumerate the steps to benchmark? (APRIL/MAY2008)

- a) Decide what to benchmark
- b) Understand current performance
- c) Plan
- d) Study others
- e) Learn from the data
- f) Use the findings

187. What are the types of benchmarking? (NOV\DEC 2008)

- i. Internal
- ii. Competitive
- iii. Process

188. What is a QFD?

Quality Function Deployment is a planning tool used to fulfill customer expectations. It is a disciplined approach to product design, engineering, and production and provides in-depth evaluation of a product.

189. What are the benefits of QFD? (APRIL/MAY2010)

- i. Customer driven
- ii. Reduces implementation time
- iii. Promotes teamwork
- iv. Provides documentation

190. What are the steps required to construct an affinity diagram? (APRIL/MAY2008)

- i. Phrase the objective
- ii. Record all responses
- iii. Group the responses
- iv. Organize groups in an affinity diagram

191. What are the parts of house of quality? (APRIL/MAY2008)

- i. Customer requirements
- ii. Prioritized customer requirements
- iii. Technical descriptors
- iv. Prioritized technical descriptors
- v. Relationship between requirements and descriptors
- vi. Interrelationship between technical descriptors

192. How will you build a house of quality? (NOV/DEC2007)

- a) List customer requirements
- b) List technical descriptors
- c) Develop a relationship matrix between WHATs and HOWs\
- d) Develop an interrelationship matrix between HOWs
- e) Competitive assessments
- f) Develop prioritized customer requirements
- g) Develop prioritized technical descriptors

193. Define FMEA? (APRIL/MAY2008)

Failure Mode Effect Analysis is an analytical technique that combines the technology and Experience of people in identifying foreseeable failure modes of a product or process and Planning for its elimination.

194. What are the stages of FMEA?**1. Specifying possibilities**

- a. Functions
- b. Possible failure modes
- c. Root causes
- d. Effects
- e. Detection/Prevention

195. Quantifying risk

- a. Probability of cause
- b. Severity of effect
- c. Effectiveness of control to prevent cause
- d. Risk priority number

196. Correcting high risk causes

- a. Prioritizing work
- b. Detailed action
- c. Assigning action responsibility
- d. Check points on completion
4. Revaluation of risk
- a. Recalculation of risk priority number

197. What are the goals of TPM? (NOV/DEC 2010)

The overall goals of Total Productive Maintenance, which is an extension of TQM are

- i. Maintaining and improving equipment capacity
- ii. Maintaining equipment for life
- iii. Using support from all areas of the operation
- iv. Encouraging input from all employees
- v. Using teams for continuous improvement

198 Give the seven basic steps to get an organization started toward TPM? (NOV/DEC2007)

- a) Management learns the new philosophy
- b) Management promotes the new philosophy
- c) Training is funded and developed for everyone in the organization
- d) Areas of needed improvement are identified
- e) Performance goals are formulated
- f) An implementation plan is developed
- g) Autonomous work groups are established

199. What are the major loss areas? (APRIL/MAY2008)

- i. Planned downtime
- ii. Unplanned downtime
- iii. Idling and minor stoppages
- iv. Slow-downs
- v. Process nonconformities
- vi. Scrap

200. What are the generic steps for the development and execution of action plans in Benchmarking? (NOV\DEC 2008)

- Specify tasks.
- Sequence tasks.

212. If earned value (EV) = 350, actual cost (AC) = 400, planned value (PV) = 325, what is cost variance (CV)?

- (A) 350 (B) -75 (C) 400 (D) -50

213. A team is using a fishbone diagram to help determine what quality standards will be used on the project. What part of the quality management process are they in?

- (A) Perform quality control (B) Perform quality assurance
(C) Quality planning (D) Variable analysis

214. The equivalent of cost reimbursable contracts is frequently termed:

- (A) Back charge contracts. (B) Fixed price contracts.
(C) Progress payment contracts. (D) Cost plus contracts.

215. A project manager must have some work done by an outside contractor. This work has a great deal of risk associated with it, and it has become very difficult to find a contractor willing to take on the job. Which of the following types of contract would offer the greatest incentive to the contractor?

- (A) Cost plus percentage of cost as an award fee (B) Cost plus fixed fee
(C) Cost plus incentive fee (D) Firm fixed price

216. In the matrix management organization, which of the following is true?

- (A) The project manager is responsible for employee skills improvement.
(B) The functional manager is responsible for employee skills improvement.
(C) The project manager is responsible for the employee's annual appraisal.
(D) The employee is responsible for his or her own skills improvement.

217. Your program manager has come to you, the project manager, for help with a bid for her newest project. You want to protect your company from financial risk. You have limited scope definition. What is the BEST type of contract to choose?

- (A) Fixed price (FP) (B) Cost plus percent of cost (CPPC)
(C) Time and material (T&M) (D) Cost plus fixed fee (CPFF)

218. The project management process groups are:

- (A) Initiating, planning, expediting, and control. (B) Plan, organize, develop, and control.
(C) Plan, do, observe, commit. (D) Initiating, planning, executing, controlling,

219. In which project management process group is the detailed project budget created?

- (A) Initiating (B) Before the project management process 11
(C) Planning (D) Executing

220. Which of the following conflict resolution techniques will generate the MOST lasting solution?

- (A) Forcing (B) Smoothing (C) Compromise (D) Problem solving

221. Decomposing the major deliverables into smaller, more manageable components to provide better control is called:

- (A) Scope planning. (B) Scope definition. (C) Scope verification. (D) All the above

222. Any numbering system that is used to monitor project costs by category such as labor, supplies, or materials, for example, is called:

- (A) Chart of accounts. (B) Work breakdown structure.
(C) Universal accounting standard. (D) Standard accounting practices.

223. Workarounds are determined during which risk management process?

- (A) Risk identification (B) Quantitative risk analysis
(C) Risk response planning (D) Risk monitoring and control

224. A person who is involved in or may be affected by the activities or anyone who has something to gain or lose by the activity of the project is called a:

- (A) Team member. (B) Customer. (C) Stakeholder. (D) Supporter.

225. A temporary endeavor undertaken to create a new product or service is called a:

- (A) New product development. (B) Project. (C) Program. (D) Enterprise.

226. What conflict resolution technique is a project manager using when he says, "I cannot deal with this issue now!"

- (A) Problem solving (B) Forcing (C) Withdrawal (D) Compromising

227. Which phase of the project is likely to have the greatest amount of its funding spent?

- (A) Initiating (B) Executing (C) Planning (D) Closeout

228. The document that is proof of upper management's commitment to the project and gives the authority to manage the project to the project manager is called:

- (A) The project plan. (B) The project goals and objectives.
(C) The project charter. (D) The project definition.

229. Which of the following represents the estimated value of the work actually accomplished?

- (A) Earned value (EV) (B) Planned value (PV)
(C) Actual cost (AC) (D) Cost variance (CV)

ANSWERS

210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229
B	D	D	C	D	A	B	D	D	B	D	B	A	D	D	B	C	B	C	A

PART B

(2 MARKS)

230. Give the ISO 9000 Series of Standards? (APRIL/MAY2008)

ISO 9000, "Quality Management and Quality Assurance Standards Guidelines for Selection and Use".

ISO 9001, "Quality Systems – Model for Quality Assurance in Design, Development, Production, Installation & Servicing".

ISO 9002, "Quality Systems – "Model for Quality Assurance in Production, Installation & Servicing".

ISO 9003, "Quality Systems – "Model for Quality Assurance in Final Inspection and Test".

ISO 9004-1, "Quality Management and Quality System Elements – Guidelines".

231. What is the need for ISO 9000? (NOV/DEC2007)

ISO 9000 is needed to unify the quality terms and definitions used by industrialized nations and use terms to demonstrate a supplier's capability of controlling its processes.

232. Give some other quality systems? (APRIL/MAY2008)

- i. QS-9000
- ii. TE-9000
- iii. AS9000

233. Give the objectives of the internal audit? (NOV\DEC 2008)

- a) Determine the actual performance conforms to the documented quality systems.
- b) Initiate corrective action activities in response to deficiencies.

- c) Follow up on noncompliance items of previous audits.
- d) Provide continued improvement in the system through feedback to management.
- e) Cause the auditee to think about the process, thereby creating possible improvements.

234. What are the requirements of ISO 14001?

- i. General requirements
- ii. Environmental policy
- iii. Planning
- iv. Implementation and operation
- v. Checking and corrective action
- vi. Management review

235. What are the benefits of ISO 14000? (APRIL/MAY2008)

a. Global

- Facilitate trade and remove trade barriers
- Improve environmental performance of planet earth
- Build consensus that there is a need for environment management and a common terminology for EMS.

b. Organizational

- Assuring customers of a commitment to environmental management
- Maintaining a good public / community relations image
- Satisfying investor criteria and improving access to capital
- Obtaining insurance at reasonable cost
- Increasing market share that results from a competitive

Advantage

- Reducing incidents that result in liability
- Improving defense posture in litigation
- Conserving input materials and energy
- Facilitating the attainment of permits and authorization

236. What are the four elements for the checking & corrective action of ISO 14001?

- a) Monitoring and measuring
- b) Nonconformance and corrective and preventative action
- c) Records d) EMS audit

237. What are the seven elements for the implementation & operations of ISO 14001? (APRIL/MAY2008)

- a) Structure and responsibility
- b) Training, awareness and competency
- c) Communication
- d) EMS documentation
- e) Documentation control
- f) Operational control
- g) Emergency preparedness and response

238. What are the four elements for the planning of ISO 14001?

- a) Environmental aspects
- b) Legal and other requirements
- c) Objectives and targets
- d) Environmental Management Programs

239. Give the types of Organizational Evaluation Standards? (NOV/DEC2007)

- Environmental Management System
- Environmental Auditing
- Environmental Performance Evaluation

240. Give the types of Product Evaluation Standards? (APRIL/MAY2008)

- Environmental Aspects in Product Standards
- Environmental Labeling
- Life-Cycle Assessment

241. Define Quality Audits ?

Quality Audits examine the elements of a quality management system in order to evaluate how well these elements comply with quality system requirements.

242. Analyze TQM?

Total Made up of the whole. Quality Degree of excellence a product or service provides.

Management Act, art or manner of handling, controlling, directing etc.

243. What are the benefits of ISO? (NOV\DEC 2008)

- Fewer on-site audit by customers.
- Increased market share.
- Improved quality, both internally and externally.
- Improve product and service quality levels from suppliers.
- Greater awareness of quality by employees.
- A documented formal systems.
- Reduced operating costs.

244. Give the ISO 9001 requirements? (NOV/DEC2007)

- _ Scope
- _ Normative Reference
- _ Terms and Definitions
- _ Quality Management System
- _ Management Responsibility
- _ Resource Management
- _ Product Realization
- _ Measurement, Analysis & Improvement

245. What are the methods of actual audit? (NOV\DEC 2008)

- i. Examination of documents
- ii. Observation of activities
- iii. Interviews

PART C**(16 MARKS)****246) Explain the elements of ISO 9000:2000? (APRIL/MAY2008)****247) Explain the implementation and documentation of Quality System?**

Implementation steps (NOV/DEC2007)

248) Explain the requirements of ISO 14000? (APRIL/MAY2008)**249) Explain the Benefits of ISO 14000? (NOV/DEC2007) (APRIL/MAY2010) (NOV/DEC 2011)****250) Discuss about ISO 9000:2000 Quality Systems? (APRIL/MAY2008)**

251) Why is ISO 9000 important? (NOV/DEC2007) (APRIL/MAY2009)

(i) Detail steps to implement **QMS (NOV/DEC 2011) (NOV/DEC 2012) (MAY/JUNE 2013)**

252) What are the different types of quality auditing performed in the organization which have implemented ISO 9000? (MAY/JUNE 2013)

FINITE ELEMENT ANALYSIS

UNIT I

INTRODUCTION

PART A

(1 MARK)

- 1. Which one of the following is required for designing and assembling the products by an analyst_____?**
(A) Stress distribution (B) natural frequencies (C) vibrations (D) All of these
- 2. _____ is the one of the methods used for engineering analysis**
(A) Numerical methods (B) approximate methods (C) both (A) & (B) (D) none of these
- 3. _____ is the small units having definite shape of geometry and nodes**
(A) Indefinite element (B) infinite element (C) finite element (D) one dimensional elements
- 4. The modern development of the finite element method in the field of structural engineering is done by_____**
(A) Levy (B) turner (C) Gallagher (D) hrennikoff
- 5. The art of sub dividing a structural in to a convenient number of smaller components is known as_____**
(A) Preprocessing (B) analyzing (C) discretization (D) post processing
- 6. _____ is the basis of finite element method**
(A) Preprocessing (B) analyzing (C) post processing (D) discretization
- 7. A finite element has a specific structural shape & is interconnected with the adjacent elements is given by_____**
(A) Nodes (B) element in truss (C) bar element (D) none of these
- 8. In _____ temperature s or fluid pressure at each nodal point is obtained.**
(A) Structural element (B) finite element (C) non-structural problems (D) structural problems
- 9. _____ is one of the named variation methods.**
(A) Point collection method (B) galerkins method (C) least square method (D) none of these
- 10. Analysis & evaluation of the solution result s referred to as_____**
(A) Preprocessing (B) analyzing (C) post processing (D) stiffness
- 11. The process of uniting the various elements together is called_____**
(A) Degrees of freedom (B) discretization (C) assemblage (D) aspect ratio
- 12. _____ is defined as the ratio of the largest dimension of the element to the smaller dimension**
(A) Degrees of freedom (B) discretization (C) assemblage (D) aspect ratio
- 13. The truss elements transmit only_____ to the element**
(A) Radial force (B) axial force (C) all of these (D) none of these
- 14. The solution of the problem does not vary with time is know as _____**
(A) Dynamic analysis (B) static analysis (C) global analysis (D) local analysis
- 15. _____ is the FEA software**
(A) ANSYS (B) NASTRAN (C) COSMAS (D) ALL OF THESE
- 16. Which one of the following satisfies the properties of stiffness matrix?**

- (A) The sum of elements in any column must equal to zero. (B) All members are pin jointed
 (C) The sum of shape function is equal to zero. (D) None of these
- 17. _____ force is defined as distributed force acting on the surface of the body**
 (A) Tangential force (B) Point load (C) Traction force (D) All of these
- 18. Why the polynomials are used as shape function**
 A.) Differentiation and integration are quite easy
 B.) The accuracy of the result can be improved by increasing the order of the elements
 C.) It is easy to formulate and computerize the finite element equations.
 D.) All of these
- 19. The finite element modeling consists of the following**
 (A) Finite shape (B) Infinite Shape
 (C) Discretization and numbering of nodes (D) None of these
- 20. A _____ is defined as a structure, made up of several bars, riveted or welded together**
 (A) Bar (B) Beam (C) Truss (D) None of these

ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
D	C	C	D	C	D	A	C	D	B	C	D	B	B	D	A	C	D	C	c

PART-B**(2 MARKS)****21. Give examples for the finite element.**

1. One dimensional elements: (a) Truss elements.
 (b) Bar, Beam elements.
2. Two dimensional elements: (a) Triangular elements.
 (b) Rectangular elements.
3. Three dimensional elements: (a) tetrahedral elements.
 (b) Hexahedral elements.

22. What is meant by node or joint?

Each kind of finite element has a specific structural shape and is interconnected with the adjacent elements by nodal points or nodes. At the nodes, degrees of freedom are located. The forces will act only at nodes and not at any other place in the element.

23. What is the basis of finite element method? (AU DEC 2009)

Discretization is the basis of finite element method. The art of subdividing a structure, into a convenient number of smaller components is known as discretization.

24. What are the types of boundary conditions?

There are two types of boundary conditions. They are:

1. Primary boundary condition.
2. Secondary boundary condition.

25. State the three phases of finite element method.

The three phases are:

1. Preprocessing.
2. Analysis.
3. Post processing.

26. What are structural and non-structural problems?

Structural problems: In structural problems, displacement at each nodal point is obtained. By using these displacement solutions, stress and strain in each element can be calculated.

Non-structural problems: In non-structural problems, temperatures or fluid pressure at each nodal point is obtained. By using these values, properties such as heat flow, fluid flow, etc., for each element can be calculated.

27. What are the methods are generally associated with the finite element analysis? (AU MAY 2008)

The following two methods are generally associated with the finite element analysis. They are

(i) Force method.

(ii) Displacement or stiffness method.

28. What is meant by post processing?

Analysis and evaluation of the solution results is referred to as Processor computer programs help the user to interpret the results by displaying them in Graphical form.

29. Name the weighted residual methods.

1. Point collocation method.
2. Sub domain collocation method.
3. Least squares method.
4. Galerkin's method.

30. What is Rayleigh-Ritz method? (AU MAY 2007)

Rayleigh-Ritz method is a integral approach method which is useful for solving complex Structural problems encountered infinite element analysis. This method is possible only if a suitable functional is available.

31. What is meant by discretization and assemblage?

The art of subdividing a structure into a convenient number of smaller components is known as discretization. These smaller components are then put together. The process of uniting the various elements together is called assemblage.

32. What is meant by degrees of freedom? (AU MAY 2009)

When the force or reaction act at nodal point node is subjected to deformation. The "deformation includes displacement, rotations, and/or strains. These are collectively known as degrees of freedom.

33. What is "Aspect ratio"?

Aspect ratio is defined as the ratio of the largest dimension of the element to the smallest dimension. In many cases, as the aspect ratio increases the inaccuracy of the solution increases. The conclusion of many researches is that the aspect ratio should be close to unity as possible.

34. What is truss element?

The truss elements are the part of a truss structure linked together by point joints, which Transmit only axial force to the element.

35. List out two advantages of post-processing. (AU DEC 2010)

1. Required result can be obtained in graphical form.
2. Contour diagrams can be used to understand the solution easily and quickly.

36. What are 'h' and 'p' versions of finite element method?

'h' versions and 'p' versions are used to improve the accuracy of the finite element Method. In 'h' versions, the order of polynomial approximation for all elements is kept constant and the number of elements is increased. In 'p' version, the number of elements is maintained constant and the order of Polynomial approximation of element is increased.

37. During discretization, mention the places where it is necessary to place a node? (AU MAY 2010)

The following places are necessary to place a node during discretization process.

- (i) Concentrated load acting point
- (ii) Cross-section changing point.
- (iii) Different material intersection point.
- (iv) Sudden change in load point.

38. What is the difference between static and dynamic analysis?

Static analysis: The solution of the problem does not vary with time is known as static analysis.

Example: Stress analysis on a beam.

Dynamic analysis: The solution of the problem varies with time is known as dynamic analysis.

Example: Vibration analysis problems.

PART-C

(16 MARKS)

39. List and briefly describes the general steps involved in FEA.

40. Explain the discretization process.

41. Explain the following: a) Variation approach. b) Weighted residual methods.

42. A cantilever beam is shown in figure. It is subjected to an UDL 'W', point load W and moment M_0 at the free end as shown. (AU MAY 2008)

43. A SSB is subjected to UDL over entire span. Determine the bending moment and deflection at mid span by using Rayleigh-Ritz method and compare with exact solutions.

44. A beam AB of span 'l' simply supported at ends and carrying a point load W at the centre 'C' as shown in fig. Determine the deflection at midspan by using Rayleigh-Ritz method and compare with exact result. (AU DEC 2009)

45. A SSB subjected to UDL over entire span and it is subjected to a point load at centre of the span. Calculate the bending moment and deflection at midspan by using Rayleigh-Ritz method and compare with exact solution.

46. A bar of uniform cross section is clamped at left end at other end free and it is subjected to a uniform axial load P as shown in figure. Calculate the displacement and stress in a bar by using two terms polynomial and three terms polynomial. Compare with exact solutions.

47. The following differential equation is available for a physical phenomenon. $D^2y/dx^2 = 0$, $0 \leq x \leq 10$, Trial function is $y = a_1x(10-x)$ Boundary conditions are, $y(0) = 0$, $y(10) = 0$. Find the value of the parameter a_1 by the following methods. (i) point collocation; (ii) Subdomain collocation; (iii) Least squares; (iv) Galarkin. (AU, MAY 2010)

48. The differential equation of a physical phenomenon is given by $d^2y/d^2x + 500x^2 = 0$; $0 \leq x \leq 1$. By using the trial function, $y = a_1(x - x^2) + a_2(x - x^5)$, calculate the value of the parameters a_1 and a_2 by the following (i) Point collocation; (ii) Subdomain collocation; (iii) Least squares; (iv) Galarkin. The boundary conditions are: $y(0) = 0$, $y(1) = 0$.

UNIT II

ONE DIMENSIONAL PROBLEMS

PART- A

(1 MARK)

49. The designer's notebook can serve which purpose(s)?

- (A) Sketching
- (B) Legal records
- (C) Documentation Capture ideas and information
- (D) All of the above

50. 3D models offer advantages over 2D drawings in every way but one:

- (A) Creating schematic drawings
- (B) A wide range of ways to view the model
- (C) a database to drive prototyping and manufacturing machinery
- (D) Updating related parts of the model when changes are mad

51. One of the advantages of concurrent engineering over the traditional model is:

- (A) Limited communication required between sales and design engineers.
- (B) Keeping only a few people involved in the design process.
- (C) Identifying a manufacturing problem early, allowing for redesign.
- (D) The CAD database manages itself.

52. The problem identification stage seeks to answer questions such as:

- (A) Who is the customer/user?
- (B) What is the least expensive option?
- (C) How will the product be used?
- (D) A & B
- (E) A & C

53. Two of the three key roles that graphics play in engineering design are:

- (A) Visualization
- (B) Communication
- (C) Entertainment
- (D) A & B
- (E) A & C

54. Documentation drawings are:

- (A) The only drawings that design engineers keep in fireproof cabinets.
- (B) Paper drawings with a lot of details.
- (C) Drawings that document the design process.
- (D) A drawing or set of drawings that includes all information necessary to produce the part or process.

