AF-1928 MPH4E2

M.Sc. DEGREE EXAMINATION, APRIL 2010

Fourth Semester

Physics

ELECTIVE-BIOMEDICAL INSTRUMENTATION

(CBCS—2008 Onwards)

Duration : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **All** the questions.

1. Draw the structure of the neuron.
2. Define half cell potential.
3. Define differential amplifier.
4. What is EOG ?
5. What is cardiac output ?
6. Mention any three advantages of blood pressure measurement by direct method.
7. What are the different magnets that can be used in NMR imaging system ?
8. Define specific acoustic impendance.
9. What is Diathermy?
10. What do you mean by defibrillators ?

Part - B (5 × 5 = 25)

Answer **All** the questions.

11 (a) Describe the anatomy of human heart.

Or

(b) Write short notes on microelectrodes.

12. (a) Explain the principle and origin of heart sounds that leads to measurements of phonocardiograph.

Or

(b) Explain in detail biofeedback instumentation.

13. (a) Explain the principle of Electromagnetic Flow meter.

Or

(b) Explain thermal dilution method.

14. (a) Write the advantages of NMR imaging system.

Or

(b) Discuss the different arrangements in multi-element array scanners.

15. (a) Explain with basic block diagram the working of defibrillator analysis

Or

(b) Describe the working of an ultrasonic therapy with neat block diagram.

Part - C

(3 × 10 = 30)

Answer any **Three** questions.

16. Explain different electrodes used in ECG.

17. Explain the description of an Electroencephalograph with block diagram.

18. Explain the principle and working of laser doppler blood flow meter.

19. Explain the principle and working of NMR imaging system.

20. With neat block diagram explain the working of a typical modern pacemaker.

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AF-1911 **MPH1C2**

M.Sc. DEGREE EXAMINATION, APRIL 2010

First Semester

Physics

CLASSICAL DYNAMICS AND RELATIVITY

(CBCS—2008 Onwards)

Duration : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** the Questions

1. State D'Alemberts principle.

2. Give two advantages of Lagrangian approach over the Newtonian approach.

3. Define differential scattering cross-section.

4. State Kepler's third law of planetary motion.

5. Define Euler Angles.

6. What is meant by Normal Coordinate ?

7. State the principle of Least Action.

8. What do you mean by Canonical Transformation ?

9. State the two basic postulates of special theory of relativity.

10. What are the conditions for the Lorentz transformation ?

Part - B (5 × 5 = 25)

Answer **all** the Questions

11 a. Develop the notation for velocity in terms of Generalised Coordinates.

(Or)

b. Deduce Lagrange's equations of motion from Hamilton's principle for a conservative system.

12 a. Reduce the two body problem to its equivalent one body problem.

(Or)

b. Deduce an expression for the orbits under inverse square law of force.

13 a. Derive the kinetic energy of a rigid body in space.

(Or)

b. Distinguish group velocity from phase velocity.

14 a. Show that the Poisson brackets are invariable under canonical transformation.

(Or)

b. Define Action angle variables with example mention one use of this formalism.

15 a. Discuss the law of addition of velocities in relativity.

(Or)

b. Mention the advantages of four vectors in the four dimensional continuum.

Part - C

$(3 \times 10 = 30)$

Answer any **three** Questions

16. Deduce Lagrange's equation of motion from D'-Alembert's principle for both conservative and non-conservative systems.

17. Obtain an expression for Rutherford scattering cross-section.

18. What are normal coordinates ? Discuss the normal frequencies of a vibrating motion for a linear triatomic molecule.

19. Discuss Kepler's problem by action angle variable method.

20. a)Derive Einsterin's mass-energy relation.

    b)Prove that the four dimensional volume element 'dx dy dz dt' is invariant under Lorentz transformation.

AF-1912 MPH 1C3

M.Sc DEGREE EXAMINATION, APRIL 2010

I Semester

PHYSICS

ELECTRONICS

(CBCS - 2008 Onwards)

Duration : 3 Hours Maximum : 75 marks

Part - A (10 x 2 = 20)

Answer ALL Questions

1. What is meant by dark current?
2. Give the applications of tunnel diode.
3. Define depletion mode MOSFET.
4. What is DIAC?
5. Draw the circuit diagram of voltage follower.
6. Define filter. How are filters classified?
7. What is the difference between the saw tooth wave and the triangular wave?
8. Define resolution in A/D converter.
9. What do you mean by monolithic IC?
10. List the applications of CCDs.

Part-B (5 x 5 = 25)

Answer ALL Questions

11. a. Write a short note on Schottky diode.

(OR)

b. Briefly explain the construction of a Gunn diode.

12. a. Draw the V-I characteristics of SCR and explain the same.

(OR)

b. Explain how UJT can function as a relaxation oscillator.

13. a. Describe the band-pass filter.

(OR)

b. Explain how Op-Amp can be used as an inverting Amplifier.

14. a. Explain the principle and working of dual slope ADC.

