AF-2788 MPH1C1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

First Semester

Physics

MATHEMATICAL PHYSICS

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** questions.

1. Define gradient of a Scalar field.

2. State Gauss theorem.

3. Define Linear dependence of vectors.

4. Find the inner product of the vectors (1, 2, 3) and (3, –5, 6).

5. State Cayley-Hamilton's theorem.

6. List the methods to compute the inverse of a matrix.

7. Give the significance of Frobenius method.

8. State Cauchy's Integral theorem.

9. Find the Residues of $f(z) = \frac{z}{(z-1)(z-2)}$ at its poles.

10. Define Fourier Cosine series.

Part - B (5 × 5 = 25)

Answer **all** questions.

11. (a) Find grad div $\vec{F}$ and Curl $\vec{F}$ at (1, 0, 1) where $\vec{F} = 3xyz^2 \hat{i} + 4x^3 y\hat{j} - xy^2 z\hat{k}$.

(*Or*)

(b) Find the total work done in moving a particle in a force field given by $F = 2xy\hat{i} + 3x\hat{j} + 5z\hat{k}$ along the space curve $x = t$, $y = t^2 + 1$, $z = 2t^2$ from $t = 0$ to $t = 1$.

12. (a) State and prove Gram - Schmidt orthogonalisation process.

(*Or*)

(b) Show that the Eigen values of a Hermitian matrix are real and its eigen vectors corresponding to two distinct eigen values are orthogonal.

13. (a) Solve : $x \frac{dy}{dx} - 2y = 2x.$

(*Or*)

(b) Solve $x^2 \frac{d^2y}{dx^2} - (x^2 + 2x)\frac{dy}{dx} + (x + 2)y = x^3 e^x.$

14. (a) Derive the necessary conditions for Cauchy's Riemann differential equation.

(*Or*)

(b) State and derive Laurent's expansion.

15. (a) Derive the complex form of fourier series.

(*Or*)

(b) Develop Fourier series for $f(x) = x$ such that $-\pi < x < \pi$.

Part - C (3 × 10 = 30)

Answer any **three** questions.

16. State and prove Green's theorem.

17. State and prove Cayley-Hamilton theorem, Use it to find the inverse of $\begin{bmatrix} 5 & 3 \\ 3 & 2 \end{bmatrix}$.

18. Obtain the solution of Strum–Liouville differential equation.

19. Show that $\int_0^{\alpha} \frac{\sin mx}{x}\, dx = \pi/2$.

20. Expand $f(x)$ as a fourier series where $f(x) = -\pi$, if $-\pi < x < 0 = x$ if $0 \le x \le \pi$. Also show that $\pi^2/8 = 1 + \frac{1}{3^2} + \frac{1}{5^2} + \ldots$.

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AF-2789 **MPH1C2**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

First Semester

Physics

CLASSICAL DYNAMICS AND RELATIVITY

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** the questions.

1. State Hamilton's principle.

2. What is meant by constrained motion?

3. What are the two main features of the motion of a particle under the action of a central force?

4. State Kepler's first law of Planetary Motion.

5. What is meant by Spin type of motion?

6. Define Wave Packet.

7. What is Canonical transformation?

8. Define Lagrange's bracket.

9. What is Minkowski space?

10. What are the conditions for the Lorentz transformation?

Part - B (5 × 5 = 25)

Answer **all** the questions.

11. (a) Discuss about the holonomic and non-holonomic constraints.

Or

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

12. (a) Discuss about the differential scattering cross - section with necessary diagram.

Or

(b) Deduce an expression for Virial theorem.

13. (a) What are normal modes of vibrations? Explain briefly.

Or

(b) Discuss briefly about the Group velocity and Phase velocity in wave mechanics.

14. (a) Show that the Poisson brackets are invariable under Canonical transformation.

Or

(b) Give the solution of harmonic oscillator problem by Action angle variable method.

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

Or

(b) Explain briefly about the postulates of special theory of relativity.

Part - C (3 × 10 = 30)

Attempt 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 is meant by Euler angle? Derive the Euler's equation of motion for a rigid body.