55. Typically, who isn't on the design team?

- (A) Manufacturing personnel
- (B) Project/Program managers
- (C) Customers
- (D) Engineers

56. Concurrent engineering practices can be used to facilitate sharing of:

- (A) Updating and changing the model
- (B) Sketches
- (C) Performance data
- (D)None of the above
- (E) All of the above

57. Which of the following is not one of the six phases of the design process?

- (A) Ideation
- (B) Time Management
- (C) Problem identification
- (D) Documentation
- (E) Refinement

58. Which of the following may not be an advantage of making CAD models versus cardboard-glue or foam models?

- (A) Sharing the model with all members of the design team
- (B) Modifying the model
- (C) Engineering analysis of the model
- (D) Low cost equipment

59. Factors of safety in engineering design are generally:

- (A) Less than one
- (B) Between one and fifteen
- (C) Between fifteen and one hundred
- (D) Greater than one hundred

60. Which of the following properties is not available under mass property calculations for today's solid modelers?

- (A) Radii of gyration
- (B) weight
- (C) centroid or center of gravity
- (D) volume

61. When calculating the mass properties of a solid created with several different CAD software packages, one would expect:

- (A) The results to depend upon the algorithms used by the software
- (B) Some results to depend upon the material assigned to the model
- (C) The results to depend upon the accuracy of the modeling
- (D) Some results to depend upon a defined coordinate system
- (E) All of the above

- 62. When exporting data from the source application to the target application, one would expect the level of information to:**
 (A) Decrease (B) Either stay the same or decrease (C) Increase (D) Stay the same
- 63. Which of the following is not a common file for exporting data?**
 (A) DXF (B) IGES (C) STEP (D) DWF
- 64. When creating a model in CAD software and exporting it for rapid prototyping, the file format would be:**
 (A) STL (B) IGES (C) STEP (D) DXF
- 65. STL files define the boundaries of the CAD model using:**
 (A) Rectangular facets (B) Triangular facets (C) Hexagonal facets (D) Circular facets
- 66. The first STL method available on the market was:**
 (A) SGC (B) TSF (C) SLA (D) FDM
- 67. Rapid Tooling differs from Rapid Prototyping in that:**
 (A) Rapid Tooling does not create the part itself
 (B) Time involved for Rapid Tooling is much less than RP
 (C) Rapid Tooling does not use CAD files as input
 (D) The accuracy for Rapid Tool models are not as great as RP models
- 68. Which of the following is not a concern regarding images you export?**
 (A) Resolution (B) Raster vs. vector data
 (C) Transparency (D) The number of colors in the file

ANSWERS

49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68
D	A	C	D	C	D	C	D	B	D	C	B	E	B	D	A	B	C	A	C

PART-B

(2 MARKS)

- 69. What are the types of loading acting on the structure?**
 There are three types of loading acting on the body. They are:
 (i) Body force (/).
 (ii) Traction force (T).
 (iii) Point load (p).
- 70. Define body force (f). (AU MAY 2010)**
 A body force is distributed force acting on every elemental volume of the body.
 Unit: Force per unit volume.
 Example: Self-weight due to gravity.
- 71. Define Traction force (T).**
 Traction force is defined as distributed force acting on the surface of the body.
 Unit: Force per unit area.
 Examples: Frictional resistance, viscous drag, surface shear etc.
- 72. What is Point Load (P).**
 Point load is force acting at a particular point which causes displacement.
- 73. What are the basic steps involved in the finite element modeling.**
 Finite element modeling consists of the following:
 (i) Discretization of structure.

(ii) Numbering of nodes.

74. What is discretization?

The art of subdividing a structure into a convenient number of smaller components is known as discretization.

75. What are the classifications of co-ordinates?

The co-ordinates are generally classified as follows:

(i) Global co-ordinates.

(ii) Local co-ordinates

(iii) Natural co-ordinates.

76. What is Global co-ordinates?

The points in the entire structure are defined using co-ordinate system is known as global co-ordinate system.

77. What is natural co-ordinates?

A natural co-ordinate system is used to define any point inside the element by a set of dimensionless numbers, whose magnitude never exceeds unity. This system is very useful in assembling of stiffness matrices

78. Define shape function. (AU MAY 2008)

In finite element method, field variables within an element are generally expressed by the following approximate relation:

$$\Phi(x, y) = N_1(x, y) \phi_1 + N_2(x, y) \phi_2 + N_3(x, y) \phi_3$$

N_1 , N_2 & N_3 are also called shape functions because they are used to express the geometry or shape of the element.

ϕ_1 , ϕ_2 & ϕ_3 are the values of the field variable at the nodes and N_1 , N_2 & N_3 are the interpolation functions

79. If a displacement field in x direction is given by $u = 2x^2 + 4y^2 + 6xy$. Determine the Strain in x direction.

$$U: 2x^2 + 4y^2 + 6xy$$

$$\text{Strain, } \epsilon = \partial u / \partial x = 4x + 6y$$

80. What is axisymmetric element?

Many three dimensional problems in engineering exhibit symmetric about an axis rotations. Such types of problems are solved by special two dimensional elements the axisymmetric element.

81. What are the conditions for a problem to be an axisymmetric?

The problem domain must be symmetric about axis of revolution,

All boundary conditions must be symmetric about axis of revolution.

All loading conditions must be symmetric about axis of revolution.

82. What are the ways in which a three dimensional problem can be reduced to a two dimensional approach.

Plane stress: one dimensional is too small when compared to other two dimensions.

Example: Gear thickness is small.

Plane strain: one dimensional is too large when compared to other two dimensions.

Example: long pipe [length is long compared to diameter]

Axisymmetric: geometry is symmetric about the axis.

Example: Cooling tower.

83. What is the purpose of isoperimetric elements? (AU DEC 2007)

It is difficult to represent the curved boundaries by straight edge finite elements. A large number of finite elements may be used to obtain reasonable resemblance between original body and the assemblage. In order to overcome this drawback, isoparametric elements are used. i.e., for problem involving curved boundaries, a family to elements is known as “isoparametric elements are used.

84. State the properties of stiffness matrix.

1. It is symmetric matrix.
2. The sum of elements in any column must equal to zero.
3. it is an unstable element. So, the determinant is equal to zero.

85. Write the general finite element equation.

$$\{F\} = [K] \{u\}$$

Where, $\{F\} \rightarrow$ Force vector [Column matrix]

$[K] \rightarrow$ Stiffness matrix [Row matrix]

$\{u\} \rightarrow$ Degrees of freedom [Column matrix]

86. State the assumptions are made while finding the forces in a truss.

1. All members are pin jointed
2. The truss is loaded only at the joints.
3. The self weight of the members is neglected unless stated.

87. Define potential energy. (AU MAY 2008)

The total potential energy π of an elastic body is defined as the sum of total strain energy U and the potential energy of the external forces, (W) .

Total potential energy, $\pi =$ strain energy $(U) + \{$ potential energy of the external forces (W) .

88. State the principle of minimum potential energy. (AU DEC 2009)

The principle of minimum potential energy states: among all the displacement equation that satisfy internal compatibility and the boundary conditions, those that also satisfy the equation of make the potential energy a minimum in a stable system.

89. State the principle of virtual work.

A body is in equilibrium if the internal virtual work equals the external virtual work for every kinematic ally admissible displacement field.

90. What are the difference between boundary value problem and initial value problem? (AU DEC, MAY 2010)

The solution of differential equation is obtained for physical problems which satisfies some specified condition known as boundary conditions.

The differential equation together with these boundary conditions, subjected to a boundary value problem.

The differential equation together with initial conditions subjected to an initial value problem.

PART C**[16 MARKS]**

91. Derive shape function for the one dimensional bar element using global co-ordinates.
92. Derive the finite element equation for one dimensional problem.
93. Derive the stiffness matrix for one dimensional bar element.
94. Derive the force vector due to temperature effect.
95. Find the nodal displacement using FEM for stepped bar shown in figure.

96. A steel rod 1 m subjected to an axial load of 5KN and the area of cross section of the rod is 250 mm². Using one dimensional equation solve for the deflection of the bar, neglecting self weight take $E = 200000 \text{ N/mm}^2$.(AU DEC 2006)

97. Consider a tapered rod is shown in fig. subjected to an axial load of 5KN. Divide the rod into 4 equal length elements and solve for displacement at each node point. Take $E = 250000 \text{ N/mm}^2$, density of material = 7.6518×10^{-5}

98. Consider a steel column subjected to load as shown in fig. assuming axial loading, determine a) Vertical displacement at all nodes and stress in each element. Take $E = 250000 \text{ N/mm}^2$; $A = 2500 \text{ mm}^2$ Divide the column into 4 equal length elements.

99. Consider the bar shown in figure. An axial load $p = 200\text{KN}$ is applied at point P. Using finite element equation find the following: a) Nodal displacements. B) Stress in each material. C) Determine reaction forces.

100. The structure is shown in fig. is subjected to an increase in temperature of 80 °C. Determine the displacements, stresses and support reactions.

101. Derive the finite element equation for two node spring element for the bar assemblages shown in fig., determine the nodal displacements, the forces in each element and the reactions. **(AU MAY 2010)**

102. Derive stiffness matrix for one dimensional truss element. For the two bar truss shown in figure. Determine the displacements of node 1 and the stress in element 1-3. **(AU DEC 2007)**

103. Consider a four bar truss as shown in figure. It is given that $E = 200000 \text{ N/mm}^2$ and $A = 625 \text{ mm}^2$ for all elements. Determine element stiffness for each element, assemble the structural stiffness matrix K for the entire truss and displacements at all nodes.

104. For the plane shown in figure. Determine the horizontal and vertical displacements of all nodal and the stress on each element. All the elements have $E = 201 \text{ GPa}$ and $A = 4 \times 10^{-4} \text{ m}^2$. **(AU MAY 2009)**

105. For the three bar truss element shown in figure. Determine the displacement of node 1 and the stress in element 3.

106. Derive finite element equation for one dimensional bar element based on The potential energy approach. (AU DEC 2010)

107. Derive finite element equation for one dimensional bar element based on Galerkin approach. (AU MAY 2010)

UNIT III TWO DIMENSIONAL CONTINUUM

PART- A

(1 MARK)

- 108. Which lighting option is not available for most rendering software?**
(A) Parallel (B) Omni directional (C) Neon (D) Ambient
- 109. Which of the following is the most sophisticated rendering algorithm?**
A) Ray tracing B) Radiosity C) Flat shading D) Gouraud shading E) Phong shading
- 110. Storyboarding is used to:**
A) Record your design ideas B) Place each frame of your rendered scene
C) Plan your computer upgrade D) Plan your animation project
- 111. Which of the following is not a file format for animation?**
A) FLI B) VRML C) TIFF D) FLC
- 112. Which of the following charts and graphics would be most useful to emphasize the relationship between two variables?**
A) Area charts B) Line charts C) Bar charts D) Pie charts
- 113. In choosing the right modeling method, which of the following is a key consideration?**
A) Software capabilities B) end uses of model C) time to model part
D) accuracy E) all of the above
- 114. The least attractive feature of a physical model/prototype in the refinement phase is:**
A) Accuracy B) High costs to create the prototype
C) Storing the full-size prototype during the design process D) A prototypes lack of flexibility
- 115. Which of the following is the least likely to benefit from solid modeling?**
A) Finite Element Analysis B) Machine design C) Civil mapping D) Product design
- 116. In general, a disadvantage of 3D CAD modeling over 2D CAD modeling is:**
A) Modifying the model B) Sharing information with non-engineers
C) Computer hardware requirements D) Viewing the model
- 117. NURBS curves can be used to generate:**
A) Planes B) Free-form curves C) Cylinders D) Arcs E) All of the above

118. _____ is one of the latest system tools for the development and display of manufacturing knowledge.

- a. Flow charts b. Decision tables c. Experts system shells d. All of these

119. The commercially available generative CAPP systems are _____

- a. ABBAS b. CMPO c. EXCAP d. XPLA

120. _____ identifies a series of components characteristics . including geometric features , dimension , tolerances and surface condition.

- a. Subsystem b. Database c. report generator d. Part description

121. the manual process plan is very much dependent on the _____, _____ & _____

- a. Skill b. Judgement c. Experience d. All the above

122. A retrieval CAPP system is based on the principles of _____ & _____

- a. Group technology (GT) b. Part classification & coding

- c. generative CAPP & Process planning d. Both a & b

123. A generative CAPP system generates the process plan based on _____ & _____

- a. decision logics b. Pre coded algorithms c. group technology d. Both a & c e. both a& b

124. _____ are a system / logic tool to bring together, analyse & display complex decision logic .

- a. Flow chart b. Decision logics c. decision tables d. Expert system shells

125. A _____ is an attempt to forecast the expenses that must be incurred to manufacture a product.

- a. cost estimation b. Time estimation c. product estimation d. Machine estimation

126. _____ requires high technical knowledge about manufacturing methods, operation times etc.,

- a. cost estimation b. Time estimation c. product estimation d. Machine estimation

127. Preliminary estimate is based on _____

- a. Complete data b. Incomplete data c. both a & b d. None of these

ANSWERS

108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127
c	c	d	d	d	e	c	a	a	b	C	B	D	C	B	E	D	C	B	c

PART B

[2 MARKS]

128. Name any four FEA software.

1. ANSYS.
2. NASTRAN.
3. COSMOS.
4. NISA.

129. Difference between global and local axes.

Local axes are established in an element. Since it is in the element level, they change with the change in orientation of the element. The direction differs from element to element. Global axes

are defined for the entire system. They are same in direction for all the elements even though the elements are differently oriented

130. State the methods of engineering analysis. (AU MAY 2007)

There are three methods of engineering analysis they are:

Experimental method

Analytical methods.

Numerical methods or approximate methods.

131. What is meant by finite element?

A small unit having definite shape of geometry and nodes is called finite element.

132. What is meant by finite element analysis? (AU MAY 2010)

Finite element method is a numerical method for solving problem of engineering and mathematics. In the finite element method instead of solving the problem for the entire body in one operation we formulate the equation for each finite element and combine them to obtain the solution of the whole body.

133. Explain force method and stiffness method? (AU DEC 2008)

In force method internal force are considered as the unknown of the problem. In displacement or stiffness method, displacement of the nodes is considered method as the unknown of the problem. Among them two approaches, displacement method is desirable.

134. Why polynomial types of interpolation function are mostly used in FEM?

The polynomial types of interpolation function are mostly used due to the following reasons:

It is easy to formulate and computerize the finite element equations.

It is easy to perform differentiation or integration.

The accuracy of the result can be improved by increasing the order of the polynomial.

135. Name the variational methods.

1. Ritz-method.

2. Rayleigh-Ritz method.

136. What is meant by plane stress analysis? (AU MAY 2010)

Plane stress is defined to be a state of stress in which the normal stress (σ) and shear stress (τ) directed perpendicular to the plane are assumed to be zero.

137. Define plane strain analysis.

Plane strain is defined to be a state of strain in which the strain normal to the xy plane and the shear strain are assumed to be zero.

PART C

[16 MARKS]

138. Derive the shape function for constant strain triangular element (CST).

139. Derive the strain-displacement matrix for constant strain triangular element (CST). (AU DEC 2007)

140. Derive stress-strain relationship matrix or constitutive matrix for two dimensional elements.

141. Determine the stiffness matrix for the CST element shown in figure. The co-ordinates are given in units of millimeters. Assume plane stress conditions. Take $E = 210 \text{ GPa}$, $\nu = 0.25$ and $t = 10\text{mm}$. (AU MAY 2007)

142. Calculate the stiffness matrix for the shown in figure. The co-ordinates are given in millimeters. Assume plane stress conditions. Take $E = 210000 \text{ N/mm}^2$, $\nu = 0.25$ and $t = 10\text{mm}$.

143. Evaluate the element stiffness matrix for the triangular element shown in figure.1 under plane stress conditions. Take $E = 200000\text{N/mm}^2$, $\nu = 0.3$ and $t = 10\text{mm}$. **(AU DEC 2010)**

144. For the plane stress element shown in figure. The nodal displacement are $u_1 = 2\text{mm}$, $u_2 = 0.5\text{mm}$, $u_3 = 3\text{mm}$ and $v_1 = 1\text{mm}$, $v_2 = 0$, $v_3 = 1\text{mm}$. Determine the element stress σ_x , σ_y , τ_{xy} σ_1 and σ_2 and the principle angle θ_p . Let $E = 210 \text{ GPa}$, $\nu = 0.25$ and $t = 10\text{mm}$. All co-ordinates are in millimeters.

145. Calculate the element stress σ_x , σ_y , τ_{xy} σ_1 and σ_2 and the principle angle θ_p for the element shown in figure. The nodal displacement are $u_1 = 2\text{mm}$, $u_2 = 0.5\text{mm}$, $u_3 = 3\text{mm}$ and $v_1 = 1\text{mm}$, $v_2 = 0$, $v_3 = 1\text{mm}$. Let $E = 210 \text{ GPa}$, $\nu = 0.25$. Assume plane stress condition. **(AU MAY 2009)**

146. For the plane strain element shown in figure. The nodal displacement are $u_1 = 0.005\text{mm}$, $u_2 = 0\text{mm}$, $u_3 = 0.005\text{mm}$ and $v_1 = 0.002\text{mm}$, $v_2 = 0$, $v_3 = 0\text{mm}$. Determine the element stress σ_x , σ_y , τ_{xy} , σ_1 and σ_2 and the principle angle θ_p . Let $E = 70\text{ GPa}$, $\nu = 0.3$ and use unit thickness for plane strain. All co-ordinates are in millimeters. (AU MAY 2010)

147. For the triangular element shown in figure. Obtain the strain displacement relation matrix [B] and determine the strains e_x , e_y and γ_{xy} . The nodal displacement are $u_1 = 0.001\text{mm}$, $u_2 = 0.003\text{mm}$, $u_3 = -0.003\text{mm}$ and $v_1 = -0.004\text{mm}$, $v_2 = 0.002$, $v_3 = 0.005\text{mm}$. All co-ordinates are in millimeters.

UNIT IV AXISYMMETRIC CONTINUUM

PART A

[1 MARK]

148. _____ is the study of human work in order to increase the effectiveness of an organization.

- a. method study b. work study c. time study d. both a & b

149. Efficiency means _____

- a. doing things right b. Doing the right things
c. technology improvement d. Increasing the productivity

150. Effectiveness means _____

- a. doing things right b. Doing the right things
c. technology improvement d. Increasing the productivity

151. Work study = _____ + _____

- a. Method study +work measurement b. time study +work measurement
c. Motion study +work measurement d. Both a & c

152. Method study is mainly concerned with developing a better method of _____

- a. increasing efficiency b. doing job c. increasing costs d. reducing productivity

153. Method study is also known as _____

- a. method engineering b. Methods analysis c. work improvement d. All of these.

154. Process chart symbols are the symbols used in the _____ & _____ of the charts.

- a. construction & improvement b. Destruction & improvement
c. construction & interpretation d. construction & destruction

155. _____ indicates main steps in a process, method or procedure.

- a. ○ b. □ c. ◇ d. △

156. SIMO stands for _____

- a. Simulation Motion cycle chart b. Simulation Mentor Of cycle
c. Symbol In Manufacturing Organisation d. None of these

157. Work measurement is also known as _____

- a. time study b. Motion study c. method study d. work study

158. _____ is the time allowed to an operator to carry out the specified task under specified conditions.

- a. Standard time b. Normal time c. Basic time d. Observance time

159. The various techniques used for work measurement are _____

- a. Stop watch time study b. Work sampling c. Predetermined time standards d. All of these

160. SIMO charts are used in _____

- a. method study b. Micro motion study c. process analysis d. Layout analysis

161. SIMO charts are used primarily for the operations of _____ performed with extreme rapidly.

- a. Short duration b. Long duration c. time to time d. certain period

162. Time taken by a trained worker to perform an operation, while working at steady place _____

- a. standard time b. Normal time c. representative time d. None of these.

163. Standard time = _____ + _____

- a. normal time + allowances b. Normal time – allowances c. normal time – idle time d. Normal time + idle time

164. Allowances added to normal time of a given work element to get elemental standard time is _____

- a. relaxation allowances b. Tool allowances
c. reject allowances d. All of the above

165. Basic time in the work study is _____

- a. stop watch b. Planning watch c. process chart d. Bar chart

166. Time standards are used for _____

- a. cost estimating b. Performance evaluation of individual workers
c. incentive payments d. All of the above

167. Work study is used in _____

- a. industries b. Hospitals c. transport d. Design e. all of the above

ANSWERS

148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167
b	a	b	a	b	d	c	a	a	a	d	d	b	a	a	a	d	a	d	e

PART B**[2 MARKS]****168. What is axisymmetric element?**

Many three dimensional problems in engineering exhibit symmetry about an axis of rotation. Such types of problems are solved by a special two dimensional element called as axisymmetric element.

1. What are the conditions for a problem to be axisymmetric?
 - i. The problem domain must be symmetric about the axis of revolution.
 - ii. All boundary conditions must be symmetric about the axis of revolution.
 - iii. All loading conditions must be symmetric about the axis of revolution.

169. Write down the displacement equation for an axisymmetric triangular element. (AU MAY 2007)**170. Write down the shape function for an axisymmetric triangular element.****171. Give the strain displacement matrix equation for an axisymmetric triangular element. (AU MAY 2009)****172. Write the stress-strain relationship matrix equation for an axisymmetric triangular element. (AU DEC 2010)****173. Give the stiffness matrix equation for an axisymmetric triangular element.****174. Calculate the jacobian of the transformation J for the triangular element shown in figure. (AU MAY 2010)**

PART C**[16 MARKS]**

175. Derive shape function for axisymmetric element.

176. Derive stress-strain relationship matrix for axisymmetric element.

177. For axisymmetric elements shown in figure [1], determine stiffness matrix.

Let

$E = 2.1 \times 10^5 \text{ N/mm}^2$ and $\nu = 0.25$. The co-ordinates all are in millimeters.

178. For the axisymmetric elements shown in figure [1], determine the element stresses. Let $E = 210 \text{ GPa}$ and $\nu = 0.25$. The co-ordinates all are in millimeters. The nodal displacement are $u_1 = 0.05\text{mm}$, $u_2 = 0.02\text{mm}$, $u_3 = 0\text{mm}$ and $w_1 = 0.03\text{mm}$, $w_2 = 0.02$, $w_3 = 0\text{mm}$. **(AU MAY 2009)**

1. For the axisymmetric elements shown in figure [1], determine the element stresses. Let $E = 2.1 \times 10^5 \text{ N/mm}^2$ and $\nu = 0.25$. The co-ordinates all are in millimeters. The nodal displacement are $u_1 = 0.05\text{mm}$, $u_2 = 0.02\text{mm}$, $u_3 = 0\text{mm}$ and $w_1 = 0.03\text{mm}$, $w_2 = 0.02$, $w_3 = 0\text{mm}$.