(OR)

b. Explain the action of R-2R ladder in D/A conversion.

15. a. Explain masking and etching.

(OR)

b. Describe the working of the 555 timer as a monostable multivibrator.

Part-C (3 x 10 = 30)

Answer any THREE Questions

16. Describe with a neat circuit, the effect of forward and reverse biasing in a PN junction.

17. Obtain the V-I characteristics of N-Channel JFET and explain its working.

18. Using Op-Amp, solve the following simultaneous equations
$3a + 2b = 8$; $2a + 2b = 6$.

19. Give a detailed account on the working of triangular wave generator and obtain an expression for the frequency of oscillation.

20. Describe the various steps involved in fabricating diodes, transistors and capacitors.

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AF-1913 **MPH1E1**

M.Sc. DEGREE EXAMINATION, APRIL 2010

First Semester

Physics

ELECTIVE - NUMERICAL METHODS

(CBCS—2008 Onwards)

Duration : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** Questions

1. Define Random error.

2. Give the normal equations of a parabola.

3. Write the General Formula for the Method of False position.

4. What is iteration method ?

5. Give the significance of Lagrange's interpolation.

6. Write the general formula for forward and backward interpolation formula.

7. Give the relation between divided differences and forward differences.

8. List two practical applications of Simpson's rule.

9. Give the algorithm of third order Runge Kutta Method.

10. Write the formula for Euler method.

Part - B (5 × 5 = 25)

Answer **all** Questions

11 a. Explain the principles of Least Squares.

(Or)

b. Derive the normal equations to fit straight line.

12 a. Obtain the General formula for the method of False position.

(Or)

b. Write the program in C language for solving linear equations using Gauss seidal method.

13 a. Deduce Newton's central difference interpolation formula.

(Or)

b. Given the set of tabulated points (1, -3), (3, 9), (4, 30) and (6, 132). Obtain the value of y using Newton's divided - difference formula.

14 a. Compute the derivatives by Newton Forward difference formula.

(Or)

b. Write the program in C language for evaluating the Integral using Simpson's $^1/_3$ rule.

15 a. Using Euler's method. solve $\frac{dy}{dx}$ = 1-y; y(0) = 0 in the range $0 \leq x \leq 0.2$ by taking h = 0.1

(Or)

b. Find y (0.2) given $y^1 = x - 2y$, y (0) = 1 taking h = 0.1 by third order Range - Kutta Method.

Part - C (3 × 10 = 30)

Answer any **three** Questions

16. Fit a straight line using the method of least squares to the following data :

x	1	2	3	4	5
y	14	27	40	55	68

Estimate the value of y when x = 6.

17. Solve the system of equations using Gauss Elimination method.

$2x_1 + 4x_2 + 2x_3 = 15.$

$2x_1 + x_2 + 2x_3 = -5$

$4x_1 + x_2 - 2x_3 = 0.$

18. From the following table of values x and f(x), determine f(0.23)

x	0.20	0.22	0.24	0.26	0.28	0.29
f(x)	1.6596	1.6698	1.6804	1.6912	1.7024	1.7139

19. Evaluate : (i) $\int_0^1 \frac{dx}{1+x}$ correct to 3 decimal places using trapezoidal rule with h = 0.125

(ii) $\int_0^{10} \frac{dx}{1+x}$ by dividing the range into eight equal parts using simpsons 1/3 rule.

20. Solve $\frac{dy}{dx} = x + y$ from x = 0 to 0.1 with h = 0.05 using Improved Euler's method under the condition $x_0 = 0$ and $y_0 = 1$.

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AF-1914 MPH 1E2

M.Sc DEGREE EXAMINATION, APRIL 2010

I Semester

PHYSICS

ELECTIVE - CRYSTAL GROWTH AND THIN FILMS

(CBCS - 2008 Onwards)

Duration : 3 Hours Maximum : 75 marks

Part - A (10 x 2 = 20)

Answer ALL Questions

1. Mention the suitability of low temperature solution growth method.
2. Mention the methods of crystallization.
3. Differentiate physical gel and chemical gel.
4. Mention the advantages of gel growth technique.
5. Give the principle of Melt growth method.
6. List the major practical factors to be considered in growing melt crystals.
7. Differentiate Thin film and Thick film.
8. Mention the different types of sputtering.
9. Mention the sources for IR Spectrophotometer.
10. Explain Hardness number.

Part-B (5 x 5 = 25)

Answer ALL Questions

11. a. Explain Miers T - C diagram.

(OR)

b. Give the criteria adopted in selection of crystallizers.

12. a. Explain the principle of gel growth.

(OR)

b. Mention the advantages of gel method.

13. a. Write notes on Growth process.

(OR)

b. Explain chemical vapour transport technique.

14. a. Explain Radio frequency sputtering technique.

(OR)

b. Write notes on Spray pyrolysis.

15. a. Explain the working of Vickers mica - hardness tester.

(OR)

b. Outline the working principle of SEM.

Part-C (3 x 10 = 30)

Answer any THREE Questions

16. Discuss the method of seed preparation, mounting and seasoning for quality crystals.

17. Describe single and double diffusion methods of growing gel crystals.

18. Discuss the Bridgman technique of growing single crystals. Write note on - Physical vapour deposition.

19. Discuss the various methods of producing vacuum.

20. Explain with a neat sketch the working of FTIR.

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M.Sc. DEGREE EXAMINATION, APRIL 2010

Second Semester

Physics

ELECTROMAGNETIC THEORY

(CBCS—2008 Onwards)

Duration : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **All** Questions

1. Starting from Coulomb's Law, Proove that div E = e/E_o and Curl E = 0.

2. Derive Poisson's equation.

3. State Biot - Savart Law.

4. Define magnetic susceptibility and permeability.

5. Write the characteristics of displacement Current.

6. Explain the principle of conservation of charge.

7. Write the equations of telegraphy ?

8. Define Snell's Law.

9. What is the significance of retarded potentials.

10. On the basis of Rayleigh scattering, explain the blue Sky.

Part - B (5 × 5 = 25)

Answer **All** Questions

11. a. Write short notes on Boundary conditions in electrostatics.

(*Or*)

b. Energy in electic field.

12. a. Derive an expression for Lorentz Force on a charged particle moving in an electromagnetic field.

(*Or*)

b. Briefly explain the magneto static boundary conditions.

13. a. Derive the integral and differential form of Faraday's Law.

(*Or*)

b. Discuss the significance of poynting Vector.

14. a. Derive an expression for the velocity of propogation of a plane electromagnetic ware in an isotropic medium.

(*Or*)

b. Deduce Brewester's Law and degree of polarisatron on the basis of electromagnetic theory.

15. Briefly explain the following.

a. Electric and magnetic dipole radiation.

(*Or*)

b. Scalar diffraction theory.

Part - C (3 × 10 = 30)

Answer any **Three** Questions

16. Prove that the potential due to an arbitrary charge distribution can be expressed as a sum of multipole potentials.

17. Derive an expression for the magnetic vector potential and magnetic induction due to a small element of a current carrying circuit at a large distance.

18. Derive Maxwell's equations in differential and integral forms and explain their physical meaning.

19. Discuss the phenomenon of total internal reflection on the basis of electromagnetic theory.

20. Deduce an expression for retarded potential and prove that the charges are stationary and currents are steady and these expressions become the solution of Poisson's equation.

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M.Sc. DEGREE EXAMINATION, APRIL 2010

Second Semester

Physics

QUANTUM MECHANICS

(CBCS—2008 Onwards)

Duration : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **All** Questions

1. What is normalisation of a wave function ?

2. Why the Schroediryer's wave equation is not valid for relativistic particles ?

3. A Proton and a deutron having the same energy penetrate a given rectangular barrier, which particle has greater depth of penetration ?

4. What do you mean by tunneling through the barrier ?

5. What do you mean by degeneracy of a system ?

6. Explain the Principle of time - dependent perturbation theory.

7. Define differential scaltering cross - section.

8. What are partial waves ?

9. What is the value of de Alembertian operator ?

10. What are Pauli's spin matrices ?

Part - B (5 × 5 = 25)

Answer **All** Questions

11. a. Outline Dirac's Bra and Kel rotations.

(*Or*)

b. Deirve Schroedinger's time dependent wave equation.

12. a. State Schroedinger's wave equation for a particle in an one dimentional closed box.

(*Or*)

b. A linear harmonic oscillator is in the first excited state

i) Where is its probability density maximum ?

ii) What is the value of maximum probability density ?

13. a. Explain WKB approximation.

(*Or*)

b. Write a note on sudden approximation.

14. a. Prove that the square of the total ansular momentum commutes with one of its components.

(*Or*)

b. What is particle exchange operator ? What are its eigen values ? Show that it is a constant of motion.

15. a. Give the energy spectrum of a free Dirac Particle and explain Pair production and Pair annihilation.

(*Or*)

b. What are Dirac matrices ?

Part - C (3 × 10 = 30)

Answer any **Three** Questions

16. What are Hermitan operators ? Give their properties.

17. Formulate Schroedinger equation for a rigid rotator. Find its eigen values and eigen functions. How are these results used to explain rotational spectrum of diatomic molecule ?

18. Discuss the first order time dependent Perturbation theory and device the Fermi-golden rule for transition rate from a given initial state to the find state of Continum..

19. What are C.G. coefficients ? Calculate the C.G. coefficients for $j_1 = j_2 = 1/2$.

20. For a Dirac particle moving in a central potential, show that the orbital angular momentum is not a constant of motion.