179. Calculate the element stiffness matrix and the thermal force vector for the axisymmetric triangular element shown in figure. The element experiences a 15°C . The co-ordinates are in millimeters. Take $\alpha = 10 \times 10^{-6}/^\circ\text{C}$; $E = 2 \times 10^5 \text{ N/mm}^2$; $\nu = 0.25$. **(AU MAY 2010)**

180. Calculate the element stresses for the axisymmetric element shown in figure. The nodal displacement are $u_1 = 0.06\text{mm}$, $u_2 = 0.02\text{mm}$, $u_3 = 0.01\text{mm}$ and $w_1 = 0.04\text{mm}$, $w_2 = 0.03$, $w_3 = 0.01\text{mm}$. **(AU DEC 2008)**

UNIT V ISOPARAMETRIC ELEMENTS FOR TWO DIMENSIONAL CONTINUUMS

PART A

[1 MARK]

- 181. Multiple activity charts are the process charts using a _____**
 a. Product scale b. Manufacture's scale c. Time scale d. Customers scale
- 182. _____ are the symbols used to denote the various activities and movements done for different purposes.**
 a. Flow charts b. Decision charts c. therblings d. None of the above
- 183. Chart used in work study is**
 a. man machine chart b. Flow process chart
 c. operation chart d. All of the above
- 184. Time study is carried out to determine the time required to complete job by**
 a. slow worker b. Fast worker c. average worker d. Apprentice
- 185. Study used to find a simpler, easier, and better way of performing a job, is known as**
 a. time study b. Motion study c. motion & time study d. Method study
- 186. Ergonomics is the study of the relationship between _____**
 a. human beings b. Surroundings
 c. man machine system d. Man & his working environment
- 187. ergonomics is also known as _____**
 a. human engineering b. human factor engineering
 c. nuclear engineering d. Both A & B
- 188. The objective of ergonomics is designing for human use _____ -**
 a. optimizing working b. living conditions
 c. both A&D d. Optimizing machines & living conditions
- 189. Process planning consists of _____ that describe how to manufacture the product and its parts.**
 a. set of operations b. Set of instructions c. set of specifications d. None of these.
- 190. _____ is the systematic determination of the method by which a product is to be manufactured, and competitively.**
 a. operation planning b. Process planning c. manufacturing planning d. both a & b.
- 191. The first step in process planning is to _____ as specified in the engineering design.**
 a. Select the appropriate machines b. Analyse the finished product
 c. selection of materials d. None of these
- 192. The calculation of part processing time requires the determination of the sequence of the processing steps on machine is called the _____**
 a. process planning b. process time c. out planning d. Document processing
- 193. The final step in process planning is to _____ the manufacturing knowledge to the shop floor.**
 a. operate b. Plan c. design d. Communicate
- 194. The resulting process plan is generally documented as a job routine or _____**
 a. Traveller b. Instruction sheet
 c. operation sheet d. All of these

204. Write down the stiffness matrix equation 4 noded isoparametric quadrilateral element.

205. Write down the element force vector equation for 4 noded quadrilateral elements. (AU MAY 2009)

206. Write down the Gaussian quadrature expression for numerical integration.

207. Define super parametric element.

If the number of nodes used for defining the geometry is more than number of nodes used for defining the displacements, then, it is known as superparametric element.

208. What is meant by subparametric element?

If the number of nodes used for defining the geometry is less than number of nodes used for defining the displacements, then, it is known

209. What is the difference between natural co-ordinate and simple co-ordinate? (AU DEC 2010)

210. Is beam element an isoparametric element?

Beam Element is not an isoperimetric element since the geometry and displacement are defined by different order interpolation functions.

211. What is meant by isoparametric element?

If the number of nodes used for defining the geometry is same as number of nodes used for defining the displacements, then, it is known as isoperimetric element

212. Give examples for essential (forced or geometric) and non-essential boundary conditions. (AU DEC 2010)

The geometric boundary conditions are displacement, slope, etc. the natural boundary conditions are bending moment, shear force, etc.

213. Define material non-linearity. (AU MAY 2010)

- i. Non – linearity in material behavior from point to point.
- ii. Non – linearity in loading- deformation relation.
- iii. Geometric Non – linearity
- iv. Change in boundary condition for different loading.

PART C**[16 MARKS]**

214. The integral $f(r) = (r^3+2r^2+1)$ between the limits -1 and +1 can be evaluated exactly by using two point Gaussian. **(AU MAY 2009)**

215. Integrate the function $f(r) = 1+ r + r^2 + r^3$ between the limits-1 and +1 using (a) Exact method, (b). Gauss integration and compare the two results.

216. The integral $f(x) = \cos x / (1-x^2)$ dx between the limits -1 and +1 by using 3 point Gaussian quadrature. **(AU MAY 2010)**

217. Evaluate the integral $f(x) = \cos (\pi x / 2)$ dx between the limits of -1 and +1 by using three point Gaussian quadrature and compare with exact solution.

218. Evaluate the integral $f(x) = \cos (x / 2)$ dx between the limits of -1 and +1 by using three point Gaussian quadrature and compare with exact solution.

219. Evaluate the integral $f(x) = (2+x+x^2)$ dx between the limits of -1 and +1 by using three point Gaussian quadrature and compare with exact solution.

220. For the isoparametric four noded quadrilateral elements shown in figure. Determine the Cartesian co-ordinates of point P which has local co-ordinates $\epsilon = 0.5$ and $\eta = 0.5$. **(AU MAY 2009)**

221. For the isoparametric four noded quadrilateral elements shown in figure. Determine the local co-ordinates of point P which has Cartesian co-ordinates (7, 4). **(AU DEC 2007)**

222. Evaluate [J] at $\epsilon = \eta = 0.25$ for the linear quadrilateral element shown in figure.**(DEC 10)**

UNIT I MECHATRONICS, SENSORS AND TRANSDUCERS**PART A****[1 MARK]**

- 1. When the speed of the alternator is changed from the 3600 r.p.m to 1800 r.p.m the generator e.m.f /phases will become**
(a) one -half (b) twice (c) four times (d) one-fourth
- 2. The magnetic of the three voltage drops in an alternator due to armature resistance, leakage reactance and armature reaction is solely determined by**
(a) load current ,Ia (b) p.f of the load
(c) whether it is lagging or leading p.f load (d) field construction of the alternator
- 3. Armature reaction in an alternator primarily affects**
(a)rotor Speed (b)terminal voltage per phase
(c)frequency of armature current (d)generator voltage per phase
- 4. Under no-load condition ,power drawn by the prime mover of an alternator goes of**
(a)produce induce e.m.f in armature winding (b)meet no-load losses (c)produces power in the armature
(d)meet CU losses both in armature and rotor winding
- 5. As load P.f of an alternator becomes more leading ,the value of generated voltage required to give rated terminal voltage**
(a)increase (b)remains uncharged (c)decreases (d)Varies with rotor speed
- 6. With a load p.f of unity the effect of armature reaction on the main field flux of an alternator is**
(a)Distortional (b)magnetizing (c)Demagnetizing (d)nominal
- 7. At lagging loads, armature reaction in an alternator**
(a)Cross -magnetizing (b)Demagnetizing (c)non-effective (d)magnetizing
- 8. At leading p.f the armature flux in an alternator _____ rotor Flux**
(a)opposes (b)aods (c)Distorts (d)Does not affect
- 9. The voltage regulation of an alternator having 0.75 leading ,p.f load ,no-load induced e.m.f of 2400V and rated terminal voltage at 3000V is _____ percent**
(a)20 (b)-20 (c)150 (d)-26.7
- 10. If in a three phase alternator ,a field current of 50 A produced a full load armature current of 200A on short circuit and 1730 V on open circuit, then its synchronous impedance is _____ Ohm**
(a)8.66 (b)4 (c)5 (d)34.6
- 11. High frequency operation of a circuit is limited by**
(a) On state loss in the device (b) Off state loss in the device
(c) Switching losses in the device (d) All the above
- 12. The number of *p-n* junction in a thyristor is**
(a) 1 (b) 2 (c) 3 (d) 4
- 13. When a thyristor is forward biased, the number of blocked *p-n* junction is**
(a) 1 (b) 2 (c) 3 (d) 4
- 14. In a thyristor, anode current is made up of**
(a) electronic only (b) electrons or holes (c) holes only (d) none of these
- 15. When a thyristor is reverse biased, the number of blocked *p-n* junction is**
(a) 1 (b) 2 (c) 3 (d) 4

16. In a thyristor, the ratio of holding current to latching current is

- (a) 0.4 (b) 1.0 (c) 2.5 (d) 4.0

17. For reliable gate triggering of thyristor, it is advisable to employ

- (a) slight overtriggering (b) very soft triggering
(c) very hard triggering (d) none of the above

18. It is easier to manufacture

- (a) fast SCR of high PIV (b) fast SCR of low PIV
(c) fast SCR of low losses (d) none of the above

19. A thyristor can be termed as

- (a) DC switch (b) AC switch (c) either (a) or (b) (d) square wave switch

20. Triacs are suitable when the supply voltage is

- (a) DC (b) low frequency AC (c) high frequency AC (d) full wave rectifier AC

ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
A	C	C	C	C	D	A	A	A	A	C	C	A	B	B	A	C	A	A	B

PART B

[2 MARKS]

21. How do you define sensors? (AU-May 05)

A sensor, which responds to the quantity being measured by giving as its output a signal which is related to the quantity.

22. State the difference between primary and secondary transducers. (AU-Dec 03)

Transducer is a device which converts the energy from one form to another. The transducer which does the first stage of energy conversion is called primary transducer. The transducer which converts this form of energy into some other form is called secondary transducer.

23. Define the term accuracy and precision. (AU-Nov 04)

Accuracy: Accuracy may be defined as the ability of an instrument to respond to a true value of a measured variable under the reference conditions. It refers to how closely the measured value agrees with the true value.

Precision: precision is defined as the degree of exactness for which an instrument is designed or intended to perform. It refers to repeatability when the measurements are carried out under identical conditions at a short interval time. It can also be defined as the ability of the instrument to reproduce a group of measurement of the same measured quantity under the same conditions.

24. What is hysteresis? (AU-Dec 04)

Hysteresis is defined as the difference in the output for a given input when this value is approached from the opposite direction.

25. A thermometer is calibrated from 200°C to 300°C. the frequency is specified within 0.25%. what is maximum static error? (AU-Apr 04)

Span of thermometer = 300 - 200 = 100 °C

Maximum static error = $0.25 \times 100 / 100 = 0.25 \text{ }^\circ\text{C}$

26. Write the working principle of hot wire anemometer. (AU-Nov 03)

When a fluid flows over a heated surface, heat is transferred from the surface and so its temperature reduces. The rate of reduction of temperature is related to flow rate.

27. Distinguish between touch and tactile sensors. (AU-May 05)

A tactile sensor is a particular form of pressure sensor. Such a sensor is used on the 'fingertips' of robotic hands to determine when a 'hand' has come into contact with an object. They are also used for touch display screens where a physical contact has to be sensed.

28. A quartz piezoelectric crystal having a thickness of 2mm and a voltage sensitivity 0.055 VM/N is subjected to a pressure of $1.38 \times 10^6 \text{ N/m}^2$. calculate the voltage output. (AU-Nov 04)

Solution: output voltage = $v_s \cdot t \cdot p$
 $= 0.055 \times 0.002 \times 1.38 \times 10^6$
 $= 151.8 \text{ v}$

29. What is Mechatronics? (AU-May 05)

The term Mechatronics is used for the integration of microprocessor control system, electrical systems and mechanical systems. Mechatronics is defined as the integration of precision mechanical & electronic control for the development of smart products & process.

30. What are the basic elements of measurement systems? (AU-May 05)

A measurement system can be considered as a system which is used to measure the required parameter .the quantity being measured is given as input and the value of the quantity as a output. For example ,a rotation speed measurement system a digital tachometers as an input of rotation of shaft and an output of a number on the LED display.

31. What is the Difference between sensor and transducers? (AU-Nov/Dec10)//Nov/Dec 2011/(May/June 12)

A measurement system can be considered as a system which is used to measure the required parameter .the quantity being measured is given as input and the value of the quantity as a output. For example ,a rotation speed measurement system a digital tachometers as an input of rotation of shaft and an output of a number on the LED display.

32. What are the advantages of mechatronics? (AU-Nov/Dec10)./ (AU-Nov11)

The register examine key allows to examine the contents of the microprocessor register. When the appropriate keys are pressed, the monitor program can display the contents of the registers. This technique is used in conjunction either with the single – step or the break point facilities. After executing a block of instructions, the register contents at a critical juncture of the program and compare these contents with the expected outcomes

33. Define mechatronics and list its key elements. (May/June 12)

In the synchronous machines the field current is increased, the armature current increases become leading, Repetition of this procedure for other load give us the family of curve. Curve forming of equal power factor are called Compounding curve

34. **What are the disadvantages of open loop control system? (May/June 12)**

- i) There is no feedback
- ii) It can not receive any feed back error
- iii) Reliability is less

35. **Mentions the function of mechatronics system (May/June 13)**

The term Mechatronics is used for the integration of microprocessor control system, electrical systems and mechanical systems. Mechatronics is defined as the integration of precision mechanical & electronic control for the development of smart products & process.

36. **List any four types sensors and mention their features(May/June 13)**

- i. Velocity
- ii. Pressure
- iii. Flow
- iv. temperature

PART C

(16 MARKS)

37. Describe the function of a bourdon tube pressure gauge in detail. (AU-Nov 03)

38. Write a detailed note on pressure measuring systems and pressure measuring transducers. (AU-Apr 04)

39. Explain in detail about the characteristics of fluid flow and measurement of fluid velocity.(AU-Apr 04)

40. Explain the following :

- i) Thermoelectric thermometry
- ii) Thermo resistive elements
- iii) Thermocouples (AU-Apr 04)

41. Explain the basic elements of a closed loop system (AU-Nov Dec 06)

42. Explain the sequential control system with an example (AU-Nov Dec 06)

43. Compare and contrast the control system for the domestic central heating system involving a bimetallic thermostat with a microprocessor based. (AU-Apr May 07)

44. Write the advantages and disadvantage of closed loop system .(AU-Apr May 07)

45. Explain any five characteristics of a sensor (AU-May Jun 08)

46. What are microprocessors based controllers? Explain with automatic camera as an example

47. Explain the principle and features of strain gauge sensors

48. Derive the for gauge factor strain gauge

49. Write about the Mechatronics based engine management system (AU-May Jun 08)

50. Explain about the displacement sensors (AU-Nov Dec 05)

51. Explain various flow transducers (AU-Nov Dec 05)

52. Define the term mechatronics and give 4 examples of mechatronics systems. (AU-Nov/Dec10)

53. Write short notes on “Scope and importance of Mechatronics” (AU-Nov/Dec10)

54. Explain the working principle and constructional details of any two velocity sensors with neat sketches. (AU-Nov/Dec10)
55. Explain about performance terminology of transducers in detail(AU-Nov11)
56. Discuss on the following: Absolute Encoder, Hall effect sensor, Strain Gauge load cell, MPX sensor(AU-Nov11)
57. Discuss the displacement is sensed by LVDT. With neat sketch show how it can be made phase sensitive. (May/June 12)
58. What are the application of bimetallic strip? Discuss their types and principles of operation respectively? (May/June 12)
59. How bourdon tube is used to measure the pressure? (May/June 13)
60. How is bernoullis principle used to measure the flow rate? (May/June 13)

UNIT II**ACTUATION SYSTEMS****PART A****[1 MARK]****61. Reverse recovery current in a diode depends upon**

- (a) forward field current (b) storage charge
(c) temperature (d) PIV

62. A power MOSFET has three terminals called

- (a) collector, emitter and base (b) drain, source and base
(c) drain, source and gate (d) collector, emitter and gate

63. As compared to power MOSFET, a BJT has

- (a) lower switching losses but higher conduction loss
(b) higher switching losses but higher conduction loss
(c) switching losses but lower conduction loss
(d) lower switching losses but lower conduction loss

64. Choose the correct statement

- (a) Both the MOSFET and BJT are voltage controlled devices (CDs)
(b) Both the MOSFET and BJT are current CDs
(c) MOSFET is a voltage CD whereas BJT is a current CD
(d) MOSFET is a current CD whereas BJT is a voltage CD

65. Secondary breakdown occur in

- (a) MOSFET but not in BJT (b) Both MOSFET and BJT
(c) BJT but not in MOSFET (d) None of this one

66. An IGBT has 3-terminal called

- (a) collector, emitter and base (b) drain, source and base
(c) drain, source and gate (d) collector, emitter and gate

67. An MCT has 3 terminals called

- (a) anode, cathode and gate (b) drain, source and base
(c) drain, source and gate (d) collector, emitter and gate

68. In the conduction mechanism of Schottky diode

- (a) only electrons can participate (b) only holes can participate
(c) both holes and electrons participate (d) none of the above

69. Common emitter current gain h_{FE} of a BJT is

- (a) dependent on Collector Current, I_C (b) dependent on Collector Emitter Voltage, V_{CE}
(c) dependent on Base Emitter Voltage, V_{BE} (d) always constant

70. The semiconductor devices which is suitable for induction hardening in radio frequency range is

- (a) MCT (b) BJT (c) IGBT (d) MOSFET

71. High frequency operation of a circuit is limited by

- (a) On state loss in the device (b) Off state loss in the device
(c) Switching losses in the device (d) All the above

72. The number of $p-n$ junction in a thyristor is

- (a) 1 (b) 2 (c) 3 (d) 4

73. When a thyristor is forward biased, the number of blocked $p-n$ junction is

- (a) 1 (b) 2 (c) 3 (d) 4

74. In a thyristor, anode current is made up of

- (a) electronic only (b) electrons or holes (c) holes only (d) none of these

75. When a thyristor is reverse biased, the number of blocked $p-n$ junction is

- (a) 1 (b) 2 (c) 3 (d) 4

76. In a thyristor, the ratio of holding current to latching current is

- (a) 0.4 (b) 1.0 (c) 2.5 (d) 4.0

77. For reliable gate triggering of thyristor, it is advisable to employ

- (a) slight overtriggering (b) very soft triggering
(c) very hard triggering (d) none of the above

78. It is easier to manufacture

- (a) fast SCR of high PIV (b) fast SCR of low PIV
(c) fast SCR of low losses (d) none of the above

79. A thyristor can be termed as

- (a) DC switch (b) AC switch (c) either (a) or (b) (d) square wave switch

80. Triacs are suitable when the supply voltage is

- (a) DC (b) low frequency AC (c) high frequency AC (d) full wave rectifier AC

ANSWERS

61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
A	C	A	C	A	A	C	A	B	B	A	C	A	B	B	A	C	A	A	B

PART-B

(2 MARKS)

81. Write about dynamic characteristics? (AU-Nov Dec 05)

The dynamic characteristics refer to the behavior between the time that the input value changes and the times that the value given by the transducer settles down to the steady state value. Dynamic characteristics are stated in terms of the response of the transducer to inputs in particular forms.

82. What is gauge factor? (AU-Nov Dec 06)

When the strain – gauged element is subjected to strain, its resistance R changes, the fractional change in resistance $\Delta R/R$ being proportional to the strain. i.e. $\Delta R/R = G\epsilon$, where G , the constant of proportionality is termed as the gauge factor.

83. What is the purpose of a sensor? (AU-Nov Dec 06)

Sensor is used for an element which produces a signal relating to the quantity being measured. I.e., an electrical resistance temperature element, the quantity being measured is temperature and the sensor transforms an input of temperature into a change .

84. . What is a displacement sensor? (AU-Apr May 05)

Displacement sensors are concerned with the measurement of the amount by which some object has been moved.

85. Write about the contact sensors? (AU-Apr May 05)

In contact sensors the measured object comes into mechanical contact with the sensor. For those linear displacement methods involving contact, there is usually a sensing shaft, which is in direct contact with the object being monitored by a sensor.

86. What is the capacitance of a parallel plate capacitor? (AU-May June 06)

The capacitance of a parallel plate capacitor is given by,

$C = \epsilon_r \epsilon_0 \frac{A}{d}$ Where, ϵ_r the relative permittivity of the dielectric between the plates. ϵ_0 – a constant called the permittivity of free space

A – the area of overlap between the two plates d – the plate separation.

87. Write about LVDT? (AU-Nov Dec 06)

The Linear Variable Differential Transformer consists of three coils symmetrically spaced along an insulated tube. The central coil is the primary coil and the other two are identical secondary coils, which are connected in series in such a way that their outputs oppose each other.

88. What are the two types of position encoders? (AU-Nov Dec 06)

The two types of position encoders are,

- a. Incremental encoders
- b. Absolute encoders

89. What is an incremental encoder? (AU-Nov Dec 05)

An incremental encoder is used for the measurement of angular displacement. A beam of light passes through slots in a disc and is detected by a suitable light sensor. When the disc is rotated, the sensor produces a pulsed output with the number of pulses being proportional to the angle through which the disc is rotated. Hence, the angular position of the disc is determined.

90. What are the uses of photosensitive devices? (AU-Apr May 06)

Photosensitive devices can be used to detect the presence of an opaque object by it breaking a beam of light or infrared radiation, falling on such a device or by detecting the light reflected back by the object.

91. What are the advantages of stepper motor over DC servo motor? (AU-Nov/Dec10)

- i) Stepper motor can be used in precision machines
- ii) Angle rotation can be achieved easily.
- iii) Construction is simple

92. What are the applications of Ratchet and Pawl Mechanism. (AU-Nov/Dec10)/ (May/June 13)

They are used in mechanical clocks, Heavy weight lifting mechanism, turnstiles, spanners, winding gear

93. List down various mechanical actuation system(AU-Nov11)

- i. Belt drives
- ii. cam follower
- iii. Bearing
- iv) Rotary actuator
- v) Ratchet and Pawl Mechanism

94. State the working principle of D.C.Motor (AU-Nov11)

In the single phase induction motor single phase ac supply is given to the stator .stator winding produced the alternating flux is called main flux .this flux link with the rotor conductor and due to transformer action emf get induced in the rotor .the induced emf drive current through the rotor as rotor circuit is closed .this rotor current through produced another flux is called rotor flux .the two flux interaction between the motor is starting

95. Write the three elements of system building blocks (AU-Nov11)

Resistance
Capacitance
Inductance

96. List down few types of cam followers(May/June 12)

i) Knife edge
ii) Flat faced
iii]Sprical
iv] Roller

97. What is meant by slew range? (May/June 12)

The slot space factor is the ratio of conductor (or copper) area per slot and slot area. It gives an indication of the space occupied by the conductors and the space available for insulation. The slot space factor for induction motor varies for 0.25 to 0.4.