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AF-1917 **MPH2C3**

M.Sc. DEGREE EXAMINATION, APRIL 2010

Second Semester

Physics

SOLID STATE PHYSICS

(CBCS—2008 Onwards)

Duration : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** the Questions

1. What is a reciprocal lattice ?

2. What are point groups ?

3. Define the elastic constants for a crystal.

4. What is Phonon momentum ?

5. Define Hall-effect.

6. What is meant by bandgap ?

7. Define Hund's rule.

8. What is dielectric loss ?

9. Define Meissner effect.

10. What is flux quantization ?

Part - B

(5 × 5 = 25)

Answer **all** the Questions

11 a. Describe the crystal structure of NaCl. Explain clearly how this structure differ from that of CsCl.

(Or)

b. Discuss experimental aspects of X-ray diffraction by crystals.

12 a. How are stress and strain in a crystal analysed ?

(Or)

b. Prove that the elastic stiffness constant are symmetrical i.e. $C_{ij} = C_{ji}$

13 a. Briefly discuss the physical origin of Hall effect and mention the applications of this effect.

(Or)

b. Explain effective mass and density of states.

14 a. Explain briefly about rare earth ions.

(Or)

b. Find an expression for the dielectric constant of an ionic system.

15 a. Discuss A.C Josephson effect. Show that the current oscillates with frequency w = 2eV/h.

(Or)

b. Obtain an expression for the London Penetration depth of magnetic field for a super-conductor.

Part - C

(3 × 10 = 30)

Answer any **three** Questions

16. State and explain the properties of reciprocal lattices and show that the FCC lattice is the reciprocal of the bcc lattice and vice versa.

17. How lattice vibrations are quantized ? Describe the inelastic scattering of neutrons and phonons.

18. Discuss Kronig - Penny model for the energy band structure of solids.

19. Explain polarizability of atoms and molecules. Setup Clausius - Mossotti relation between polarizability and dielectric constant of a solid.

20. Bring out BCS theory of super conductivity.

AF-1918

MPH2E1

M.Sc. DEGREE EXAMINATION, APRIL 2010

Second Semester

Physics

Elective—MATHEMATICAL METHODS IN PHYSICS

(CBCS—2008 Onwards)

Duration : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **All** questions.

1. Define Fourier sine and cosine transforms.

2. Give any three properties of Inverse Laplace Transform.

3. Write the non-trivial solution for two dimensional Differential Heat equation.

4. Express the Laplace equation in Polar Co-ordinate systems.

5. Define Rank of a Tensor.

6. What are Covariant and Mixed Tensors ?

7. What are Reducible Irreducible representation of a Group ?

8. Define a Cyclic Group.

9. Give the Generating function of Bessel's Differential Equation.

10. Show that $P_n(1) = 1$.

Part - B $(5 \times 5 = 25)$

Answer **All** questions.

11. (a) Obtain the Complex form of Fourier series.

(*Or*)

(b) Find F(t) if its Laplace transform is $\frac{8}{(s^2+4)^2}$, using the result $L\{t \sin 2t\} = \frac{2s}{(s+4)^2}$.

12. (a) Find the potential at any point of an infinite plane sheet if the boundary conditions are as follows.

$$\left.\begin{array}{ll} V = 0, & \text{when } y = \propto \\ V = f(x), & \text{when } y = 0 \end{array}\right\}, \text{ V denotes the potential}$$

(*Or*)

(b) Solve $x^2 \frac{d^2y}{dx^2} - x\frac{dy}{dx} + y = 2\log x$.

13. (a) Prove that the Kroneckar Symbol δ_i^k is a tensor where components are the same in every Co-ordinate system.

(*Or*)

(b) If the components of a tensor are zero in one Co-ordinate system, then prove that the components are zero in all co-ordinate systems.

14. (a) Find the classes of D_3 group.

(Or)

(b) Explain Homomorphism and Isomorphism with examples.

15. (a) Show that (i) $J_{1/2}(x) = \sqrt{\frac{2}{\pi x}} \cos x$.

(ii) $\int_{-1}^{+1} p_n^2(x)\, dx = \frac{2}{2n+1}$ if $n = m$.

(Or)

(b) Show that (i) $\overline{|(1)} = 1$, (ii) $\beta_{(m,n)} = \int_0^{\infty} \frac{y^{m-1}}{(1+y)^{m+n}}$.

Part - C (3 × 10 = 30)

Answer any **Three** the questions.

16. An indicator of H henry and Capacitor C farad in series with an emf E volts. At $t = 0$, the charge on the capacitor and the current flowing this circuit are zero. Find the charge on the capacitor at any time $t > 0$ if $E = E_0$.

17. Obtain the solution for equation of the vibrating string.

18. Explain associated tensors. Show that for a rectangular system of Co-ordinates the raising and lowering of a suffix leaves the components unaltered in 3-dimensional space.