98. Highlight the properties of a stepper motor. (May/June 13)

The motor is self starting
There are no external connections to the rotor

PART C

(16 MARKS)

99. List three advantages of multistage compressors as compared with a single stage type. (AU-Apr May 05)
100. Explain the purpose of a pressure sequence valve. (AU-Apr May 05)
101. List two industrial applications for which air is the only applicable process. (AU-Apr May 06)
102. What is the principal difference in construction between a vane pump and a vane motor? (AU-Nov Dec 06)
103. With a help of a block diagram, explain signal flow in a fluid power system. (AU-Nov Dec 06)
104. Why is pressure regulation important in a fluid power system? Explain briefly. (AU-Nov Dec 06)
105. Sketch and explain the workings of a time delay valve. (AU-Nov Dec 06)
106. Explain how control valve can be used as processing elements. (AU-Apr May 05)
107. Explain control of a double acting with a suitable pneumatic circuit.(AU-Apr May 05)
108. Explain the types of motion with neat sketch. (AU-May Jun 06)
109. Explain the principle of slider crank mechanism with its types. (AU-May Jun 06)
110. Describe the working of a 3 phase AC motor. (AU-Apr May 07)
111. Explain the principle operation of stepper motor.(AU-Apr May 07)
112. Explain the principle operation of electric motor. (AU-May Jun 08)
113. Explain the principle of a pilot operated valve. (AU-May Jun 08)

114. Explain the working principle , constructional details, advantages and disadvantages of a servo – motor. (AU-Nov/Dec10)
115. Explain the various mechanical actuation systems with neat sketches. (AU-Nov/Dec10)
116. Describe the construction and working and application stepper motors(AU-Nov11)
117. Describe construction and working principle of belt drives(AU-Nov11)
118. Define four types of belts and state their application. (AU-Nov11)
119. Discuss about the hydraulic power supply system(May/June 12)
120. With neat sketches explain about the working of various pressure control valves(May/June 12)
121. Discuss about various types of bearings(May/June 12)
122. Describe the working of different rotary actuators. (May/June 13)
123. Describe the working of an AC servo motor. (May/June 13)

UNIT III SYSTEM MODELS AND CONTROLLERS

PART A

[1 MARK]

124. How many synchronous and asynchronous modes are there in serial port of 8096?
a) 2, 2 respectively b) 3,1 respectively c) 1, 3 respectively d) 1, 2 respectively
125. In 8096 we have _____ interrupt sources and _____ interrupt vectors.
a) 18, 8 b) 21, 6 c) 21, 8 d) 16, 8
126. 8096 has ___ general purpose I/O ports, Port 2 includes _____ of the following
i) two quasi-bidirectional I/O lines ii) two output lines
iii) four input lines iv) open drain outputs
a) 4, i, iv b) 6, ii, iii c) 4, i,ii,iii d) 6, i, ii, iv
127. 8096 write-protected mode, no code can write to memory address between ____.
a) 2020 to 3FFFH b) 8000 to FFFFH c) 2000 to 3FFFH d) 2020 to 202FH
128. If the __ pin is __ , then we have the option of using the _____ ROM or EPROM together with _____ memory and devices.
a) EA, high, internal, external b) EA, low, internal, external
c) EA, high, external, internal d) EA, low, external, internal
129. In 8096, CCB bit 3 is ____.
a) write strobe mode select b) address valid strobe select
c) bus width select d) Internal read control mode
130. In 8096, mode ____ of serial port are ____ modes commonly used for ____ communications.
a) 1, 8bit, single processor b) 0, 7bit, multiple microcontroller
c) 2, 9 bit, multiple processors d) 3, 8 bit, multiple microcontroller
131. What is the function of watchdog timer?
a) The watchdog Timer is an external timer that resets the system if the software fails to operate properly.
b) The watchdog Timer is an internal timer that sets the system if the software fails to operate properly.
c) The watchdog Timer is an internal timer that resets the system if the software fails to operate properly.
d) None of them
132. Which bus is a bidirectional bus?
A.address bus B.Data bus C. Address bus and data bus D. None of the above
133. Which of the following buses is primarily used to carry signals that direct other ICs to find out what type of operation is being performed?
A.Data bus , B.control bus, C.Address bus, D.address decoder bus

134. What kind of computer program is used to convert mnemonic code to machine code?

- A. debug B. assembler C. C++ D. Fortran

135. In 8085 name the 16 bit registers?

- A) Stack pointer
B) Program counter
C) a & b

136. Which configuration is more preferred during floorplaning?

- a. Double back with flipped rows
b. Double back with non flipped rows
c. With channel spacing between rows and no double back
d. With channel spacing between rows and double back

137. What is the effect of high drive strength buffer when added in long net?

- a. Delay on the net increases b. Capacitance on the net increases
c. Delay on the net decreases d. Resistance on the net increases.

138. Delay of a cell depends on which factors?

- a. Output transition and input load b. Input transition and Output load
c. Input transition and Output transition d. Input load and Output Load.

139. After the final routing the violations in the design ____.

- a. There can be no setup, no hold violations
b. There can be only setup violation but no hold
c. There can be only hold violation not Setup violation
d. There can be both violations.

140. Utilisation of the chip after placement optimisation will be ____.

- a. Constant b. Decrease c. Increase d. None of the above

141. What is routing congestion in the design?

- a. Ratio of required routing tracks to available routing tracks
b. Ratio of available routing tracks to required routing tracks
c. Depends on the routing layers available
d. None of the above

ANSWERS

124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143
A	C	C	C	C	D	A	A	A	A	C	C	A	B	B	A	C	A	A	B

PART B

(2 MARKS)

144. What is a tacho generator? (AU-May 05)

A tachogenerator is used to measure angular velocity. Variable reluctance Tachogenerator consists of a toothed wheel of ferromagnetic material, attached to the rotating shaft. As the wheel rotates, the teeth move past the coil and the air gap between the coil and the ferromagnetic material changes and so the flux. The resulting cyclic change in the flux produces an alternating e.m.f. in the coil.

145. What are the types of pressure measurements? (AU-Dec 03)

The types of pressure measurements are, a. Absolute pressure, where the pressure is measured relative to zero – pressure i.e., vacuum. Differential pressure, where a pressure difference is measured and gauge pressure where the pressure is measured relative to the barometric pressure.

146. **Write about piezoelectric sensors? (AU-Nov 04)**

Piezoelectric materials when stretched or compressed generate electric charges with one face of the material becoming positively charged and the opposite face negatively charged. As a result, a voltage is produced.

147. **Write about Thermistors? (AU-Dec 04)**

Thermistors are small pieces of material made from – mixtures of metal oxides, such as those of chromium, cobalt, iron, manganese and nickel. These oxides are semiconductors. The material is formed into various forms of element, such as beads, discs and rods.

148. **What are thermocouples? (AU-Apr 04)**

The base metal thermocouples, E, J, K and T are relatively cheap but deteriorate with age. They have accuracies which are typically about ± 1 to 3%. Noble metal thermocouples, e.g. R, are more expensive but are more stable with longer life. They have accuracies of the order of ± 1 % or better.

149. **What are the types of light sensors? (AU-Nov 03)**

The types of light sensors are a. Photodiodes b. Phototransistors c. Photo resistors.

150. **What are phototransistors? (AU-May 05)**

The phototransistors have a light – sensitive collector – base p – n junction, when there is no incident light there is a very small collector – to – emitter current. When light is incident, a base current is produced that is directly proportional to the light intensity. This leads to the production of a collector current which is then a measure of the light intensity.

151. **What is a microprocessor? (AU-Nov 04)**

A microprocessor is a multipurpose, programmable, clock driven, register – based electronic device that reads binary instructions from a storage device called memory, accepts binary data as input and processes data according to those instructions, and provides results as output.

152. **Define the terms. a) Bus b) RAM c) ROM. (AU-May 05)**

BUS – A group of lines used to transfer bits between the microprocessor and other components of the computer system. RAM – Random Access Memory . Data is stored in a read / write memory. ROM – Read only Memory. A memory that stores binary information permanently. The information can be read from this memory but cannot be altered.

153. **Differentiate a compiler and an interpreter? (AU-May 05)**

Compiler – A program that translates English – like words of a high level language into the machine language of a computer. A compiler reads a given program, called a source code, in its entirety and then translated the program into the machine language, which is called an object code. Interpreter – A program that translates the English – like statements of a high – level language in to the machine language of a computer. An interpreter translates one statement at a time from a source code to an object code.

154. **What are the Building blocks of an Electrical System? (AU-Nov/Dec10)/ (AU-Nov11)**

The microprocessor controlled system can cope easily with giving precision and programmed control. The system is much more flexible. This improvement in flexibility is a common characteristic of Mechatronics systems when compared with traditional systems.

155. Give Four Examples of Electromechanical System (AU-Nov/Dec10)

With the relay type, the signal from the PLC output is used to operate a relay and so is able to switch currents of the order of a few amperes in an external circuit. The relay isolates the PLC from the external circuit and can be used for both D.C. and A.C. switching. Relays are, however, relatively slow to operate.

156. Brief on multistep on controllers (May/June 12)

- i) ON/OFF mode
- ii) Proportional control mode
- iii) integral mode
- iv) Derivative mode

157. What is meant by stack point register (May/June 12)

If the functions performed by a peripheral device can be altered or changed by a program instruction then the peripheral device is called programmable device. Usually the programmable devices will have control registers. The device can be programmed by sending control word in the prescribed format to the control register.

158. What do you meant by discrete controllers (May/June 13)

A portion of the program or important partial results required for further execution may be saved back on secondary storage to make the physical memory free for further execution of another required portion of the program. This is called 'swapping out' of the executable program.

159. What are various stages of operation an adaptive control systems(May/June 13)

The various stages of using higher flux density in design of core (i) Increased magnetizing current and iron losses, saturation of magnetic material, lower efficiency, because of higher no-load losses,(ii) higher temperature rise of transformer.

PART C

(16 MARKS)

160. What is the difference between field and armature controlled motors? (AU-Apr May 05)

161. What is the procedure for obtaining the system differential equations of mechanical systems? (AU-Apr May 05)

162. Explain what is meant by back e.m.f of DC motor. (AU-Apr May 06)

163. What are types of process are suitable ON-OFF controllers? (AU-Nov Dec 06)

164. Give a simple analogy that helps to explain Kirchhoff law of voltage. (AU-Nov Dec 06)

165. Name five modes of controller and give a description of each mode. (AU-Nov Dec 06)

166. Explain why differential controllers are combined with other modes of controllers for practical application. (AU-Apr May 05)

167. Describe any application of propositional controllers and their limitations. (AU-Apr May 05)

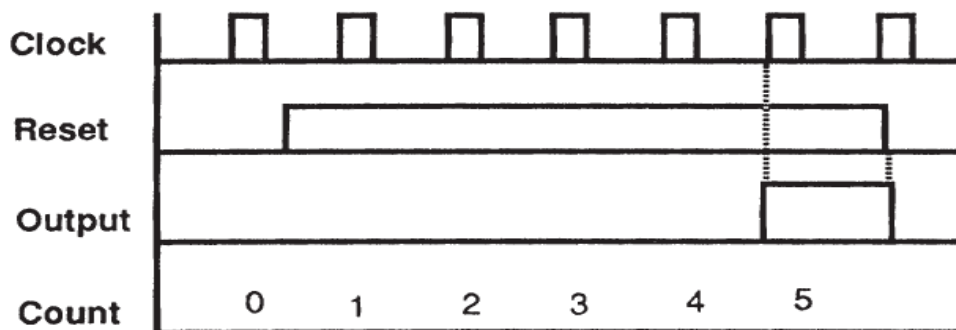
168. Explain what is meant by thermal capacitance, thermal resistance. (AU-May Jun 06)

A	C	C	C	C	D	A	A	A	A	C	C	A	B	B	A	C	A	A	B
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

PART B**(2 MARKS)**

205. **What are the types of bus? (AU-May 05)**
The types of bus are,
a. Address bus b. Data bus c. Control bus.
206. **Write about the 16 – bit register of a 8085 microprocessor? (AU-Dec 03)**
The 8085 has two 16 – bit register.
a. The program counter b. Stack pointer
The program counter is used to sequence the execution of a program.
The stack pointer is used as a memory pointer for the stack memory.
207. **What are the advantages of DRAM? (AU-Nov 04)**
The advantages of DRAM are,
a. This memory is made up of MOS transistor gates and it stores the bit as a charge. b. It has high density. Low power consumption d. Cheaper than static memory e. Economic to use when the system memory size is at least 8K for small systems.
208. **What are the interfacing devices? AU- Dec 04**
The bus drivers increase the current driving capacity of the buses, the decoder decodes the address to identify the output port, and the latch holds data output for display. These devices are called interfacing devices. The interfacing devices are semiconductor or chips that are needed to connect peripherals to the bus system.
209. **What are the instructions of a 8085 instruction set for data transfer from memory to the microprocessor? (AU-Apr 05)**
The 8085 instruction set includes three memory transfer instructions. They are,
a. MOV R,M : Move from Memory to Register b. LDAX B/D : Load Accumulator Indirect
c. LDA 16 – bit : Load Accumulator Direct
210. **What are the opcodes related to rotating the accumulator bits? (AU-Nov 03)**
The opcodes related to rotating the accumulator bits are,
a. RLC – Rotate Accumulator Left through Carry b. RAL – Rotate Accumulator Left
c. RRC – Rotate Accumulator Right through Carry d. RAR – Rotate Accumulator Right
211. **What are the advantages of single step? (May 05)**
With the single step technique, it is able to spot, a. Incorrect addresses b. Incorrect jump locations for loops c. Incorrect data or missing codes.
212. **Write about shift register examine? (AU-May 05)/ (May/June 13)**
The register examine key allows to examine the contents of the microprocessor register. When the appropriate keys are pressed, the monitor program can display the contents of the registers. This technique is used in conjunction either with the single – step or the break point facilities. After executing a block of instructions, the register contents at a critical juncture of the program and compare these contents with the expected outcomes.
213. **How will you interface the I/O devices? AU-Apr May 07**
I/O devices can be interfaced using two techniques. They are,

- a. Peripheral – mapped I/O b. Memory – mapped I/O.
214. **What is A/D and D/A converter? (AU-May Jun 06)**
The electronic signal that translates the analog signal into digital signal is called analog to digital (A/D) converter. The electronic signal that translates the digital signal into analog signal is called digital to analog (D/A) converter.
215. **What is meant by ladder diagram. (AU-Nov/Dec10)/ (May/June 12)/ (AU-Nov11)**
The features of PLC as a controller are a. They are rugged and designed to withstand vibrations, temperature, humidity and noise b. The interfacing for inputs and outputs is inside the controller. c. They are easily programmed and have an easily understood programming language
216. **What are Advantages of PLC over the relay system. (AU-Nov/Dec10)**
With the relay type, the signal from the PLC output is used to operate a relay and so is able to switch currents of the order of a few amperes in an external circuit. The relay isolates the PLC from the external circuit and can be used for both D.C. and A.C. switching. Relays are, however, relatively slow to operate.
217. **Define the structure of ladder diagram used in PLC(AU-Nov11)**
a. They are rugged and designed to withstand vibrations, temperature, humidity and noise
b. The interfacing for inputs and outputs is inside the controller.
c. They are easily programmed and have an easily understood programming language
218. **Draw the diagram of for a off delay timer(May/June 12)**



219. **Brief on EEPROM (May/June 13)**
Electrically Erasable programmable read only memory
It has Volatile memory

PART C

(16 MARKS)

220. Compare the PLC and general purpose computer. (AU-Apr May 05)
221. Describe three basic elements of an I/O address. (AU-Apr May 05)

222. Explain the function of the A/D converter circuit used in an analogue input modules.
(AU-Apr May 06)
223. Explain the function of three major parts of the CPU. (AU-Nov Dec 06)
224. Compare ROM and RAM memory design. (AU-Nov Dec 06)
225. Explain the limitation of PROM and EPROM memory. (AU-Apr May 05)
226. Explain adaptive controllers with basic principle and neat diagram. (AU-May Jun 06)
227. Draw the timer circuit for PLC ladder programming and explain sequence of operation.
(AU-Nov/Dec10)
228. How is PLC used for counting? Explain with a sketch. (AU-Nov/Dec10) (AU-Nov11)/
229. Explain PLC operating Cycle. (AU-Nov/Dec10)
230. Explain the need of PLC used for in modern industries. (AU-Nov/Dec10)
231. Develop a relay based controller that will allow three switches in a room to control a single light and write ladder program for this design(May/June 13)
232. Explain data handling in PLC(May/June 13)/ (May/June 12)
233. Discuss about input output processing((May/June 12))
234. Draw the basic architecture of PLC and explain the function of each block(AU-Nov11)

UNIT V**DESIGN OF MECHATRONICS SYSTEM****PART A****[1 MARK]**

- 235. The frequency of voltage generated by an alternator having 4 poles and rotating at 1800 RPM is _____ HZ**
(a) 60 (b) 7200 (c) 120 (d) 450
- 236. A 50 HZ alternator will run at the generator possible speed if it is wound for _____**
(a) 8 (b) 6 (c) 4 (d) 2
- 237. The disadvantage of using short-pitch winding in alternator is that it _____**
(a) reduces the harmonics in the generator voltage
(b) reduces the total voltage around the armature is that the armature coils
(c) produces asymmetry in the three phase winding
(d) increase CU of end required
- 238. Three phase alternator are invariably Y-connection because**
(a) magnetic losses are minimized (b) less turn of wire are required
(c) smaller conductor can be used (d) higher terminal voltage is obtained
- 239. The winding of a 4 -pole alternator having 36 slot and a coil span of 1 to 8 is short-pitched by _____ degree**
(a) 140 (b) 80 (c) 20 (d) 40
- 240. If an alternator winding has a fractional pitch of 5/6 ,the coil span is ____ degree**
(a) 300 (b) 150 (c) 20 (d) 60
- 241. The harmonic which would be totally eliminated from the alternator e.m.f using a fractional pitch of 4/5 is**
(a) 3rd (b) 7th (c) 5th (d) 9th

- 242. For eliminating 7th harmonic from the e.m.f wave of an alternator ,the fractional -pitch must be _____**
 (a) $2/3$ (b) $5/6$ (c) $7/8$ (d) $6/7$
- 243. If ,in an alternator ,chording angle for fundamental flux wave is ____,its value for 5th harmonics is**
 (a) 5 (b) 15 (c) 25 (d) $1/25$
- 244. Regarding distribution factor of an armature winding of an alternator which statement is false?**
 (a) it decreases as the distribution of coils (slots /pole) increase
 (b) higher its value ,higher the induced e.m.f Per phase
 (c) it is not affected by the type of winding either lap or wave
 (d) it is not affected by the number of turns / coil
- 245. When the speed of the alternator is changed from the 3600 r.p.m to 1800 r.p.m the generator e.m.f /phases will become**
 (a) one -half (b) twice (c) four times (d) one-fourth
- 246. The magnetic of the three voltage drops in an alternator due to armature resistance ,leakage reactance and armature reaction is solely determined by**
 (a) load current ,Ia (b) p.f of the load
 (c) whether it is lagging or leading p.f load (d) field construction of the alternator
- 247. Armature reaction in an alternator primarily affects**
 (a) rotor Speed (b) terminal voltage per phase
 (c) frequency of armature current (d) generator voltage per phase
- 248. Under no-load condition ,power drawn by the prime mover of an alternator goes of**
 (a) produce induce e.m.f in armature winding (b) meet no-load losses
 (c) produces power in the armature (d) meet CU losses both in armature and rotor winding
- 249. As load P.f of an alternator becomes more leading ,the value of generated voltage required to give rated terminal voltage**
 (a) increase (b) remains uncharged (c) decreases (d) Varies with rotor speed
- 250. With a load p.f of unity the effect of armature reaction on the main field flux of an alternator is**
 (a) Distortional (b) magnetizing (c) Demagnetizing (d) nominal
- 251. At lagging loads, armature reaction in an alternator**
 (a) Cross -magnetizing (b) Demagnetizing (c) non-effective (d) magnetizing
- 252. At leading p.f the armature flux in an alternator _____ rotor Flux**
 (a) opposes (b) aods (c) Distorts (d) Does not affect
- 253. The voltage regulation of an alternator having 0.75 leading ,p.f load ,no-load induced e.m.f of 2400V and rated terminal voltage at 3000V is _____ percent**
 (a) 20 (b) -20 (c) 150 (d) - 26.7
- 254. If in a three phase alternator, a field current of 50 A produced a full load armature current of 200A on short circuit and 1730 V on open circuit, then its synchronous impedance is _____ Ohm**
 (a) 8.66 (b) 4 (c) 5 (d) 34.6

ANSWERS

235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254
C	C	A	B	B	A	C	A	A	B	A	C	C	C	C	D	A	A	A	A

PART B**(2 MARKS)****255. What is a PLC? (AU-May 05)**

A programmable Logic Controller (PLC) is defined as a digital electronic device that uses a programmable memory to store instructions and to implement functions such as logic, sequencing, timing, counting and arithmetic in order to control machines and processes.

256. What are the features of PLC as a controller? (AU-Dec 03)

The features of PLC as a controller are a. They are rugged and designed to withstand vibrations, temperature, humidity and noise b. The interfacing for inputs and outputs is inside the controller. c. They are easily programmed and have an easily understood programming language.

257. Write about the relay? (AU-Nov 04)

With the relay type, the signal from the PLC output is used to operate a relay and so is able to switch currents of the order of a few amperes in an external circuit. The relay isolates the PLC from the external circuit and can be used for both D.C. and A.C. switching. Relays are, however, relatively slow to operate.

258. Write about counters? AU-Dec 04

Counters are used when there is a need to count a specified number of contact operations. Example – where items pass along a conveyor into boxes, and when the specified number of items has passed into a box the next item is diverted into another box.

259. What the operations that are carried out with a PLC on data words? (AU-Apr 05)

The operations that are carried out with a PLC on data words are,
a. Moving data b. Comparison of magnitudes of data c. Arithmetic operations such as addition and subtraction d. Conversions between binary coded decimal (BCD), binary and octal.