19. Construct the group table for group of symmetric operation of a square. Determine its classes.

20. Obtain the general solution for Hermite's Differential Equation.

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AF-1919 **MPH2E2**

M.Sc. DEGREE EXAMINATION, APRIL 2010

Second Semester

Physics

Elective - NANO TECHNOLOGY

(CBCS—2008 Onwards)

Duration : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** the Questions

1. List some properties which vary on reducing the size.

2. What are periods and groups in periodic table ?

3. Name some physical deposition techniques.

4. Define sputtering.

5. What are the different allotropes of Carbon ?

6. What is a self assembled Monolayer ?

7. Define Photonics.

8. What is surface plasma ?

9. What are quantum dots ?

10. What are quantum computers ?

Part - B (5 × 5 = 25)

Answer **all** the Questions

11 a. Explain how the mechanical properties vary on reducing size from bulk to nanoscale.

(Or)

b. Explain the optical properties of nanomaterials.

12 a. Explain with sketches the different Ball Milling Methods.

(Or)

b. Write a note on potential applications of nanomaterials.

13 a. Comment on mechanical, thermal, electrical and optical properties of carbon nanotubes.

(Or)

b. Write a note on future of biological nanotechnology.

14 a. Explain the applications of photonic crystals.

(Or)

b. Write notes on nanocrystal solar cells.

15 a. Explain the basis of quantum computing.

(Or)

b. What is quantum electronics ? Explain briefly quantum electronic devices.

Part - C

$(3 \times 10 = 30)$

Answer any **three** Questions

16. Explain the top-down and bottom-up approaches of nanoscale formation. Mention their advantages and disadvantages.

17. Explain with necessary sketches, any one chemical deposition technique.

18. Briefly explain biological nanostructures and their applications in information processing.

19. Explain the detail surface plasmon nanophotonics and mention its applications.

20. Decribe MEMS and its applications.

M.Sc. DEGREE EXAMINATION, APRIL 2010

Third Semester

Physics

STATISTICAL PHYSICS

(CBCS—2008 Onwards)

Duration : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **All** Questions

1. What is meant by Entropy ?
2. State the third law of thermodynamics.
3. What is meant by distribution function ?
4. What is Collision Probability ?
5. What is Phase Space ?
6. State the Liouville's theorem.
7. What is the concept of quantum Statistical Mechanics ?
8. What is Fermi energy ?
9. Give the expression for the most probable distribution in energy for the Fermi-Dirac gas.
10. What is meant by Strong degeneracy ?

Part - B (5 × 5 = 25)

Answer **All** Questions

11. a. What is meant by intrinsic energy ? Arrive at the first thermodynamic relation using the four Variables.

(*Or*)

b. Discuss briefly about the Phase transitions.

12. a. What are the assumptions made while deriving the Maxwell Boltzmann distribution law ?

(*Or*)

b. State Boltzmann's H-theorem and explain briefly.

13. a. Explain, with the necessary diagram, the Grand Canonical ensemble.

(*Or*)

b. Derive an expression for the equipartition energy.

14. a. Distinguish between classical and quantum statistics.

(*Or*)

b. Derive the Sackur-Tetrode equation.

15. a. List out the peculiar properties of Liquid Heat low temperature.

(*Or*)

b. Discuss the Phenomenon of Bose-Einstein condensation.

Part - C

(3 × 10 = 30)

Answer any **Three** Questions

16. i. Explain the Principle of degradation of energy.

    ii. Explain the concept of Entropy.

17. Give the experimental determination of mean free path with necessary diagram.

18. State and prove Lioville's theorem and hence give expression for the Principle of Conservation of density in phase space.

19. Explain with necessary equations about the Bose-Einstein Condensation.

20. Apply Bose-Einstein statistics to black body radiation problem and derive Planck's law.

AF-1921 **MPH3C2**

M.Sc. DEGREE EXAMINATION, APRIL 2010

Third Semester

Physics

NUCLEAR AND PARTICLE PHYSICS

(CBCS—2008 Onwards)

Duration : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **All** Questions.

1. Nuclei of atoms have constant density. Comment.

2. Explain the term atomic mass unit.

3. Electrons as such do not exist in the nucleus what then is the cause of β decay ?

4. What are Particle detectors ?

5. Explain the Principle of Cyclotron.

6. Why are neutrons useful as bombarding agents for nuclear reactions ?

7. What are Pions ?

8. What are quarks ?

9. What is a nuclear reaction ?

10. What are endoergic reactions ?

Part - B (5 × 5 = 25)

Answer **All** Questions.

11. a. Explain the wave mechanical properties of the nucleus

i) Statistics and

ii) Parity.

(*Or*)

b. What are magic numbers ? How does the shell model explain the existance of magic numbers ?

12. a. What do you understand by internal conversion ? How does it take place ?

(*Or*)

b. Explain the construction and working of a proportional counter.

13. a. Describe a Proton synchrotron and give its theory.

(*Or*)

b. Write a short notes on breeder reactor.

14. a. Define and explain the term differential cross-section.

(*Or*)

b. Give the theory of Compound nucleus.

15. a. Derive the Gell-mann Nishijima formula.

(*Or*)

b. Explain the CPT theorem.

Part - C (3 × 10 = 30)

Answer any **Three** Questions.

16. i. Discuss graphically the variation of average binding energy per nucleon with mass number and stability of the nucleus.

ii. Explain the terms in the semi emprical mass formula.

17. What is β decay ? Give the fermi theory of β decay.

18. What is a betatron ? Derive the betatron condition for successful acceleration of electron.

19. Derive the Breit Wigner Dispersion formula for resonance scattering.

20. What are elementary Particles ? What are the broad categories into which elementary particles are classified. Mention important elementary particle in each category and discuss their chief characteristics.

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AF-1922 **MPH3E1**

M.Sc. DEGREE EXAMINATION, APRIL 2010

Third Semester

Physics

Elective-ENERGY PHYSICS AND ENVIRONMENTAL SCIENCE

(CBCS—2008 Onwards)

Duration : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **All** questions

1. What is bio-fuel ?

2. Define energy-GDP elasticity.

3. Mention the important components of Flat plate collector.

4. What is convection ?

5. Mention any two critical properties of concentrating collector.

6. What are the basic elements of a solar water heater ?

7. Define the efficiency of a solar cell.

8. List any two major disadvantages of a solar photovoltaic system.

9. What is meant by green house effect ?

10. Explain eutrophication.

Part - B (5 × 5 = 25)

Answer **All** questions

11. (a) Explain the working of OTEC plant.

(Or)

(b) Explain the impacts of utilisation of conventional energy sources.

12. (a) Describe how solar radiations are converted into heat ?

(Or)

(b) Write a note on pyranometers.

13. (a) List down the disadvantages of solar air heater.

(Or)

(b) Explain the feasibility of a futuristic solar power plant using a satellite.

14. (a) Explain any one application of solar photovoltaic system.

(Or)

(b) Study the characteristics of a solar cell.

15. (a) Write a note on artificial air pollutants.

(Or)

(b) Describe any two water pollutants.

Part - C (3 × 10 = 30)

Answer any **Three** questions

16. Discuss various available non-conventional energy sources.

17. Discuss various thermal losses in Flat plate collector.

18. What are the advantages and disadvantages of focussing type collector over flat plate collector ? Discuss.

19. Classify and discuss solar cell based on active material used in their fabrication.

20. Detail out the effect of air pollution on human health.

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AF-1923 **MPH3E2**

M.Sc. DEGREE EXAMINATION, APRIL 2010

Third Semester

Physics

Elective-COMMUNICATION ELECTRONICS

(CBCS—2008 onwards)

Duration : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **All** questions

1. What is meant by noise temperature ?

2. Define power gain of antenna.

3. Define delta modulation.

4. What is meant by FDM ?

5. What is the advantage of the TRAPATT diode ?

6. Define doppler effect.

7. What are the requirements in selecting materials for optical fibers?

8. What is meant by signal attenuation ?

9. Define inclination .

10. List any two advantages of digital cellular systems.

Part - B (5 × 5 = 25)

Answer **All** questions

11. (a) Describe the theory of phase modulation.

(Or)

(b) Describe Bandwidth, bean width and polarisation of an antenna.

12. (a) What is pulse width modulation ? How is it demodulated ?

(Or)

(b) Explain frequency shift keying.

13. (a) Explain the term bunching.

(Or)

(b) Explain GUNN effect. With suitable sketch describe the construction and working of GUNN diode.

14. (a) How absorption is caused ? Explain any two mechanisms.

(Or)

(b) Derive the calculation for power launching.

15. (a) What are the three methods of multiple access Technologies? Compare each.

(Or)

(b) Differentiate analog cellular mobile system and digital cellular mobile system.

Part - C

(3 × 10 = 30)

Answer any **Three** questions

16. Explain any two microwave antenna.

17. Explain differential and quadra polar phase shift keying.

18. With suitable schematic diagram explain the fundamentals and operation of Reflex klystron.

19. Define fiber splicing. Explain with neat sketch about splicing techniques.

20. What are the characteristics of GSM ? With neat sketch explain the architeture of GSM.

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AF-1924

MPH3E3

M.Sc. DEGREE EXAMINATION, APRIL 2010

Third Semester

Physics

Elective-MICROPROCESSORS AND MICRO CONTROLLERS

(CBCS—2008 Onwards)

Duration : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **All** questions

1. What is a bus ? Draw the system bus of μp 8085 ?

2. How the instructions are classified in μp 8085 ?

3. Differentiate interrupt driven data transfer and DMA data transfer scheme.

4. Sketch the pin diagram of USART 8251 A.

5. What are program and data memory of 8051 ?

6. Name some special function registers (SFR) of μ^C 8051.

7. What are the various addressing modes of μ^C 8051.

8. Write the program to Add two 8 bit numbers using 8051 μc .

9. What are the characterstics of ADC ?

10. What are the advantages of seven segment display interfacing ?

Part - B $(5 \times 5 = 25)$

Answer **All** questions

11. (a) Briefly explain the time delay calculations in μp 8085.