260. What are the number of stages in the design process? (AU-Nov 03)/ (May/June 13)

The design process can be considered as a number of stages.

They are, a. The need b. Analysis of the problem c. Preparation of a specification d. Generation of possible solutions e. Selections of a suitable solution f. Production of a detailed design g. Production of working drawings.

261. What is the advantage of using PLC solution over mechanical solution? AU-Apr May 07

A PLC solution could involve the arrangement with the given ladder program. This would have the advantage over the rotating cam of having off and on times which can be adjusted by purely changing the timer preset values in the program whereas a different cam is needed if the times have to be changed with the mechanical solution.

262. What are the advantages of the microprocessor controlled system? AU- Apr May 07

The microprocessor controlled system can cope easily with giving precision and programmed control. The system is much more flexible. This improvement in flexibility is a common characteristic of Mechatronics systems when compared with traditional systems.

263. **What are the inputs of shift register? (AU-May Jun 06)**

There are three inputs of shift register. They are,

- a. One to load data into the first element of the register (OUT).
- b. One as the shift command (SFT).
- c. One for resetting (RST).

264. **What is a down counter? (AU-May Jun 06)**

Down counter means that the computer counts down from the preset value to zero i.e., events are subtracted from the set value. When zero is reached the counters contact changes state.

265. **What are the components of Mechatronics system? (AU-Nov/Dec10)**

The term Mechatronics is used for the integration of microprocessor control system, electrical systems and mechanical systems. Mechatronics is defined as the integration of precision mechanical & electronic control for the development of smart products & process.

266. **What are the factors to be considered in design of mechatronics System?**

AU-Nov/Dec10)/ (AU-Nov11)

Transducer is a device which converts the energy from one form to another. The transducer which does the first stage of energy conversion is called primary transducer. The transducer which converts this form of energy into some other form is called secondary transducer.

267. **Mention possible mecatronics solution for cam operated mechanical switch (May/June 12)**

A PLC solution could involve the arrangement with the given ladder program. This would have the advantage over the rotating cam of having off and on times which can be adjusted by purely changing the timer preset values in the program whereas a different cam is needed if the times have to be changed with the mechanical solution

268. **What are the various movements of robot? (May/June 12)**

- i) Up and Down
- ii) Clockwise
- iii) Counter clockwise
- iv) Forward and reverse

269. **Mention the basic components of an industrial robot(May/June 13)**

- i)Arm
- ii) Coulmn
- iii)Gripper

270. **Denote on intelligent mechatronics system (May/June 13)**

The dynamic characteristics refer to the behavior between the time that the input value changes and the times that the value given by the transducer settles down to the steady state value. Dynamic characteristics are stated in terms of the response of the transducer to inputs in particular forms.

PART C

(16 MARKS)

271. What are the various stages in designing a mecatronic system? Explain. (AU-Nov'05)/ (AU-Nov11)
272. Design hardware to interface 7 segment LEDs with 8085 microprocessor. Write a software to display numbers from 0 to 9 continuously with a suitable delay time. (AU-Apr'05).
273. Distinguish between machine language program and assembly language program. (AU-Apr'05).
274. Write an assembly language program to convert a binary number in to BCD number with flow chart. (AU-Apr'05)
275. Discuss the design aspects of a pick and place robot, in terms of the various mechatronic elements involved. (AU-Nov'05)
276. Discuss mechatronic design of an automatic car parking system. (AU-Jun'06)/ (May/June 13)
277. Discuss a mechatronic based engine management system. (AU-Nov'05)/ (May/June 12)
278. Considering a computer controlled machine tool (CNC) as a mechatronic system, discuss the design considerations and solutions to these considerations. (AU-Nov'05)
279. Discuss briefly Engine management System and Pick and Place Robot. (AU-Nov/Dec10)/ (May/June 12)/ (AU-Nov11)
280. Explain about the mechatronic system considering wireless surveillance ballon as an example (May/June 13)

COMPUTER INTEGRATED MANUFACTURING

UNIT I

INTRODUCTION TO CIM

PART A

[1 MARK]

1. CAD/CAM is the inter relationship between _____
 - a. marketing and design
 - b. manufacturing and marketing
 - c. engineering and marketing
 - d. engineering and manufacturing.
2. Two discipline, which are usually tied by a common data base are _____
 - a. documentation and geometric modeling
 - b. computer aided design and computer aided manufacturing
 - c. drafting and documentation
 - d. testing and analysis
3. CAE and CAM are linked through _____
 - a. a common data base and communications system
 - b. NC tape programming and automated design
 - c. assembly automation and tool production
 - d. parts production and testing
4. CAD/CAM is hardware oriented, but _____ gives it life.
 - a. numerical control
 - b. documentation
 - c. software
 - d. communications
5. Key hardware items which ties a CAD/CAM system together is _____
 - a. keyboard
 - b. graphics workstation
 - c. digitizer
 - d. plotter
6. Item, which best describes a CAM technology is _____
 - a. numerical control
 - b. documentation
 - c. drafting
 - d. geometric modeling

7. **A device, which does the general population associate most with automation is _____**
 a. flexible manufacturing b. robots, c. computer graphics workstation
 d. numerical control machine
8. **Group technology brings together and organizes _____**
 a. parts and simulation analysis b. documentation and analysis
 c. automation and tool production d. common parts, problems, and tasks
9. **Four basic elements are required for an automated machine tool or production process are input interface, memory, output interfaces and _____**
 a. logic b. NC tape programming c. software d. computer graphics workstation
10. **Robots consists of three basic components power supply, control console, and _____**
 a. microcomputer b. coaxial cable c. mechanical unit d. software
11. **Four basic configurations that can be combined to produce a variety of robotic combined to produce a variety of robotic combinations are cartesian, articulated, cylindrical, and _____**
 a. octagonal c. square
 b. oblong d. spherical
12. **Automation means _____**
 a. increased productivity b. workers controlling machines
 c. assisting and replacing humans by machines d. all of these
13. **Use of modern control technology in automation systems _____**
 a. reduces cost b. increases yield c. improves reliability d. all of these
14. **A flexible manufacturing system may be _____**
 a. an automated assembly line b. expensive to alter
 c. very difficult to change when new products are introduced d. all of these.
15. **Numeric control _____**
 a. applies only to milling machine
 b. is a method for producing exact number of parts per hour
 c. is a method for controlling by means of set of instructions
 d. all of these
16. **What are the components of typical NC system?**
 a. tape input b. machine tool c. controller d. all of these
17. **Flexible manufacturing allows for _____**
 a. factory management b. automated design
 c. tool design d. quick and in expensive product design
18. **A programmable controller _____**
 a. allows faster machine checkout b. is easier to repair than standard relay logic
 c. has all the logic status maintained in memory d. all of these
19. **The benefits of numerical control on machines are _____**
 a. reduced fixturing b. reduced nonproductive time
 c. improved quality control d. all of these.
20. **The benefits of CAD are _____**
 a. improved design accuracy b. shorter lead times
 c. minimum transcription errors d. all of these

ANSWERS

1	2	3	4	5	6	7	8	9	10
D	B	A	C	B	A	B	D	A	C
11	12	13	14	15	16	17	18	19	20
D	D	D	A	D	B	D	C	D	D

PART B**[2 MARKS]:****21. Define CIM. [Au may-12]**

CIM is the integration of the total manufacturing enterprise through the use of integrated systems and data communication coupled with new managerial philosophies that improve organizational and personnel efficiency.

22. Is CIM a concept or a technology?

CIM is both a concept and a technology. For top management, CIM is a concept, a blueprint for success. For middle managers and line managers, CIM is a technology, a physical realization of resources that are more capable and flexible.

23. List the various components of CIM? [Au dec-08]

- ❖ Computer-aided design (CAD).
- ❖ Computer- aided manufacture (CAM)
- ❖ Computer numerically controlled (CNC) machines
- ❖ Flexible manufacturing systems (FMS)
- ❖ Robotics
- ❖ Automated material handling systems (AMHS)
- ❖ Group technology (GT)
- ❖ Computer aided process planning (CAPP)
- ❖ Manufacturing resource planning
- ❖ Computer Control systems

24. What is the main objective of CIM?

The main aim of CIM is to use the advanced information processing technology into all areas of manufacturing industry in order to:

- make the total process more productive and efficient;
- increase product reliability;
- decrease the cost of production and maintenance relating to the manufacturing system as well as to the product; and
- reduce the number of hazardous jobs and increase the involvement of well educated and able humans in the manufacturing ability and design.

25. Define automation.

Automation may be defined as the process of having machines follow a predetermined sequence of operations with little or no human labour, using specialized equipment and devices that perform and control manufacturing processes.

26. What do you mean by 'Islands of automation'?

The individually automated workstations or processes are called islands of automation. In other words the term 'islands of automation' represents the various technologies that facilitate manufacturing automation in isolation, without having integrated with other manufacturing technologies.

27. Differentiate between the islands approach to automation and CIM.

✓ The primary difference between the islands approach to automation concept. The CIM is global while the islands approach is local.

✓ CIM represents the logical evolution of the islands of automation concept.

28. What is MAP?

Manufacturing automation protocol (MAP) is an implementation of the OSI mode. It is a hardware cum software implement set of rules that facilitate information transfer among networked computers and computer-based equipment.

29. What is production planning and production control?

✓ Production planning is a preproduction activity. It is the pre-determination of manufacturing requirements such as manpower, materials, machines, and manufacturing process.

✓ Production control, through control mechanism, tries to take corrective action to match the planned and actual production.

30. What is meant by physical distribution?

Physical distribution may be defined as the broad range of activities concerned with different movement of finished products from the end of the production line to the customers. These activities include freight transpiration, Warehousing, materials handling, protective packaging, inventory control, plant warehouse site selection, order processing, market forecasting, and customer service.

PART C

[16 MARKS]

31. What is a CIM wheel? Explain its different segments in relation to CIM's scope.

32. CIM is both a concept and a technology'. Comment.

33. Sketch and explain the different levels of integration for CIM.

34. Discuss the hierarchical structure of computer control of manufacturing systems.

35. Bring out the various benefits of implementing a CIM system.

36. What is enterprise integration or external communication? Elucidate its significance in realizing/implementing a CIM.

37. With neat sketch, explain the various product-related activities involved in a discrete part manufacturing company. [Au may-12, Au May-09]

38. List the activities carried out in the marketing department in a manufacturing company. Mention also the various data inputs and outputs this department exchange with other departments in the company. [Au Dec-09]

39. With a flow chart, explain the various engineering functions carried out in a manufacturing company and the various data associated with these functions.

40. Specify the activities carried out by the production planning and control department of a manufacturing company and the data associated with these activities. [Au may-09]

UNIT II GROUP TECHNOLOGY AND COMPUTER-AIDED PROCESS PLANNING

PART A

[1 MARK]

66. What are the three basic code structures used in GT application? [Au may-07]

- ❖ Attribute codes (or polycodes or chain type structure).
- ❖ Hierarchical codes (or monocodes or tree structure).
- ❖ Decision-tree codes (or hybrid codes or mixed codes).

67. List any six coding systems that are widely recognized in industries.

1. Opitz classification system,
2. MICLASS system,
3. DCLASS system,
4. CODE system,
5. KK-3 system, and
6. CUTPLAN system.

68. What is cellular manufacturing? [Au may-12, Au may-09]

Cellular manufacturing (CM) is an application of group technology in which dissimilar machines have been aggregated into cells, each of which is dedicated to the production of a part family.

69. List any four design considerations guiding the cell-formation.

- ❖ Parts/products to be fully completed in the cell.
- ❖ Higher operator utilization.
- ❖ Fewer operations than equipment.
- ❖ Balanced equipment utilization in the cell.

70. What is meant by process planning? [Au Jun-08]

Process Planning is the systematic determination of the methods by which a product is to be manufactured, economically and competitively.

71. What is meant by CAPP? [Au may-09]

CAPP refers to computer/aided process planning. CAPP is used to overcome the drawbacks of manual process planning. With the use of computers on the process planning one can reduce the routine clerical work of manufacturing engineers. Also it provides the opportunity to generate rational, consistent and optimal plans.

PART C**[16 MARKS]**

72. What is group technology? Also explain why GT is important in achieving CAD and CAM integration. . [Au May-11]

73. Explain the concept of part family with a suitable illustration.

74. Discuss with examples the following: monocode, polycode, and mixed code.

75. (a) Explain the Opitz classification system generally used in group technology.

(b) Develop the form code (first five digits) in the Opitz system for the part illustrated in Fig.

[Au May-12]

76. What is MICLASS system. Compare it with DCLASS system. . [Au Dec-08]

77. Write an engineering brief about (i) DCLASS, and (ii) CODE classification system. . [Au May-11, Au May-11]

78. What is production flow analysis? List the steps involved in carrying out PFA.

79. What is meant by cellular manufacturing? Explain, in detail, single-linkage clustering algorithm used for cell formation.

80. What do you understand by cell design? What are the criteria used for cell design?

81. What is process planning? What are the activities associated with it?

82. What is meant by CAPP? List out the benefits of CAPP systems. . [Au May-09]

UNIT III SHOP FLOOR CONTROL AND FLEXIBLE MANUFACTURING SYSTEMS**PART A****[1 MARK]**

83. In point-to-point NC system, it is not the entire movement of the job that is controlled, but control is made only on _____

- a. final position of the job movement
- b. final position of the tool movement
- c. movement of the job and tool both
- d. none of these

84. The use of NC machine tools in manufacturing is a major step towards automation so as to _____

- a. reduce the machine time
- b. reduce cost per piece
- c. increase quality of work
- d. all of these

85. In CNC systems editing is easier as compared to that of NC system because in the former _____ -

- a. the part programmed is stored in computer accuracy
- b. the part programmed can be easily checked and corrected in the former
- c. data tape in case of NC system can be reused
- d. all of these

86. The use of NC system in manufacturing has enhanced productivity by way of automation such that it has _____

- a. reduced the infallibility of the operator
- b. relieved the operator from constant supervision
- c. enhanced quantity and accuracy of the work
- d. all of these

87. Volume of work produced in FMS environment is determined from _____

- a. number of machine used in the FMS
- b. kind of material handling equipment used in FMS
- c. kind of layout used in FMS
- d. all of these

88. The advantage of implementing CAD is to _____

- a. increase quality of design
- b. expertise in the area of data base manufacturing management
- c. increase productivity
- d. improve communication

89. Which one of the following items, best describes the CAM technology?

- a. Numerical control
- b. Documentation
- c. Drafting
- d. Geometric modeling

90. A NC machine tool system has replaced _____

- a. hand action of the operator
- b. brain of the operator
- c. hand and brain of the operator
- d. something else

91. FMS production methodology is applicable to situation where the lot size of a product ranges between _____

- a. 100 to 500 items
- b. 100 to 1000 items
- c. 100 to 1500 items
- d. something else

92. The use of specialized workstations _____

- a. reduces the host computer workload
- b. reduces the host computer workload and allows more users
- c. provides limited growth potentials for 3-D
- d. has a high cost tradeoff

93. Ergonomics refers to the _____

- a. human aspect of the environment around the workstation as well as the workstation itself
- b. level of involvement the operator has with the workstation

- c. technology involved in the workstation itself
 d. cost relationship of the workstation versus productivity

94. Which of the following is not considered a method of input control in a CAD system? _____

- a. programmable function box b. joystick c. plotter d. touch terminal

95. Operator interaction directly with the CRT is accomplished via _____

- a. vector scanning b. a digitizing tablet c. a stylus d. a touch terminal

96. Three types of cursors for tablets are mouse, stylus, or _____

- a. digitizing cursor b. light pen c. joystick d. programmable dials

97. Digitizer, which measures a wave traveling at the speed of sound is _____

- a. electrostatic b. sonic c. digitizing scanner d. capacitive

98. Currently the two available types of automatic digitizing are vector and _____

- a. light pen scanning b. raster scanning
 c. electrostatic scanning d. electromagnetic scanning

99. Three types of touch terminal system are capacitive, light beam interruption, and _____

- a. stroke b. electrostatic c. Mylar layers d. raster scan

100. Three different types of pen plotter technology are flatbed, drum, and _____

- a. thermal b. electrostatic c. pinch roller d. impact

101. The best quality graphics, reproduction is produced by _____

- a. dot matrix printers b. laser printers c. inkjet printers d. plotters

102. The perform specific commands a plotter requires a _____

- a. software b. firmware c. driver d. controller

ANSWERS

83	84	85	86	87	88	89	90	91	92
A	C	A	B	D	A	B	B	A	C
93	94	95	96	97	98	99	100	101	102
D	C	A	C	B	A	B	B	B	B

PART B

[2 MARKS]

103. Define the term Production Planning and control?

Production planning and control may be defined as the direction as the direction and coordination of a firm's material and physical facilities towards the attainment of prespecified Production of goods, with production efficiency.

104. What is production planning? [Au may-07]

1. Deciding which products to make, how many of each, and when they should be completed.
2. Planning the manpower and equipment resources needed to accomplish the production plan.
3. Scheduling the production and delivery of the parts and products ; and

105. What is production control? [Au Jun-09]

Production control is concerned with determining whether the necessary resources to implement the production plan have been provided or not.

106. Write the activities of production control.

1. Shop floor control;
2. Inventory control;
3. Manufacturing resource planning (MRP II); and
4. Just-in-time manufacturing systems.

107. What is MRP? What is the function of MRP?

It is a planning technique. It translates the master production schedule (MPS) of end products into a detailed schedule for the raw materials and parts used in those end products.

108. What is BOM?

The bill of materials (BOM) designates what items and how many of each are used to make up a specified final product.

109. List the benefits of MRP? [Au may-10]

The benefits of implementing MRP system are:

- ✓ Reduced inventory levels.
- ✓ Better Production scheduling
- ✓ Reduced production lead time.
- ✓ Better machine utilization.
- ✓ Improved product quality.

110. What is SFC?

Shop floor control (SFC) is concerned with :

1. the release of production orders to the factory,
2. monitoring and controlling the progress of the orders through the various work centers ; and
3. acquiring information on the status of the orders.

111. What is scheduling? [Au may-11]

Operation scheduling is concerned with the problem of assigning specific jobs to specific work centers on a weekly, daily, hourly basis.

Operation scheduling = Machine loading + Job sequencing

112. What is dispatching? [Au may-12]

Dispatching is the function concerned with issuing the individual orders to the machine operations.

PART C**[16 MARKS]**

113. What is production planning and control? Describe the various activities of a PPC system.

114. What is MRP? Explain the inputs to MRP and various MRP outputs. Also list the various benefits of MRP.

115. What is shop floor control? What are the functions of SFC? [Au May-12, Au Dec-11, Au Dec-08, Au May-09]

116. List and briefly explain the various priority sequencing rules used for job sequencing.

117. Write an engineering brief about (i) MRP II, and (ii) JIT production system.

118. What is meant by a factory data collection system? Explain the various techniques used for this purpose.

119. Explain the bar-code technology. [Au Dec-11, Au Dec-08]

120. What is flexible manufacturing system? In what ways, FMS differs from other manufacturing systems. [Au Dec-11]

121. List and explain the functions of the material handling system in a FMS. [Au Dec-11, Au May-11, Au Dec-08, Au May-09, Au Dec-09]

122. With suitable sketches, explain the various FMS layout configurations prevalent today. [Au May-12, Au May-09]

UNIT IV CIM IMPLEMENTATION AND DATA COMMUNICATIONS

PART A

[1 MARK]

123. Multiple activity charts are the process charts using a _____

- a. Product scale b. Manufacture's scale c. Time scale d. Customers scale

124. _____ are the symbols used to denote the various activities and movements done for different purposes.

- a. Flow charts b. Decision charts c. therblings d. None of the above

125. Chart used in work study is

- a. man machine chart b. Flow process chart c. operation chart d. All of the above

126. Time study is carried out to determine the time required to complete job by

- a. slow worker b. Fast worker c. average worker d. Apprentice

127. Study used to find a simpler, easier, and better way of performing a job, is known as

- a. time study b. Motion study c. motion & time study d. Method study

128. Ergonomics is the study of the relationship between _____

- a. human beings b. Surroundings
c. man machine system d. Man & his working environment

129. ergonomics is also known as _____

- a. human engineering b. human factor engineering
c. nuclear engineering d. Both A & B

130. The objective of ergonomics is designing for human use _____ -

- a. optimizing working b. living conditions
c. both A&D d. Optimizing machines & living conditions

131. Process planning consists of _____ that describe how to manufacture the product and its parts.

- a. set of operations b. Set of instructions c. set of specifications d. None of these.

132. _____ is the systematic determination of the method by which a product is to be manufactured, and competitively.

- a. operation planning b. Process planning c. manufacturing planning d. both a & b.

133. The first step in process planning is to _____ as specified in the engineering design.

- a. Select the appropriate machines b. Analyse the finished product
c. selection of materials d. None of these

134. The calculation of part processing time requires the determination of the sequence of the processing steps on machine is called the _____

- a. process planning b. process time c. out planning d. Document processing

135. The final step in process planning is to _____ the manufacturing knowledge to the shop floor.

- a. operate b. Plan c. design d. Communicate

136. The resulting process plan is generally documented as a job routine or _____

- a. Traveler b. Instruction sheet c. operation sheet d. All of these

137. The two general approach to process planning are _____

- a. Manual process planning b. Computer process planning
c. computer aided process planning d. Both a & c e. Both a & b

138. _____ overcomes the drawbacks of manual process planning .

- a. Manual process planning b. Computer process planning
c. computer aided process planning d. Both a & c

139. _____ provides the interface between the CAD and CAM

- a. CAPP b. CAP c. CAMM d. CAD

140. The 3 commonly used tools for acquiring and documenting knowledge are _____

- a . Flow charts b. Decision tables c. Experts system shells d. All of these

141. __ _ is one of the most commonly used tools for the collection and display of manufacturing knowledge.

- a. Flow charts b. Decision tables c. Experts system shells d. All of these.

142. _____ are a system /logic tool to bring together , analyse , & display decision logic which can be readily grasped.

- a. Flow charts b. Decision tables c. Experts system shells d. All of these

ANSWERS

123	124	125	126	127	128	129	130	131	132
C	C	D	C	B	D	D	A	B	D
133	134	135	136	137	138	139	140	141	142
B	C	D	D	D	A	A	D	A	B

PART B

[2 MARKS]

143. What are IDEF modeling tools?[Au Jun-09]

The acronym IDEF stands for Integrated CAM DEF ignition. The IDEF modeling tools cover a range of uses from function modeling to information, simulation, object-oriented analysis and design and knowledge acquisition.

144. What is the use of the following modeling tools? IDEF0, IDEFE, and IDEF2.

- ✓ IDEF0 modeling tool is used for describing the activities and functions of a system.
- ✓ IDEF1 modeling tool is used for describing the information and its relationships.
- ✓ IDEF2 modeling tool is used for describing the dynamics of a system.

145. What are ER diagrams?

The entity-relationship (ER) diagrams are used to capture the relationship between entities.

146. What is an activity cycle diagram? [Au Jun-07]

Activity cycle diagram (ACD) is a modeling approach designed to represent the dynamic of a system.

147. What is CIMOSA?[Au Dec-09]

The term CIMOSA stands for CIM Open System Architecture. CIMOSA define a model-based enterprise method which categorizes manufacturing operations into generic and specific functions.

148. How does CIMOSA separate functions? [Au Dec-12]

CIMOSA separates functions using two interrelated concepts:

- (i) CIMOSA modeling framework, which separates the specific and the generic functions clearly; and
- (ii) CIMOSA Integrating infrastructure, which supports the execution of generic functions and also links with specific functions.

149. List the four modeling views of the enterprise function defined by CIMOSA.

1. Functional view, which describes workflows.
2. Information vies, which describes the structure of resources.
3. Resource view, which describes the structure of resources.
4. Organization view, which defines authorities and responsibilities.

150. What do you mean by the term CIM architecture? [Au May-12]

The term 'CIM architecture' often applied to a template which can be used for the design and implementation of a CIM system.

151. What is a data dictionary?

A data dictionary is a catalogue of all the data in the database. The dictionary may include cross-reference information explaining which programs use which programs use which data and which department needs which reports.

152. What is product data management (PCM)?

Product data management (PDM) is concerned with the management of the life-cycle data of products.

PART C

[16 MARKS]

153. What is meant by systems modeling? What three forms of modeling tool are desirable to characterize company operation?

154. What does the acronym IDEF refer to? Explain the features of an IDEF0 model with an example.

155. Compare the features of IDEF1 and IDEF2 models with suitable illustrations.

156. What is activity cycle diagram? Draw an ACD and explain its features.

157. What do you understand by CIM architecture? Explain its analogy with the building architecture. [Au may-08]

158. What is data communication? Identify and briefly explain the five components of a data communication system.

159. What is a network? Explain the various advantages of networking?

160. Write short notes on LAN, MAN, and WAN. [Au Dec-09, Au Dec-08]

161. What is network topology? Discuss briefly the five basic network topologies. Also give an advantage and a disadvantage for each type of network topology. [Au May-12, Au Dec-08]

162. Write short notes on: Ethernet, token ring, and FDDI. [Au May-10]

UNIT V

OPEN SYSTEMS AND DATABASES FOM CIM

PART A

[1 MARK]

163. _____ is one of the latest system tools for the development and display of manufacturing knowledge.

- a. Flow charts b. Decision tables' c. Experts system shells d. All of these

164. The commercially available generative CAPP systems are _____

- a. ABBAS b. CMPO c. EXCAP d. XPLA

165. _____ identifies a series of components characteristics. Including geometric features, dimension, tolerances and surface condition.

- a. Subsystem b. Database c. report generator d. Part description

166. The manual process plan is very much dependent on the _____, _____ & _____

- a. Skill b. Judgment c. Experience d. All the above

167. A retrieval CAPP system is based on the principles of _____ & _____

- a. Group technology (GT) b. Part classification & coding
c. generative CAPP & Process planning d. Both a & b

168. A generative CAPP system generates the process plan based on _____ & _____

- a. decision logics b. Pre coded algorithms c. group technology
d. Both a & c e. both a& b

169. _____ are a system / logic tool to bring together, analyze & display complex decision logic .

- a. Flow chart b. Decision logics c. decision tables d. Expert system shells

170. A _____ is an attempt to forecast the expenses that must be incurred to manufacture a product.

- a. cost estimation b. Time estimation
c. product estimation d. Machine estimation

171. _____ requires high technical knowledge about manufacturing methods, operation times etc.,

- a. cost estimation b. Time estimation c. product estimation d. Machine estimation

172. Preliminary estimate is based on _____

- a. Complete data b. Incomplete data c. both a & b d. None of these

173. Final cost estimate is based on _____

- a. Complete data b. Incomplete data c. both a & b d. None of these

174. The commonly used methods of estimating are _____

- a. continuous method b. Cumulative method c. Describe method d. All of these
e . none of these

175. The selection of the method that is used by the estimator is determined by _____

- a. the information required b. Time required c. both a & b d. None of these

176. _____ & _____ are the methods used where time is the main factor.

- a. Comparison & continuous method
 c. Conference & Comparison method
- b. Continuous & Detailed analysis method
 d. None of these

177. Which of these is the basic source for the description of data- Quantity & rate of production?

- a. product engineering and /or sales department
 c. Request for estimate or sales department
- b. method engineering
 d. Cost department or treasurer or controller

178. Labour cost = _____

- a. weight of the material * Material cost per unit weight
 c. Total cost +profit
- b. Estimated cost / Number of jobs
 d. Estimated labour time needed to produce the product* cost of labour per hour

179. _____ is the determination of an actual cost of a component after adding different expenses incurred in various departments.

- a. Cost accounting
 b. Cost Control
 c. outputs targets
 d. Cost determination

180. _____ is the materials which are consumed in the manufacturing of a product.

- a. Direct materials
 b. Store materials
 c. Productive materials
 d. All of these

181. Which is the one of the Examples of direct material cost?

- a. Workers in various machines like machine shop, welding shop etc.,
 b. Mild steel bar used to manufacture spindles
 c. Grease
 d. lubricating oil used to lubricate the equipments

182. All the expenditures other than the direct material cost and direct labour cost are known as _____

- a. material cost
 b. Labour cost
 c. expenses
 d. None of these

ANSWERS

163	164	165	166	167	168	169	170	171	172
C	C	D	D	D	E	C	A	A	B
173	174	175	176	177	178	179	180	181	182
A	B	A	B	A	D	A	A	B	C

PART-B

[2 MARKS]

183. What is network architecture?

Network architecture describes the components, the function performed, and the interfaces between the components of a network.

184. What is an OSI model? [Au May-12]

The Purpose of open system interconnection (OSI) model is to open communication between different systems without requiring changes to the underlying hardware and software.

185. What is the function of data link layer in OSI model?

The main task of the data link layer is to transform a raw facility into a reliable link and is responsible for node-to-node delivery.

186. List some of the network standards that have been developed based on the OSI reference model.

1. MAP (Manufacturing Automation Protocol)
2. TOP (Technical Office Protocol)
3. TCP/IP (Transmission Control Protocol/Internet Protocol)
4. DECENT

187. Define the terms ‘schema’ and ‘PBMS’?

- ✓ The scheme is a diagrammatic representation of the database structure.
- ✓ A database management system (DBMS) is the collection of software which generates runs and maintains a database.

188. What is data modeling? [Au may-07]

Data modeling is method of depicting graphically data groupings and the relationship between groupings.

189. What is a hierarchical data model?[Au may-09]

In a hierarchical database, fields or records are arranged in related groups resembling a family tree, with lower/level records subordinate to higher/levels.

190. What is relational data model? [Au May-12, Au May-11]

A relational data model relates or connects data in different files through the use of a key field, or common data element.

191. What is an object-oriented database system? [Au Dec-10]

An object –oriented database system uses “object”, software written in small, reachable chunks, as elements within database files.

192. What are data associations?

Data associations are the relationship between the attributes of an entity.

- ✓ Associations between attributes of an entity can be of types:
 - ❖ One-to-association,
 - ❖ One-to-many association, and
 - ❖ Many-to-many association.

PART C

[16 MARKS]

193. What is meant by ‘open system’ interconnection? Explain briefly seven layers of the ISO/OSI reference mode.
194. What is MAP? Discuss the various MAP subsets of OSI protocols. [Au Dec-09]
195. What is TOP? In what way, TOP differs from MAP? [Au May-12]
196. Compare and contrast between MAP and TOP [Au May-09, Dec-08]
197. What is DBMS? What are different components of DBMS? [Au May-11]
198. Define the following terms:
 - (a) Database
 - (b) Fields
 - (c) Records
 - (d) Files
 - (e) Primary key.
199. What are the three levels of architecture of a database system? Describe them. [Au May-12, May-09, Dec-08]
200. Write short notes on various database operators.
201. Enumerate the advantages of relational database model over the non-relational database models. [Au May-11, Dec-08]
202. Bring out the advantages and disadvantages of DBMS in a CIM environment. [Au Dec-11]





PROCESS PLANNING AND COST ESTIMATION

UNIT I

WORKSTUDY AND ERGONOMICS

PART A

(1 MARK)

1. _____ is the study of human work in order to increase the effectiveness of an organization.
 - a. method study
 - b. work study
 - c. time study
 - d. both a & b
2. Efficiency means _____
 - a. doing things right
 - b. Doing the right things
 - c. technology improvement
 - d. Increasing the productivity
3. Effectiveness means _____
 - a. doing things right
 - b. Doing the right things
 - c. technology improvement
 - d. Increasing the productivity
4. Work study = _____ + _____
 - a. Method study +work measurement
 - b. time study +work measurement
 - c. Motion study +work measurement
 - d. Both a & c
5. Method study is mainly concerned with developing a better method of _____
 - a. increasing efficiency
 - b. doing job
 - c. increasing costs
 - d. Reducing productivity
6. Method study is also known as _____
 - a. method engineering
 - b. Methods analysis
 - c. work improvement
 - d. All of these.
7. Process chart symbols are the symbols used in the _____ & _____ of the charts.
 - a. construction & improvement
 - b. Destruction & improvement
 - c. construction & interpretation
 - d. construction & destruction
8. _____ indicates main steps in a process, method or procedure.
 - a. 
 - b. 
 - c. 
 - d. 
9. SIMO stands for _____
 - a. Simulation Motion cycle chart
 - b. Simulation Mentor Of cycle
 - c. Symbol In Manufacturing Organization
 - d. None of these
10. Work measurement is also known as _____
 - a. time study
 - b. Motion study
 - c. method study
 - d. work study
11. _____ is the time allowed to an operator to carry out the specified task under specified conditions.
 - a. Standard time
 - b. Normal time
 - c. Basic time
 - d. Observance time
12. The various techniques used for work measurement are _____
 - a. Stop watch time study
 - b. Work sampling
 - c. Predetermined time standards
 - d. All of these
13. SIMO charts are used in _____
 - a. method study
 - b. Micro motion study
 - c. process analysis
 - d. Layout analysis
14. SIMO charts are used primarily for the operations of _____ performed with extreme rapidly.
 - a. Short duration
 - b. Long duration
 - c. time to time
 - d. Certain period

15. Time taken by a trained worker to perform an operation, while working at steady place _____

- a. standard time b. Normal time c. representative time d. None of these.

16. Standard time = _____ + _____

- a. normal time + allowances b. Normal time – allowances
c. normal time – idle time d. Normal time + idle time

17. Allowances added to normal time of a given work element to get elemental standard time is _____

- a. relaxation allowances b. Tool allowances
c. reject allowances d. All of the above

18. Basic time in the work study is _____

- a. stop watch b. Planning watch c. process chart d. Bar chart

19. Time standards are used for _____

- a. cost estimating b. Performance evaluation of individual workers
c. incentive payments d. All of the above

20. Work study is used in _____

- a. industries b. Hospitals c. transport d. Design e. all of the above

ANSWER

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
b	a	b	a	b	d	c	a	a	a	a	d	b	a	a	a	d	a	d	e

PART B

2 MARK]

21. Define method study?

Method study is the systematic recording and critical examination of existing and proposed ways of doing work, as a means of developing and applying easier and more effective methods and reducing costs.

22. Write down any two important applications of work measurement. (AU Nov Dec 10)

- (i) Short cycle, repetitive jobs.
(ii) Long cycle, non-repetitive jobs.

23. What are therbligs?

1. Therbligs are the symbols used to denote the various activities and movements done for different purposes.
2. Therbligs refer primarily to motions of the human body at the work place and to the mental activities associated with them.

24. What are the types of production? (AU Nov Dec 10)

1. Batch production
2. Mass production
3. Job shop production
4. Continuous production

25. Define work measurement.

Work measurement is the applications of techniques designed to establish the time for a qualified worker to carry out a specified job at a defined level of

performance.

26. What is meant by Ergonomics?(AU NOV DEC 12)

Ergonomics is the scientific study of the relationship between man and his working environments.

27 . Write short notes on performance rating and allowances.

Performance rating is the process of adjusting the actual pace of working of an operator by company it with the mental picture of pace of an operator working at normal speed.

Allowance is an amount of time added to the normal time to provide for personal delays, unavoidable delays and fatigue of the operator.

28. What is a travel chart? (AU NOV DEC 12)

A travel chart is a tabular record for presenting quantitative data about the movement of workers, materials or equipment between any number of places over any given period of time.

29. What are the uses of ergonomics?

Successful applications of the tools and techniques of the domain of ergonomics may lead to following benefits:

(i) Improved working conditions (in terms of illumination, climatic condition, noise level)

30. What is time study?

Time study is a work measurement technique for recording the times and rates of working for the elements of a specified job carried out under specified conditions, and for analysing the data so as to obtain the time necessary for carrying out the job at a defined level of performance.

PART C

(16 MARKS)

31. State and explain major principles of motion economy.
32. a) What is continuous production? Briefly describe
b) Explain retrieval type CAPP system with a block diagram. (AU NOV DEC 12)
33. i) What are the aims of cost estimation? ii) What is meant by classification of costs? Briefly discuss with examples.
34. Explain briefly the various steps involved in conducting the work study.
35. Discuss the importance of ergonomics by mentioning various areas of applications.
36. State and explain major principles of motion economy.
37. (i) Describe the procedure for stop watch time study. (AU NOV DEC 12)
(ii) Explain the applications of ergonomics. (AU NOV DEC 11)
38. List and explain process planning activities.

UNIT II

PROCESS PLANNING

PART A

(1 MARK)

39. Multiple activity charts are the process charts using a _____

- a. Product scale b. Manufacture's scale c. Time scale d. Customers scale

40. _____ are the symbols used to denote the various activities and movements done for different purposes.

- a. Flow charts b. Decision charts c. therblings d. None of the above

41. Chart used in work study is

- a. man machine chart b. Flow process chart c. operation chart d. All of the above

42. Time study is carried out to determine the time required to complete job by

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43. Study used to find a simpler, easier, and better way of performing a job, is known as

- a. time study b. Motion study c. motion & time study d. Method study

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- a. human beings b. Surroundings
c. man machine system d. Man & his working environment

45. Ergonomics is also known as _____

- a. human engineering b. human factor engineering
c. nuclear engineering d. Both A & B

46. The objective of ergonomics is designing for human use _____ -

- a. optimizing working b. living conditions
c. both A&D d. Optimizing machines & living conditions

47. Process planning consists of _____ that describe how to manufacture the product and its parts.

- a. set of operations b. Set of instructions c. set of specifications d. None of these.

48. _____ is the systematic determination of the method by which a product is to be manufactured, and competitively.

- a. operation planning b. Process planning c. manufacturing planning d. both a & b.

49. The first step in process planning is to _____ as specified in the engineering design.

- a. Select the appropriate machines b. Analyse the finished product
c. selection of materials d. None of these

50. The calculation of part processing time requires the determination of the sequence of the processing steps on machine is called the _____

- a. process planning b. process time c. out planning d. Document processing

51. The final step in process planning is to _____ the manufacturing knowledge to the shop floor.

- a. operate b. Plan c. design d. Communicate

52. The resulting process plan is generally documented as a job routine or _____

- a. Traveller b. Instruction sheet c. operation sheet d. All of these

53. The two general approach to process planning are _____

- a. Manual process planning b. Computer process planning
c. computer aided process planning d. Both a & c e. Both a & b

54. _____ overcomes the drawbacks of manual process planning.

- a. Manual process planning b. Computer process planning
c. computer aided process planning d. Both a & c

55. _____ provides the interface between the CAD and CAM

- a. CAPP b. CAP c. CAMM d. CAD

56. The 3 commonly used tools for acquiring and documenting knowledge are

- a . Flow charts b. Decision tables c. Experts system shells d. All of these

57. ___ is one of the most commonly used tools for the collection and display of manufacturing knowledge.

- a. Flow charts b. Decision tables c. Experts system shells d. All of these.

58. _____ are a system /logic tool to bring together , analyse , & display decision logic which can be readily grasped.

- a. Flow charts b. Decision tables' c. Experts system shells d. All of these

ANSWERS

39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58
c	c	d	c	b	d	d	a	b	d	b	c	d	d	d	a	a	d	a	b

PART B

(2 MARKS)

59. What is meant by process planning? (AU NOV DEC 12)

Process planning is the systematic determination of the methods by which a product is to be manufactured, economically and competitively.

60. What are the two general approaches to process planning?

The two general approaches to process planning are:

1. Manual Process Planning, and
2. Computer-Aided Process Planning (CAPP)
 - (i) Retrieval CAPP system, and
 - (ii) Generative CAPP system.

61. What are expert system shells?

Expert system is one of the latest system tools for the development and display of Manufacturing knowledge.

62. Define the term 'estimating'. (AU NOV DEC 12)

Cost estimating is the process of determining the probable cost of the product before the start of its manufacture.

63. What are the constituents of estimation?

Three commonly used methods of estimating are:

1. Conference method,
2. Comparison method, and
3. Detailed analysis method.

64. What factor should be considered while selecting the best process planning system?

The major factors to be considered while selecting the best process planning system are:

- (i) the general environment in which process planning is conducted,
- (ii) the organizational structure of the company,
- (iii) the technical expertise available to the company, and
- (iv) the needs and objectives of the company regarding the generation of

manufacturing information and process plans.

65. What are the factors that influence process planning?

The factors affecting process planning are:

- (i) Volume of production
- (ii) The skill and expertise of manpower
- (iii) Delivery dates for parts and products

66. Brief about scope of process planning. (AU NOV DEC 10)

- (i) Process rationalization and standardization.
- (ii) Faster response to engineering changes.
- (iii) Standard plans leads to achieve six sigma level.

67. What are the documents used in process planning?

Process sheet, operation sheet and route sheet.

68. Define the term “route sheet” . (AU NOV DEC 11)

The route sheet, also known as operation sheet or instruction sheet or planner or traveler , lists the production operations and associated machine tools for each component and sub assembly of the product.

PART C

(16 MARKS)

69. (i) What are the advantages of efficient costing?

(ii) Describe the procedure for estimating. (A.U Dec-05)

70. Discuss the various process planning activities in detail. (A.U Jun-09)

71. What do you understand by CAPP? Explain in detail about the types of CAPP and mention the benefits of CAPP. (AU NOV DEC 12)

72. Describe material selection parameters.

73. What are the advantages & limitations of using (a) flow chart, and (b) decision tables?

74. Determine the time to face mill a C.I. casting 1.2m long and 266.7mm wide, considering start and end allowances. Assume the following: No. of teeth in the cutter:32; Cutter diameter :375mm; Spindle speed:75rpm; Table feed:287.5mm per minute.

(A.U Dec-07) (AU NOV DEC 12)

UNIT III

INTRODUCTION TO COST ESTIMATION

PART A

(1 MARK)

75 . _____ is one of the latest system tools for the development and display of manufacturing knowledge.

- a. Flow charts
- b. Decision tables'
- c. Experts system shells
- d. All of these

76. The commercially available generative CAPP systems are _____

- a. ABBAS
- b. CMPO
- c. EXCAP
- d. XPLA

77. _____ identifies a series of components characteristics. Including geometric features, dimension, tolerances and surface condition.

- a. Subsystem
- b. Database
- c. report generator
- d. Part description

78. the manual process plan is very much dependent on the _____, _____ & _____

- a. Skill
- b. Judgement
- c. Experience
- d. All the above

94. All the expenditures other than the direct material cost and direct labour cost are known as _____

- a. material cost b. Labour cost c. expenses d. None of these

ANSWERS

75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94
c	c	d	d	d	e	c	a	a	b	a	b	c	b	a	d	a	d	b	c

PART B

(2 MARKS)

95. What is manufacturing logic?

Manufacturing logic is a system to support a process planning system, the acquisition and documentation of manufacturing knowledge.

96. Define costing. (AU NOV DEC 12)

Costing is defined as a system of accounts which systematically and accurately records every expenditure in order to determine the cost of a product after knowing the different expenses incurred in various departments.

97. Define Cost accounting. (AU NOV DEC 12)

Cost accounting is the determination of an actual cost of a component after adding different expenses incurred in various departments.

98. What do you mean by catalogue price?

Usually the distributors of the product will be given some percentage of discount. So the net price obtained after considering the discount in the selling price is called as catalogue price.

99. What are indirect expenses?

Indirect expenses are those which cannot be charged directly to a particular product manufactured.

100. What is meant by Total cost?

The addition of manufacturing cost, selling expenses and distribution expenses is called Total cost.

101. What is meant by direct material cost?

Direct material is the one which becomes a part of the product. The cost of direct materials required for the manufacturing of the product is known as direct materials cost.

102. What is meant by labour cost?

Direct labours are the workers who actually work or process different materials either manually or with the help of machines.

103. What is prime cost?

The addition of direct labour cost, direct material cost & direct expenses is called prime cost.

104. What is Factory cost? (AU NOV DEC 12)

The addition of prime cost and factory expenses is called Factory cost.

PART C**(16 MARKS)**

105. A certain piece of work is produced by a firm in batches of 100. The direct materials cost for that 100 piece work is Rs.160 and the direct labour cost is Rs.200. Factory on cost is 35% of the total material and labour cost. Overhead charges are 20% of the factory cost. Calculate the prime cost and factory cost. If the management wants to make a profit of 10% on the gross cost determine the selling price of each article. **(A.U Dec-05)**

106. What are the causes of depreciation? **[A.U Dec-05) (AU NOV DEC 12)**

107. Define cost accounting? Explain the difference between cost estimating and cost accounting. **(A.U May-09)**

108. What are the methods of costing? Explain. **(A.U May-09) (AU NOV DEC 12)**

109. State and explain the objectives of cost estimation. What are different classifications of cost? Explain. **(A.U Dec-07) (AU NOV DEC 12)**

UNIT V**COST ESTIMATION****PART A****(1 MARK)**

110. Production planning can be -----categories

- a. 3 b.4 c.6 d.2

111. Production planning is one of the-----

- a. pre production activity b .manufacturing activity c. material planning d. all the above

112. How many factors involving the production planning?

- a. 5 b.3 c. 2. d.1





113. Work measurements is one of the?

- a. level of performance b. study performance c. critical performance d. all the above

114. Work study and work measurement is

- a. low product b. higher productivity c. medium productivity d. all the above

115. _____ indicates main steps in a process,

- a.  b.  c.  d. 