(Or)

(b) Write a simple assembly language program to find

(i) Multiply two 8 bit numbers and.

(ii) Divide two 8 bit numbers.

12. (a) Write a short note on programmable interval timer 8253 A.

(Or)

(b) Explain briefly programmable DMA controller 8257 A.

13. (a) Discuss shortly the memory organization of μc 8051.

(Or)

(b) What are the key features of μc 8051 ?

14. (a) Describe arthimetic, logical, Jump and call instructions of 8051 with one example each.

(Or)

(b) Write an assembly language program to find the smallest and biggest number in an array.

15. (a) Explain the working of ADC (0809) interfacing with μc 8051

(Or)

(b) Give the simplified block diagram of keyboard interfacing with μc 8051

Part - C

$(3 \times 10 = 30)$

Answer any **Three** questions

16. Discuss the instruction set of microprocessor 8085 with examples.

17. With a neat diagram explain the working of programmable peripheral interface (8255A) as an interfacing device.

18. (a) Write a short note on timer/counter of μc 8051.

    (b) What are the various types of interrupts in 8051 μc.

19. (a) Discuss the different addressing modes in μc 8051 with suitable examples.

    (b) Write assembly language program to find sum of n-numbers.

20. Using the block diagram, describe a μc based.

    (a) temperature measurement system and

    (b) traffic light problem

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AF-1925 **MPH3E4**

M.Sc. DEGREE EXAMINATION, APRIL 2010

Third Semester

Physics

Elective-DIGITAL SIGNAL PROCESSING

(CBCS—2008 Onwards)

Duration : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **All** questions

1. What are the various classifications of discrete time signals ?

2. List any two advantages of DSP.

3. List the properties of Z transform.

4. Define Fourier transform.

5. What is decimation in Time algorithm ?

6. List any two properties of linear convolution.

7. Mention the most general form of the Z-transform of IIR filter.

8. Give any two properties of chebyshev filters

9. What is meant by Hardward architecture ?

10. Give an example for implied addressing mode.

Part - B (5 × 5 = 25)

Answer **All** questions

11. (a) Explain different types of signal representations.

(Or)

(b) Explain operation on signals.

12. (a) Breifly explain system function.

(Or)

(b) Derive the relation between fourier and Z-transform.

13. (a) State and prove shifting property of DFT.

(Or)

(b) Prove the commutative property of linear convolution.

14. (a) Compare IIR and FIR filters.

(Or)

(b) List the advantages of bilinear transformations.

15. (a) Write program to do simple arithmetic operations.

(Or)

(b) List various applications of DSP.

Part - C (3 × 10 = 30)

Answer any **Three** questions

16. Draw the block diagram of DSP and briefly explain blocks. List the advantages, disadvantages and applications of DSP.

17. Explain any five properties of Z-transform.

18. Discuss various properties of FFT.

19. Write the design procedure for low pass digital chebyshev IIR filter.

20. Explain the DSP based Radar signal processing.

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AF-1926 **MPH4C1**

M.Sc. DEGREE EXAMINATION, APRIL 2010

Fourth Semester

Physics

ATOMIC AND MOLECULAR PHYSICS

(CBCS—2008 Onwards)

Duration : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **All** the questions.

1. Write about two electron systems.

2. Give the statement of Hund's rule.

3. What is Zeeman effect ?

4. What is called as Born-Oppenheimer approximation ?

5. What are the basic components of an infrared spectrometer ?

6. Give the microwave wavelength region in the electromagnetic spectrum.

7. What is meant by Raman shift ?

8. What is known as dissociation energy ?

9. What is meant by the term chemical shift ?

10. Give the basic principles of ESR spectroscopy.

Part - B (5 × 5 = 25)

Answer **All** the questions.

11. (a) Describe hydrogen atom spectrum.

(*Or*)

(b) What is meant by equivalent electrons ?

12. (a) Briefly explain the Huckel's molecular approximation.

(*Or*)

(b) Write brief notes on bonding and antibonding Mo's.

13. (a) Explain the Rotational spectra of diatomic molecules.

(*Or*)

(b) Write short notes on characteristic and group frequencies.

14. (a) Explain the origin of Stoke's and anti-Stoke's lines in Raman effect.

(*Or*)

(b) Explain the Franck-Condon principle.

15. (a) Write down the basic principles of NMR spectoscopy.

(*Or*)

(b) Write down the biological applications.

Part - C (3 × 10 = 30)

Answer any **Three** questions.

16. Discuss the following :-

(a) Periodic table.

(b) Alkali type spectra.

17. Explain covalent, ionic and van der Wall's interactions.

18. Write detailed notes on diatomic vibrating rotator.

19. Give the detailed notes on Rotational fine structure of electronic vibration transitions.

20. Describe the experimental setup for studying NMR.

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AF-1927 **MPH4E1**

M.Sc. DEGREE EXAMINATION, APRIL 2010

Fourth Semester

Physics

Elective-MEDICAL PHYSICS

(CBCS—2008 Onwards)

Duration : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **All** the questions.