116. One TMU-----

- a. 0.006mm b. 0.005mm c. 0.001mm d. 0.01m

117. The unit of measurement in stop watch time study?

- a. cent minute b. minutes c. cent poise d. micro minute

118. The unit of measurements in work sampling?

- A . minutes b. second c. millimeter d. Meter sec

119. Which one is time measuring equipments?

- a. stop watch b. scale c. meter d. all the above

120. Normal time =-----

- a. Observed time rating factor b. standard time allowances
c. rating d. factor allowances

121. Standard time = -----

- a. normal time allowance b. rating factor allowance c. rating time +allowances

122. Value means-----

- a. function/cost b .objective/cost c. analysis/value d. All the above

123. Performance rating-----

a. observed time/normal time b. observed time/ allowances c. normal factor/allowances

124. Performance rating is also known as-----

a. rating factor b. leveling factor c. all the above

125. Which one is economic value

a. process value b. product value c. exec functional change value d. all the above

126. STR -----

a. due date-processing time b. due date – control time c. mean flow time- due date

127. Statistical quantity control (SQC) is based on?

a. probability b. sampling c. Statistical inference d. all the above factors

128. ABC analysis?

a. relative inventory control b. material management c. unit cost annual consumption

129. A graphical representation of work performed by the left and right hand in accomplishing a job is called?

a. Simon chart b. Operation chart c. gnat chart d. process chart

ANSWERS

110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129
b	a	b	a	d	c	a	c	c	a	a	a	a	a	a	b	a	a	d	b

PART B**(2 MARKS)****130. What are the types of estimates?**

i. Preliminary estimate, ii. Final estimate.

131. What is preliminary estimate?

It is prepared based on assumption and general information supplied by sales department. It is usually made for new product.

132. What is final estimate?

It is prepared based on complete available data for a product.

133. What is indirect material cost? (AU NOV DEC 12)

Indirect material cost is the cost incurred for maintaining and operating the plant and equipment not be a part of the product cost.

134. What is meant by over estimation?

If the estimated cost of the job is much more than the actual cost of the product, then the estimation is called over estimation.

135. What is meant by under estimation?

If the estimated cost is below the actual cost of the product, then the estimation is called under estimation.

136. What is meant by budgetary estimate?

Budgetary estimate is the process of determining the probable cost of the elements of various activities that constitute a budget.

137. Define Welding.

Welding is the process of joining similar or dissimilar metals by the application of heat.

138. Define Forging. (AU NOV DEC 12)

Forging is performed by hammering or pressing the work piece that is to be brought into a specific shape and size.

139. What are the types of Forging.

Hot forging, Cold forging.

PART C

(16 MARKS)

140. It is required to prepare a hexagonal bolt of 15mm dia and 25cm length from a bar stock of 1.8cm dia. Calculate the length of bar stock required.(A.U Dec-05) (AU NOV DEC 12)

141. Define standard data. How data requirements and sources are developed?(A.U May-09)

142. Explain the following : Parametric estimating, Statistical estimating(A.U Dec-07)

143. Explain various methods of estimates.(A.U Dec-07) (AU NOV DEC 12)

144. Discuss data requirements and sources for cost estimation.(A.U Dec-07)

UNIT V

PRODUCTION COST ESTIMATION

PART A

(1 MARKS)

145. The materials perpetual inventory is checked as the materials reaches?

- a. minimum value b. maximum value c. average value d. none of the above

146. A chart in which time value are recorded and motion are classified by therblings is called?

- a. Simon chart b. operation chart c. gnat chart d. Process chart

147. Work cost is equal to

- a. factory cost b. primary cost c. factory cost +primary cost d. all the above

148. The lines must be balanced in?

- a. product layout b. process layout c. plant layout
d. functional layout e. all the above except(a)

149. Functional layout is suited for?

- a. mass production b. job production c. batch production d. all the above

150.. Product layout is suited for?

- a. mass production b. job production c. batch production d. all the above

151. The deduction for employee's provident fund is start?

- a. after one year joining the service b. after two year joining the service
c. after 240 days joining the service d. Immediately joining

152. For medium and large scale computer the fastest internal storage is of the type of

- a. magnetic type b. Magnetic type storage c. Plunged cards d. none of the above

153. For search therblig colour is?

- a. red b. block c. brown d. blue

154. The unit which remains the information read by the computer so that it can be used in subsequent calculation is known as?

- a. control unit b. input unit c. output unit d. storage unit

155. Cash discount are reduction in price of good?

- a. paramount cash payment b. assurance payments
c. sold on credit d. none off the above

156. Shadow prices in linear programming are?

- a. max cost per item
- b. lowest sales prices
- c. the value assigned for one unit of capacity
- d. none of the above

157. A public sector understanding is

- a. government
- b. share holders
- c. jointly owned by private parties
- d. all the above

158. Standing order contain

- a. adopted management
- b. List of worker
- c. shift working attendance rules

159. Standing order is applicable is

- a. major industries
- b. all industries employee
- c. all employee more than 100 weaker

160. The workman are interpretation of standing order can refer to

- a. management
- b. Labor court
- c. shape supervisor
- d. Interracial
- c.. Lab our minister

161. For industrial distribute the proper authority is?

- a. management
- b, b. Labor court
- c. labour minister
- d. high court

162. Which of the following are the methods of opptimization?

- a. statically method
- b. Search
- c. Linear programming
- d. Queuing theory
- e. all the above

163. Choose the correct statements?

- a. value analysis method used
- b. batch production
- c. All the above
- d. none of these

164. A public sector under taking is

- a. fully owned by government
- b. Private parties'
- c. Share holders
- d. Private government

ANSWERS

145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164
a	a	c	e	b	a	e	b	b	d	a	c	a	c	c	b	c	e	d	a

PART B

(2 MARKS)

165. What is administrative overhead?

Administrative overhead is a overhead which incurred for general administration management for efficient and proper functioning of the enterprise.

166. Define direct labour cost?

Direct labour cost can be charged directly to the job under preparation.

167. Define Indirect labour cost? (AU NOV DEC 09)

Indirect labour cost cannot be charged directly to a particular job, but are charged on the number of products produced in the plant during a particular period.

168. Define set up time.

The time required to fit the job in the machine.

169. What is meant by machining Time?

It is the time for which the machine works on the component.

170. Define length of cut? (AU NOV DEC 12)

It is the distance traveled by the tool to machine the workpiece.

171. Define over travel?

It is the distance over which the tool idles before it enters and after it leaves the cut.

172. Define Feed? (AU NOV DEC 12)

It is the distance, through which the tool advances into the workpiece during one revolution of the workpiece or the cutter.

173. Define Depth of Cut?

It is the thickness of the layer of metal removed in one cut or pass, measured in a direction perpendicular to the machined surface.

174. Define Cutting speed?

The cutting speed can be defined as the relative speed between the tool and the job.

PART C

(16 MARKS)

175. (i) Estimate the time required for cutting 3mm pitch threads on a mild steel bar of 2.8cm dia and 8cm long. Assume the cutting speed for threading as 15m/min.

(ii) A 15cm long MS bar is to be turned from 4cm dia in single cut in such a way that for 5cm length its dia is reduced to 3.8cm and remaining 10cm length is reduced to 3.4cm. Estimate the total time required for turning it, assuming cutting speed as 30m/min, feed as 0.02cm/revolution and time required for setting and mounting of the job in a three jaw chuck is 30sec. Neglect the tool setting time. What is the time required for knurling 5cm length at 20m/min and feed 0.03cm/rev. (A.U Dec-05) (AU NOV DEC 12)

176. (i) A 20cm x 5cm CI surface on milling machine with a cutter having a diameter of 10cm and 16 teeth. If the cutting speed and feed are 50m/min and 5cm/min respectively. Determine the milling time, rpm of the cutter and feed per tooth.

(ii) Find the time required for doing rough grinding of a 15cm long steel shaft to reduce its diameter from 43.8cm with the grinding wheel of 2cm face width. Assume cutting speed as 15m/min and depth of cut as 0.25mm. (A.U Dec-05)

177. Describe the various steps involved in estimating the labour cost. (A.U May-09)

178. Explain the estimation of material cost with examples. (A.U May-09) (AU NOV DEC 12)

179. For manufacture of 1000bolts and nuts per hour, a factory incurs following expenses: Direct material cost:Rs.350 ;Direct labour cost :Rs.200; Direct expenses :Rs.70 ; Factory Overheads:150% of labour cost; Office Overheads: 30% of factory cost. Determine whether the factory is making profit or loss in selling one set of bolt and nut for Rs.1.

ME 1010

NUCLEAR ENGINEERING

UNIT I

NUCLEAR PHYSICS

PART A

[1 MARK]

1. The average thermal efficiency of a modern power plant is about

- (a) 30% (b) 40% (c) 60 (d)80%
- 2. Reflectors of a nuclear reactor are made up of**
 (a) Boron (b) Cast iron (c) Beryllium (d) Steel
- 3. The function of a moderator in a nuclear reactor is**
 (a) To slow down the fast moving electrons (b) To speed up the slow moving electrons
 (c) To start the chain reaction (d) To transfer heat produced inside the reactor to a heat exchanger
- 4. When a nuclear reactor is operating at constant power the multiplication factor is**
 (a) Less than unity (b) Greater than unity (c) Equal to unity (d) None of the above
- 5. The conversion ratio of a breeder reactor is**
 (a) Equal to unity (b) More than unity (c) Less than unity (d) None of the above
- 6. In the nuclear fission reactions isotope of uranium used**
 (a) U^{233} (b) U^{234} (c) U^{238}
- 7. Tarapur nuclear power plant has**
 (a) Pressurized water reactor (b) Boiling water reactor (c) CANDU type reactor
- 8. Critical mass of fuel is the amount required to make the multiplication factor....**
Unity
 (a) Equal to (b) Less than (c) More than (d) None of the above
- 9. The nuclear energy is measured as**
 (a) MeV (b) MW (c) Curie
- 10. Fission chain reaction is possible when**
 (a) Fission produces the same number of neutrons which are absorbed
 (b) Fission produces more neutrons than are absorbed
 (c) Fission produces less neutrons than are absorbed
 (d) None of the above
- 11. In nuclear chain fission reaction, each neutron which causes fission produces**
 (a) No new neutron (b) One new neutron
 (c) More than one new neutron (d)None of the above
- 12. Is the most commonly used moderator**
 (a) Graphite (b) Sodium (c) Deuterium (d) Any of the above
- 13. Which of the following are fertile materials**
 (a) U^{238} and Th^{239} (b) U^{238} and Th^{232} (c) U^{233} and Pu^{239} (d) U^{238} and Pu^{239}
- 14. In a nuclear reactor the function of a reflector is to**
 (a) Reduce the speed of neutron (b) Stop the chain reaction
 (c) Reflect the escaping neutron back into the core
- 15. In gas cooled reactor (GCR)..... are used as moderator and coolant respectively**
 (a) Heavy water and CO_2 (b) Graphite and air (c) Graphite and CO_2 (d) None of the above
- 16. In a pressurized water reactor**
 (a) The coolant water is pressurized to work as moderator
 (b) The coolant water boils in the core of the reactor (
 (c) The coolant water is pressurized to prevent boiling of water in the core
 (d) No moderator is used
- 17. The function of the moderator in nuclear reactor core is**
 (a) Stop chain reaction (b) Absorb neutron
 (c) Reduce the speed of neutrons (d) Reduce temperature
- 18. Thermal shielding is provided to**

- (a) Protect the walls of the reactor from radiation damage
 (b) Absorb the fast neutron
 (c) Protect the operating personal from exposure to radiation
 (d) (a),(b) and (c) (e) (b) and (c) (f) None of the above

19. A CANDU reactor uses

- (a) Only fertile material (b) Highly enriched uranium
 (c) Natural uranium (d) None of the above

20. Fission of U^{235} releases energy

- (a) 200 MeV (b) 238MeV (c) 431MeV (d) None of the above

ANSWERS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
b	a	b	a	b	d	c	a	a	a	a	d	b	a	a	a	d	a	d	e

PART B**[2 MARKS]****21. What is amu? What is its importance in nuclear physics? [Anna Univ. Nov,07]**

The energy released by each neutron during fission process is called nuclear energy which is measured in terms of amu.

The atomic mass unit [amu] is a unit of mass approximately equal to 1.66

x 10⁻²⁴ kg. It is used to find the mass loss and nuclear binding energy of any atom.

22. What is called plum pudding?

Thompson proposed a model for the atom consisting of a positive electrical field with electrons embedded into the field like plums embedded in plum pudding. It is called plum pudding model of the atom.

23. What is nuclear binding energy/?**[Anna Univ. Nov,07]**

The energy released at the moment of combination of two nucleons to form nucleus of an atom is called "binding energy".

24. Define mass defect.**[Anna Univ. Nov,07]**

If two or more particles interact to combine together, then the total mass of the system will decrease to be less than the sum of the masses of the individual particles. The stronger the interaction becomes, the more the mass will decrease. This decrease of the mass of the system is called mass defect.

25. Define natural and artificial radioactivity. [Anna Univ. Nov,07]

Natural radioactivity is isotopes that have been here since the earth formed. Example: Uranium. Artificial radioactivity is produced by cosmic rays from the sun.

26. Define Rutherford scattering.

The total positive charge in an atom, +Ze, concentrates on the central point of the atom, i.e. the nucleus, and the incident alpha particle is scattered with a repulsive coulomb force exerted by this nuclear point charge called Coulomb scattering or Rutherford scattering.

27. What is atomic number and mass number?

The number of protons in the nuclear is called atomic number. It is denoted by 'Z'. The total number of nucleons in the nuclear is called mass number. It is denoted by the letter 'A'.

28. List down some isotopes used in fusion reaction.

- [i] Protium
- [ii] Deuterium
- [iii] Tritium
- [iv] Helium-3
- [v] Helium-4

29. What is meant by elastic scattering?

In an elastic scattering, the reaction between a neutron and a target nucleus, there is no energy transferred into nuclear excitation. Momentum and kinetic energy of the system are conserved although there is usually some transfer of kinetic energy from the neutron to the target nucleus. The target nucleus gains the amount of kinetic energy that the neutron loses.

30. Mention the types of cross section.

1. The cross section σ for a particular process which applies to a single nucleus, it is called microscopic cross section.
2. If the cross section for the same process is considered for whole nucleus, it is called macroscopic cross section.

PART C

[16 MARK]

31. Discuss the advantages and disadvantages of nuclear power.
32. Discuss the elementary treatment of an atom.
33. State the law of mass energy equivalence and calculate the energy in kW likely to be produced by one gram of matter taking light velocity as 3×10^8 m/sec. [Anna univ. Nov'07]
34. Write short notes on nuclear potential.
35. Explain in nuclear binding energy? How is it measured?
36. Define 'half life', 'mean life' and 'decay constant'. [Anna Univ. Nov'07]
37. Explain the concept of elastic scattering and discuss how inelastic scattering differs from elastic scattering.
38. Write a brief note on 'neutron interactions' and 'cross sections'. [Anna univ. Nov'07]
39. Explain the various methods of determining cross section.
40. Write short notes on types of scattering cross section.

UNIT II NUCLEAR REACTIONS AND REACTION MATERIALS

PART A

[1 MARK]

41. **Fast breed reactor are best suited for india because**
 - (a) A large thorium deposits
 - (b) A large uranium deposits
 - (c) A large plutonium deposits
42. **India's first nuclear power plant was started at**
 - (a) Narora (U.P)
 - (b) Tarapur (Bombay)
 - (c) Kota (rajasthan)
 - (d) Kalpakkam (chennai)
43. **In the following , what is the use of control rods**
 - (a) To control the rate of fission
 - (b) To increase the rate of fission
 - (c) To decrease the temperature inside reactor core
 - (d) To exchange the heat from coolant to heat exchanger

- 44. The nuclear waste actinides is produced by the result of**
 (a) Neutron capture by uranium (b) Neutron capture by reflector
 (c) Neutron capture by moderator (d) Neutron capture by structural materials
- 45. Which techniques is used in india to dispose the nuclear waste**
 (a) Waste disposal in ocean (b) Waste disposal in underground
 (c) Waste disposal in mountain (d) Waste disposal in river
- 46. During nuclear fuel consumption, what are the gases are released,**
 (a) CO (b) Krypton (c) Iodine (d) B&C
- 47. The first radiation unit of international acceptance is**
 (a) Rad (b) Roentgen (c) Rem (d) None of the above
- 48.is the international organization that advises on the safe & peaceful uses of nuclear technologies**
 (a) IAEA (b) OECD / NEA (c) EC (d) EC / RP
- 49. In following which one is coming under nuclear fuel front end cycle**
 (a) Milling (b) Processing (c) (a) & (b) (d) Extract
- 50. Second layer of the reactor containment is**
 (a) Tight zirconium alloy (b) Copper alloy (c) Zinc alloy (d) None of the above
- 51. is the goal of generation IV**
 (a) Productivity (b) Sustainable (c) Safe & reliable (d) B&C
- 52. What factors control the selection of a particular type of reactor**
 (a) Capacity range (b) Type of fuel (c) Type of moderator (d) B&C
- 53. Enriched uranium reactor uses the fuel contain the uranium in the**
 (a) % of 5 to 10 (b) % of 10 to 15 (c) % of 20 to 25 (d) % of 2 to 6
- 54. UREX is process used to**
 (a) Extract uranium fuel (b) Fabricate the uranium fuel
 (c) Refine the uranium fuel (d) Produce the uranium fuel
- 55. Some materials are not fissionable by themselves. They can be converted into fissionable material is called**
 (a) Fissile fuel (b) Fertile fuel (c) Natural fuel (d) Enriched fuel
- 56. In which conditions the chain reaction cannot be maintained**
 (a) $1=k$ (b) $K<1$ (c) $K>1$ (d) None of the above
- 57. Weapon grade uranium must contain**
 (a) 90% or more U-235 (b) 80% or less than 90% U-235
 (c) 65 to 70% U-235 (d) Minimum 50% of U-235
- 58. The metal used for the fuel rod tubes are**
 (a) Aluminum (b) Steel & zirconium (c) Copper (d) None of the above
- 59. Which reactor is using the natural uranium as fuel**
 (a) CANDU (b) SCWR (c) SCFR (d) LFR
- 60. What material used for neutron shield**
 (a) Borated polyethylene material (b) Borated polyvinyl material
 (c) Concrete wall (d) Stain less steel

ANSWERS

41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60
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b	a	b	a	b	d	c	a	a	a	a	d	b	a	a	a	d	a	d	e
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PART B**[2 MARKS]****61. What are called fissile isotopes?**

These fuels undergo fission process. When unstable heavy nuclear is bombarded with neutrons, it splits into two fragments of approximately equal mass. A large amount of heat is released during this fission process.

62. What are the conditions satisfied to sustain nuclear fission process?

1. The neutrons emitted in fission must have adequate energy to cause fission of another nucleus.
2. The number of neutrons produced must be able not only to sustain the fission process but also to increase the rate of fission.
3. The fission process must liberate the energy.
4. It must be possible to control the rate of energy liberation.

63. How does neutron evaporation refer?

The excited nucleus which always has an excess of neutrons relative to its fragment products, ejects or boils off a large number of neutrons in one lot and the residual nucleus breaks into two similar fragments both having nearly the same N/Z ratio called neutron evaporation.

64. Mention the types of hydrogen fusion.

[i] Magnetic confinement uses magnetic and electric field's to heat and squeeze the hydrogen plasma.

[ii] Inertial confinement uses laser beams or ion beams to squeeze and heat the hydrogen plasma.

65. Distinguish between fission and nuclear.**[Anna Univ. Nov'2007]**

S. No.	Nuclear fission	Nuclear fusion
1.	It is the process of breaking a heavy nucleus with some projectiles into two or more light fragments with liberation of a large amount of energy.	It is a process of fusing two light nuclei into single nucleus with the liberation of a large amount of heat.
2.	This process results in the emission of radioactive rays.	This process does not emit any kind of radioactive rays.
3.	This process takes place spontaneously at ordinary temperature.	This process takes place at very high temperature [nearly at about $> 10^5$ K].
4.	The mass number and atomic number and atomic number of the daughter elements [new elements] are considerably lower than that of the parent nucleus.	The mass number and atomic number of the product is higher than that of the starting elements.
5.	This process gives rise to chain reaction.	This process does not give rise to chain reaction.
6.	During nuclear fission, neutrons are	During nuclear fusion, protons are

	emitted.	emitted.
7.	Nuclear fission can be performed under controlled conditions.	Nuclear fusion cannot be performed under controlled conditions.

66. List down the requirements of a moderator.

- [i] It should have as low atomic mass number as possible, and
- [ii] Its neutron absorbing ability should be as low as possible.

67. What is nuclear chain reaction classified?

For $k = 1$, the operation of the reactor is said to be exactly critical which is for steady-power operation. If $k < 1$, the reactor is sub critical and the number of neutrons is going down. On the other hand, if $k > 1$, the system is supercritical.

68. What are the processes involved in nuclear composition of Gamma-ray Burst fireballs?

1. Neutronization in the central engine.
2. Nucleosynthesis in the fireball as it expands and cools, and
3. Spallation of nuclei in subsequent internal shocks.

69. State the role of fuel fabrication in nuclear fuel cycle.

Nuclear fuel fabrication converts the enriched UF_6 into fuel for nuclear power reactors.

70. State the benefit of reprocessing of spent nuclear fuel.

Reprocessing enables recycling of the uranium and plutonium into fresh fuel, and produces a significantly reduced amount of waste [compared with treating all used fuel as waste].