1. What are the units in which airways resistance is measured ?

2. What is the effect of passing a DC current through tissue ?

3. What are ultrasonic waves ?

4. At about what frequency is the ear most sensitive ?

5. What is the approximate energy (in eV) of UV radiation ? Are micrawaves more or less energetic than UV ?

6. For what colour has the eye the best sensitivity ?

7. Could an X ray tube be used to produce a 3 MeV treatment beam?

8. Define Radiotherapy.

9. How does the resistance to blood flow depend upon the effective diameter of a blood vessel ?

10. What is the approximate ratio of arterial systolic pressure to body height ?

Part - B (5× 5 = 25)

Answer **All** the questions.

11. (a) Explain the role of surfactant in the functioning of the Alveoli.

Or

(b) Does tissue conduct electricity in a similar way to electrons in a metal ? Explain.

12. (a) Give the general properties of sound.

Or

(b) What are hearing defects ? How do they overcome ?

13. (a) List the applications of Lasers in the field of medicine.

Or

(b) What are optical illusions ? Explain.

14. (a) What are X rays ? Describe the construction and working of a Coolidge tube.

Or

(b) How is brachythearpy carried out ? Explain.

15. (a) State and explain Bernoulli's principle.

Or

(b) Describe the functioning of a Defibrillation.

Part - C (3 × 10 = 30)

Answer any **Three** questions.

16. Using a block diagram explain the functioning of respiratory system.

17. Describe Anatomy and physiology of the ear.

18. What is meant by chromatic aberration ? How does it overcome in opthalmology ?

19. How accurately does a radiotherapy dose have to be specified? What criteria would you use to select suitable isotope sources for radiotherapy and for radionuclide imaging?

20. What are pacemakers ? Using a block diagram explain the functioning of a pacemaker.

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AF-1910 **MPH1C1**

M.Sc. DEGREE EXAMINATION, APRIL 2010

First Semester

Physics

MATHEMATICAL PHYSICS

(CBCS—2008 Onwards)

Duration : 3 Hours Maximum : 75 Marks

Section - A (10 × 2 = 20)

Answer **All** questions

1. Define Divergence of a vector.

2. State Gauss divergence theorem.

3. Show that the set of polynomials $(2+x, x^3-2x, 4+x^3)$ is linearly dependent.

4. Prove that the modules of each eigenvalue of a Unitary matrix is Unity.

5. Write the Sturn-Liouville differential equation and its boundary conditions.

6. State the importance of Frobonius method.

7. State Cauchy's Integral theorm.

8. Determine the poles and residues of $f(z) = \frac{z^2}{(z-1)^2}$

9. Define Fourier Series.

10. What are even and odd functions ?

Section - B $(5 \times 5 = 25)$

Answer **All** questions

11 a. Show that the vector field given by $\vec{F} = (\sin y + z)\hat{i} + (x \cos y - z)$ $j + (x - y)\, k$ is irrotational and obtain its scalar potential.

(*Or*)

b. Show that div grad $\phi = \nabla^2 \phi$

12 a. Prove that any subject of a set of linearly independent vectors is linearly independent.

(*Or*)

b. Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 3 & 1 & -7 & 9 \\ 2 & -1 & -10 & 5 \end{bmatrix}$

13 a. Solve the differential equation $x^2\frac{\partial^2\psi}{\partial x^2} + 2x\frac{\partial\psi}{\partial x} = x^2$, $0 \leq x \leq 1$ with the boundary conditions that $\psi(1) + \psi'(1) = 0$ and $\psi(0)$ is finite.

(*Or*)

b. Solve the differential equation $\frac{d^2y}{dz^2} - 2\frac{dy}{dz} + y = 2z$.

14 a. Obtain the Cauchy - Riemann conditions.

(*Or*)

b. State and prove Cauchy's residue theorem.

15 a. Obtain the Fourier series for

$$f(x) = \begin{cases} 0 & \text{when } -\pi \leq x \leq 0 \\ x & \text{when } 0 \leq x \leq \pi \end{cases}$$

(*Or*)

b. Obtain the fourier series for $f(x) = x^2$ in the interval $-\pi \leq x \leq \pi$.

Section - C $(3 \times 10 = 30)$

Answer any **Three** questions

16. State and Prove Green's Theorem.

17. Show that the matrix $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ satisfies Cayley - Hamilton theorm and find its inverse.

18. Obtain the solution of Sturn Liouville Differential equation.

19. Evaluate $\int_0^{\infty} \frac{\sin x}{x} dx$

20. Find a series of sines and cosines which represents $x + x^2$ in the interval $-\pi \leq x \leq \pi$.

    Deduce that $\frac{\pi^2}{6} = \sum_{n=1}^{\infty} \frac{1}{n^2} = 1 + \frac{1}{2^2} + \frac{1}{3^2} + \ldots$

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