PART C**[16 MARKS]**

71. Explain the nuclear fission process with help of a neat sketch.

72. What is chain reaction? How it is maintained? What is the difference between controlled and uncontrolled chain reaction? Explain with neat sketches and with examples. **[Anna Univ. Dec'04 & Nov'07]**

73. Discuss how the nuclear chain reaction is sustained.

74. Write short notes on critical mass and nuclear composition.

75. Explain the nuclear fuel. **[Anna Univ. Apr'05]**

76. Explain the gas centrifuge method of enrichment.

77. Describe in situ leaching of uranium.

78. Write short notes on: [i] Nuclear fuel cycles and its characteristics.

[ii] Uranium production and purification. **[Anna Univ. Dec'04 & Nov'07]**

79. Explain clearly [i] Nuclear fuel cycle with a neat sketch, and

[ii] Spent fuel characteristics. **[Anna Univ. Dec'04 & Nov'07]**

80. Draw and explain a solvent extraction equipment. **[Anna Univ. Dec'04 & Nov'07]**

UNIT III**REPROCESSING****PART A****[1 MARK]****81. Breeding is the process of producing energy to self sustain nuclear fission chain reaction without using**

- [a] Reflector (b) Control rod (c) Moderator (d) Shielding

82. Generation III in nuclear reactor involves optimizing the current reactor in terms of

- [a] Sustainable (b) Productivity (c) Economics & safety
(d) Resistant to proliferation risks
- 83. The range of power in sodium cooled reactor is**
[a] 150 to 500MW (b) 150 TO 300MW (c) 150 TO 1500MW (d) 500 TO 2000MW
- 84. During fuel fabrications what type waste is producing**
[a] Low level solids (b). Plutonium contaminated solids
(c). (a) & (b) (d). High level solids
- 85. Is the life time for fission products**
[a] 500 to 1000 years (b) 500 to 800 years
(c) 100 to 300 years (d) None of the above
- 86. In following which one is familiar actinides**
(a) Plutonium [b] Thorium [c] Uranium [d] None of the above
- 87. Which country uses the method to dispose the nuclear waste in ocean**
(a) India [b] USA & Canada [c] Jermen [d] All of the above
- 88. The losing of hair quickly & in clumps occurs with radiation exposure is**
(a) 300 rems [b] 200 rems or higher [c] 500 rems [d] 200 rems or lower
- 89. Brain cells do not reproduce, when the radiation exposure**
(a) 1000 rems [b] 1000 to 2000 rems [c] 5000 rems or greater [d] None of the above
- 90. To make a nuclear bomb, how much kg of plutonium needed**
(a) 2 [b] 3 [c] 4 [d] 10
- 91. A draft tube is a part of which power plants?**
(A) Diesel Engine Power-Plant (B) Gas turbine Power Plant (C) Steam Power Plant
(D) Hydro Electric Power Plant (E) All of the above
- 92. The name DVC is associated with which type of Power generation?**
(A) Thermal (B) Hydro electric (C) Nuclear (D) Gas turbine (E) Diesel engine.
- 93. For under water movement of a submarine the power is provided by**
(A) Geothermal energy (B) Tidal energy (C) Batteries (D) Solar energy
(E) Thermionic converters
- 94. A jet air craft is powered by**
(A) Petrol engines (B) Diesel engines (C) Gas turbine (D) Batteries (E) Solar cells.
- 95. Satellites are powered by**
(A) Thermo-electric generators (B) Thermionic converters
(C) Photo electric cells (D) Batteries (E) Solar cells.
- 96. A ship is powered by**
(A) Steam turbine (B) Diesel engines (C) Steam turbines or diesel engines
(D) Steam turbines, diesel engine or hydraulic turbines (E) Steam turbines, diesel engines,
hydraulic turbines or nuclear reactors.
- 97. The work of installation and commissioning of power plants in India is generally undertaken by**
(A) Coal Authority of India (B) Steel Authority of India
(C) NHPC Ltd. (D) NTPC Ltd. (E) HAL.
- 98. A curve showing the variation of load on a power station with respect to time is known as**
(A) Load curve (B) Load duration curve (C) Diversity factor
(D) Performance curve (E) Flow chart.

99. The area under the load curve represents

- (A) Systems voltage (B) Current (C) Energy consumed
(D) Maximum demand (E) Average demand.

100. The highest point on the load curve represents

- (A) Maximum time (B) Maximum demand (C) Maximum concrete load
(D) KVA rating of generators (E) none of the above.

ANSWERS

81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
b	a	b	a	b	d	c	a	a	a	a	d	b	a	a	a	d	a	d	e

PART B**[2 MARKS]****101. Define reprocessing as applied to nuclear fuel. [Anna Univ. Nov'2007]**

Nuclear reprocessing separates any usable elements [e.g., uranium and plutonium] from fission products and other materials in used nuclear reactor fuels.

102. State the major composition of nuclear spent fuel.

95.6 % uranium [less than 1 % of which is ^{235}U]; 2.9% stable fission products and 0.9% plutonium [about two thirds fissile ^{239}Pu & ^{241}Pu].

103. Define Transmutation in nuclear reprocessing.

The process of conversion of long lived fission products to short-lived isotopes by either neutron or photon irradiation is called transmutation.

104. Define closed nuclear fuel cycle.

Reprocessing separates the uranium and plutonium from the wastes so that they can be recycled for re-use in a nuclear reactor as a mixed oxide [MOX] fuel. This is the closed fuel cycle.

105. State the stages in nuclear fuel cycle.

The nuclear fuel cycle consists of three important steps:

Steps in the front end – preparation of the fuel.

Steps in the service period – fuel is used during reactor operation.

Steps in the back end – this step is necessary to safely manage, contain, and either reprocess or dispose of spent nuclear fuel.

106. Define extraction.

Liquid-Liquid extraction is a mass transfer operation in which a liquid solution [the feed] is contacted with an immiscible or nearly immiscible liquid [solvent] that exhibits preferential affinity or selectivity towards one or more of the components in the feed.

107. Define the term selectivity in extraction.

The selectivity is expressed by the separation factor i.e. the ratio of the distribution coefficients of the desired and impurity species when equilibrium is attained between two phases.

108. Define open fuel cycle.

If spent fuel is not reprocessed, the fuel cycle is referred to as an open fuel cycle or a once-through fuel cycle.

109. Define the term distribution coefficient.

The distribution coefficient ratio D is defined as

$$D = \frac{\text{Concentration of component in organic phase}}{\text{Concentration of Component in aqueous phase}}$$

110. Name the common types of extractor used in nuclear industries.

- [i] Mixer-Settlers
- [ii] Centrifugal Devices
- [iii] Column contactors [Static and agitated columns]

PART C**[16 MARKS]**

111. Explain the characteristics of spent nuclear fuel. **[Anna Univ. Nov'07]**

112. Explain the working principle with a diagram of solvent extraction equipment used in nuclear industry. **[Anna Univ. Nov'07]**

113. State the role of extraction in nuclear reprocessing.

114. Write a brief note on types of nuclear fuel cycle.

115. Explain the process of FLOUREX.

116. Write short notes on the following processes for the extraction of fissile materials from spent nuclear fuel:

- [i] UREX
- [ii] TRUEX
- [iii] MOX
- [iv] PYRO

117. Explain the principle of extraction.

118. Explain the extraction of uranium and plutonium extraction form spent fuel using PUREX method.

UNIT IV NUCLEAR REACTORS**PART A****[1 MARK]****119. Diversity factor is**

- (A) Maximum demand / Average demand
- (B) demands/ Maximum demand on power station
- (C) Average load/Maximum demand
- (D) Maximum demand on power station/ Average demand
- (E) None of the above

120. Reverse capacity of a plant is given by

- (A) Maximum demand-Average demand
- (B) Plant capacity-Maximum demand
- (C) Plant capacity-Average demand
- (D) Plant capacity * (1-Load factor)
- (E) None of the above.

121. The minimum demand on a power station is 10 MW. If the annular load factor is 40% total energy generated per year will be

- (A) 35.04×10^8 k wh
- (B) 35.04×10^7 k wh
- (C) 35.04×10^6 k wh
- (D) 35.04×10^5 k wh.

122. The maximum number of generators in a power plant must be

- (A) One
- (B) Two
- (C) Three
- (D) Odd
- (E) Even

123. The capacity of generators being installed in super thermal power plant is

- (A) 100MW
- (B) 200 MW
- (C) 220 MW
- (D) 400 MW
- (E) 500 MW.

124. A generating station is to supply four region of loads with peak demands of 10 MW, 15 MW, 20 MW and 30 MW. If the diversity factor is 1.5 the maximum on the rotation is

- (A) 70 MW (B) 60 MW (C) 50 MW (D) 45 MW (E) 30 MW.

125.. Which of the following plant is suitable for peak load?

- (A) Diesel engine plant (B) Steam power plant (C) Nuclear power plant
(D) Hydro-electric power plant (E) All of the above.

126. All of the following plants are suitable for peak load EXCEPT

- (A) Gas turbine plant (B) Pumped storage plant
(C) Diesel engine plant (D) Nuclear power plant.

127. The area under load curve divided by maximum demand represents

- (A) Load factor (B) Diversity factor (C) Connected load
(D) Average load (E) None of the above

128. Diversity factor is

- (A) Maximum demand / Average demand (B) demands/ Maximum demand on power station
(C) Average load/Maximum demand (D) Maximum demand on power station/ Average demand
(E) None of the above

129. Reverse capacity of a plant is given by

- (A) Maximum demand-Average demand (B) Plant capacity-Maximum demand
(C) Plant capacity-Average demand (D) Plant capacity * (1-Load factor) (E) None of the above.

130. The minimum demand on a power station is 10 MW. If the annular load factor is 40% total energy generated per year will be

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134. Which of the following plant is suitable for peak load?

- (A) Diesel engine plant (B) Steam power plant (C) Nuclear power plant
(D) Hydro-electric power plant (E) All of the above.

135. All of the following plants are suitable for peak load EXCEPT

- (A) Gas turbine plant (B) Pumped storage plant (C) Diesel engine plant

136. All of the following plants are suitable for peak load EXCEPT

- (A) Gas turbine plant (B) Pumped store plant
(C) Diesel engine plant (D) Nuclear power plant

137. The supply and, distribution of electrical energy in states is controlled by

- (A) Department of Science and Technology (B) Department of Industries
(C) Electricity Board (D) NTpc.

138. Which of the following power plant can be easily started from cold conditions ?

- (A) Nuclear power plant (B) Thermal power plant
(C) Diesel engine plant (D) Any of the above (E) None of the above.

ANSWERS

119	120	121	122	133	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138
b	a	b	a	b	d	c	a	a	a	a	d	b	a	a	a	d	a	d	e

PART B**[2 MARKS]****139. What do you understand by moderation? [Anna Univ. Dec'04]**

The process of slow down the neutrons from high velocity without capturing them is known as moderation.

140. Explain the function of the moderator. [Anna Univ. May'07]

Moderator is a material which is used to slow down the neutrons from high velocities without capturing them. The fast moving neutrons are far less effective in causing the fission and try to escape from the reactor.

141. Define the term "Breeding". [Anna Univ. Apr'05 & Nov'07]

In fast breeder reactor, the process of producing energy to self-sustain nuclear fission chain reaction without using moderator is known as breeding. Enriched Uranium [U^{235}] or Plutonium is used as fuels which are surrounded by a thick blanket of fertile Uranium [U^{238}].

142. What factors control the selection of a particular type of a reactor?**[Anna Univ. Dec'04]**

1. Neutrons energy
2. Type of fuel
3. Type of coolant
4. Type of moderators
5. Construction of core.

143. State the goals of generation IV.

- [i] Sustainable
- [ii] Economically viable
- [iii] Safe and reliable
- [iv] Resistant to proliferation risks and likely to be easily protected from external attack.

144. What are the different types of fast breeders? [Anna Univ. Nov'07]

- [i] GFR: Gas-cooled Fast Reactor system cooled with helium
- [ii] LFR: Lead Fast Reactor cooled with lead or lead-bismuth eutectic
- [iii] MSR: Molten Salt Reactor fuelled with molten salts
- [iv] SFR: Sodium Fast Reactor
- [v] SCWR: Super-Critical Water-cooled Reactor
- [vi] VHTR: Very High Temperature Reactor cooled with helium at 1000°C at the fore outlet, for efficient production of hydrogen.

145. State the advantages of fast breeder reactors.

- [i] No moderator is required
- [ii] High breeding is possible
- [iii] It gives high power density than any other reactor.
- [iv] High efficiency in the order of 40% can be obtained.
- [v] Better fuel utilization.
- [vi] Absorption of neutrons is low.

146. What are the components of supercritical water reactor nuclear power plant?

[Anna Univ. Dec'05]

- | | |
|-------------------|------------------|
| 1. Reactor. | 2. Pressuriser |
| 3. Heat exchanger | 4. Coolant pump. |

147. Write the different fuel cycle can be used in molten salt reactor.

1. Actinide burning fuel cycle.
2. Once-through fuel cycle.
3. Denatured thorium-233U breeder cycle.
4. Thorium-233U breeder cycle.

148. List down the factors not considered for heat transfer analysis.

- [a] Multiphase flow
- [b] Condensation with non-condensable
- [c] Lower Head Cooling
- [d] Fuel Debris Cool ability.

PART C

[16 MARKS]

149. With a neat sketch explain the boiling water reactor power plant. [Anna Univ. Dec'05]

150. Write short notes on need of nuclear energy.

151. Describe the boiling water reactor with the help of neat sketch and explain its chief characteristics. [Anna Univ. Dec'07]

152. Explain with a neat sketch the indirect gas cooled reactor. [Anna Univ. Dec'05]

153. Explain the construction and working of CANDU reactor.

154. Write short notes on the following:

[i] Boiling water reactor

[ii] Fast breeder reactor.

[Anna Univ. Dec'04]

155. Explain the principle of operation of a sodium graphite reactor. [Anna Univ. Apr'05]

156. Explain the principle of operation of a Lead-bismuth reactor.

157. Discuss the advancement in nuclear reactors.

158. Write short notes on reactor shielding.

UNIT V

SAFETY AND DISPOSAL

PART A

[1 MARK]

159. In a steam locomotive the power is generated in

- | | |
|--|---|
| (A) Steam turbine | (B) Single acting condensing steam engine |
| (C) Single acting non-condensing steam engine | (D) Double acting condensing steam engine |
| (E) Double acting non-condensing steam engine. | |

160. The fixed cost of a power plant depends on

- | | |
|------------------------|-----------------------|
| (A) Installed capacity | (B) Demand factor |
| (C) Diversity factor | (D) Average demand |
| | (E) All of the above. |

161. Which of the following material has high scrap value as compared to initial cost?

- | | | | | |
|---------------|-----------|------------|----------|---------------|
| (A) Aluminium | (B) Steel | (C) Copper | (D) Wood | (E) Cast iron |
|---------------|-----------|------------|----------|---------------|

162. The value of equipment at the end of its useful life is known as

- | | | |
|------------------------|-----------------------|------------------|
| (A) Useful value | (B) Replacement value | (C) Demand value |
| (D) Obsolescence value | (E) Scrap value. | |

163. The initial cost of an equipment is Rs. 20 lakhs and depreciated cost after ten years is Rs. 15 lakhs. The useful life of the equipment is

- (A) 5 years (B) 10 years (C) 15 years
(D) 20 years (E) cannot be determined on the basis of the information provided,

164. The depreciation rate for an equipment is generally decided in light of

- (A) Sales tax rules (B) Excise duty rules (C) Income tax rules
(D) Electricity duty rules (E) None of the above.

165. The annual installment by straight line method will be

- (A) Rs. 600 (B) Rs. 6000 (C) Rs. 16,000 (D) Rs. 10,000 (E) Rs. 66,000.

166. The depreciated value of the equipment after 20 years (by straight line depreciation method will be

- (A) Rs. 1,20,000 (B) Rs. 2,40,000 (C) Rs. 3,00,000
(D) Rs. 3,60,000 (E) Rs. 3,60,000.

167. The depreciated value of the equipment after 20 years, by diminishing value method will be

- (A) Rs. 1,15,615 (B) Rs. 1,35,888 (C) Rs. 1,75,999.
(D) Rs. 2,92,496 (E) Rs. 3,33,100.

168. The annual deposit under Sinking fund method when the rate of interest's S% will be

- (A) Rs. 12,365 (B) Rs. 15,666 (C) Rs. 25,889 (D) Rs. 25,400 (E) Rs. 38,335.

169. The value of plant under 20 years by Sinking Fund method, when the rate of interest is 5%, will be

- (A) Rs. 6,33,433 (B) Rs. 5,20,698 (C) Rs. 4,16,144 (D) Rs. 4,22,666 (E) Rs. 2,44,633

170. Which of the following relation is incorrect?

- (A) $(\frac{R}{V})^2 = (\frac{R}{W})^2 + (\frac{K}{V})^2 \cdot \frac{K}{V} \cdot \frac{5}{\tan \epsilon} - m - c$ (B) $\frac{K}{V} \cdot \frac{5}{\tan \epsilon} = \frac{m}{c} \cdot \frac{R}{W}$ (C) $(\text{Apparent power})^2 = (\text{Active power})^2 + (\text{Reactive power})^2$ (D) None of the above.

171. Which of the following disadvantages occurs due to low power factor?

- (A) Greater conductor size (B) Poor voltage regulation, (C) Large copper losses
(D) Large KVA rating of transformers (E) All of the above.

172. Which of the following equipment has Power factor closer to unity?

- (A) Incandescent lamp (B) Fluorescent lamp (C) Induction infector
(D) Single phase capacitor motor (E) Carbon arc lamp.

173. The power factor of a 3 phase induction motor near full load is expected to be around

- (A) 0.8 leading (B) 0.8 lagging (C) 0.5 lagging (D) 0.5 leading (E) 0.1 lagging.

16. The power factor of a 3 phase- induction motor will be least

- (A) at full load (B) at 50% load (C) at 25% load (D) at 100% load
(E) at no load.

174. When the reactive component is small

- (A) the phase angle will be small and p.f. will be unity
(B) the phase angle will be small and p.f. will be leading
(C) the phase angle will be small and p.f. will be high
(D) the phase angle will be large and p.f. will be low
(E) the phase angle will be large and

175. Compressed air is required generally in which of the following power plants?

- (A) Nuclear power plant (B) Hydro electric power plants (C) Steam power plant
(D) Diesel engine power plant (E) All of the above.

176. Compressed air is required in diesel engine power plants mainly for

- (A) Starting the engine (B) Cleaning (C) Oil filtration
(D) Water aeration (E) All of the above

177. The major share of power in India is provided by which of the following type of power plant?

- (A) Nuclear power plant (B) Hydro-electric power plants (C) Diesel engine power plants
(D) Gas turbine power plants (E) Steam power plants

ANSWERS

159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178
b	a	b	a	b	d	c	a	a	a	a	d	b	a	a	a	d	a	d	e

PART B

[2 MARKS]

179. What are the major reasons for nuclear accidents that classified under lower probability?

Cracks in coolant pipes and loss of flow are the major reasons for nuclear accidents of lower probability.

180. State the major reasons for nuclear accidents that classified under moderate frequency.

The major reasons for nuclear accidents of moderate frequency are imbalance in heat rates. Increase in thermal power and decrease in cooling effectiveness.

181. State the major reasons for nuclear accidents that classified under severe accidents.

The major reasons for nuclear accidents of severe category are large break of loss coolant, loss of power in reactor station and failure of reactor protection system.

182. State the engineered nuclear plant safety measures adopted.

The major engineered safety features are

[i] Emergency cooling system to supply water to the reactor core in the event of a loss of coolant accident.

[ii] The containment vessel to provide a barrier to the escape to the environment of radioactivity.

[iii] Clean up system for removing part of the radioactivity and heat that may be present in the contamination atmosphere.

[iv] Hydrogen control to prevent formation of explosive hydrogen – oxygen mixture in the containment.

183 What are the criteria used for evaluation of nuclear plant safety? [Anna Univ. Nov'07]

The criteria used for the evaluation of nuclear plant safety are

[i] No unreasonable risk

[ii] Adequate protection of public health and safety

[iii] Risk as low as reasonably practicable

[iv] Safety as high as reasonably achievable

[v] Limit risk by use of best technologies at acceptable economic costs.

184. State the major problem encountered in nuclear power generation.

The nuclear power generation poses mainly two problems such as

[i] The management of radioactive waste, and

[ii] The danger passed in case of accident is very high and long standing.

185. How nuclear wastes are classified? [Anna univ. Nov'07]

The nuclear wastes are classified as:

- [i] On the basis of half life time
 - [a] Fission products
 - [b] Actinides
 - [c] The neutron activation products.
- [ii] On the basis of the intensity of radiation
 - [a] Low level waste
 - [b] Medium level waste
 - [c] High level waste.

186. What are the types of radiation which has the ability to penetrate objects or bodies?

Alpha, Beta, and gamma radiation.

187. State the common units of radiation.

Roentgen: This is defined as the quantity of radiations that will produce as result of ionization, electrons carrying a total charge of 2.58×10^{-4} coulomb in 1 kg of dry air.

Rad: The absorbed dose unit is called as rad which is defined as the amount of radiation that leads to deposition of 10-2J of energy per kg of the absorbing material.

Rem: The effect of a given adsorbed dose of radiation is expressed in terms of the dose equivalent for which the unit is rem.

188. State the beneficial uses of nuclear radiation.

- [i] Nuclear radiation has a number of beneficial uses, including.
- [ii] Medicinal, such as radio therapy for cancers and X-rays.
- [iii] Dating purposes [no, this not where you nuke a 'toxic' date]
- [iv] Level indicators and thickness gauges.
- [v] In smoke detectors and
- [vi] In tracing locations of gas or liquid leaks or
- [vii] Tracing locations of malfunctioning in the body such as a blocked kidney.
- [viii] Sterilization of medical instruments or bacteria or moulds in foods.

PART B [16 MARK QUESTIONS]

189. Explain the criteria for nuclear safety system. [Anna Univ. Nov'07]

190. Discuss about the safety measures adopted in modern nuclear plants.

[Anna Univ. Nov'07]

191. Explain with a neat diagram the disposal of low level solid nuclear wastes.

[Anna Univ. Nov'07]

192. Explain about the effects of nuclear radiation on parts of human beings.

[Anna Univ.'07]

193. Discuss about the reasons for nuclear accidents classified based on the source.

194. Explain about the nuclear safety inspections.

195. Explain about the nature of wastes generated from each stage of nuclear fuel cycle.

196. Explain with a neat diagram the disposal of high level solid nuclear wastes.

197. Explain about the disposal of gaseous nuclear wastes with a diagram.

198. Write a short note on plutonium bomb.