19. State and prove the principle of least action.

20. What are four vectors? Find the components of the momentum four vectors and derive the law of variation of mass with velocity.

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AF-2790 **MPH1C3**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

First Semester

Physics

ELECTRONICS

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** questions.

1. Explain the Einstein's relationship for a semiconductor.

2. Give some applications of the LED.

3. Mention the difference between SCR and Triac.

4. Draw the circuit symbol for depletion type MOSFET.

5. Define the term 'Common-mode Rejection Ratio".

6. Sketch the Gain versus Frequency curves for a Notch-filter.

7. What is meant by linearity error in case of a ADC?

8. Define resolution in A/D converter.

9. Explain Masking and Etching process.

10. Draw the functional block diagram of 8-pin IC555 timer.

Part - B (5 × 5 = 25)

Answer **all** questions

11. (a) What is a PN Junction? Explain the formation of depletion layer in a PN Junction?

Or

(b) Explain the working of a photodiode. Give its applications.

12. (a) Bring out a neat comparison between JFET and MOSFET.

Or

(b) Explain the construction and working of a Diac.

13. Write a short note on:

(a) Inverting amplifier

Or

(b) Band-pass filter

14. (a) Draw the circuit diagram and explain the Op-Amp based Wein bridge oscillator.

Or

(b) Briefly discuss Dual scope ADC.

15. (a) Explain the basic process of IC Fabrication.

Or

(b) Describe the steps involved in the fabrication of monolithic capacitors.

Part - C (3 × 10 = 30)

Answer any **three** questions.

16. Briefly explain the working of a

    (a) Schottky diode

    (b) Gunn diode

17. With a neat diagram, discuss the construction, working, characteristics and applications of SCR.

18. Explain:

    (a) Summing Amplifier

    (b) Differential amplifier with the help of circuit diagram and derive the equation for output voltage.

19. Draw the circuit diagram and explain the principle operation of following DAC:-

(a) Weighted resistor

(b) R-2R ladder method

20. Briefly discuss the working of the IC555 timer as a Monostable and Astable multivibrator.

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AF-2791 MPH1E1

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

First Semester

Physics

Elective—NUMERICAL METHODS

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** questions.

1. Define Error.

2. Write down the normal equations in the case of fitting a parabola $y = ax^2 + bx + c$.

3. State Newton Raphson formula for integration.

4. State the condition for convergence of Gauss - Seidel method.

5. State Gauss. forward interpolation formula.

6. Give the relation between dividend differences and forward differences.

7. Define trapezoidal rule.

8. Give the order of the error in trapezoidal rule.

9. Using Euler's method find y (0.1) given $y' = -y,\ y(0) = 1$.

10. Write down the algorithm of Fourth order Runge-Kutta method.

Part - B (5 × 5 = 25)

Answer **all** questions.

11 (a) Evaluate the constants by the method of averages (to fit a straight line).

(*Or*)

(b) Explain the principle of least squares.

12. (a) Show that the Newton-Raphson method converges to solution quadratically.

(*Or*)

(b) Solve the system by Gauss-Elimination methods

$$2x + 3y - z = 5$$

$$4x + 4y - 3z = 3$$

$$2x - 3y + 2z = 2$$

13 (a) Using Linear interpolation, find y at $x = 0.5$, $x = 0.75$ given the following table :

x	:	0	1	2	5
y	:	2	3	12	147

(*Or*)

(b) Write the C program for Lagrange interpolation.

14 (a) Compute the derivatives by Newton Backward difference formula

(*Or*)

(b) Evaluate $\int_0^1 \frac{dx}{1+x^2}$, using Trapezoidal rule with $h = 0.2$, Hence determine the value of π .

15 (a) Solve $\frac{dy}{dx} = x + y$ from $x = 0$ to 0.1 with $h = 0.5$ using Euler's method under the condition $x_0 = 0$ and $y_0 = 1$.

(*Or*)

(b) Obtain the values of y at $x = 0.1, 0.2$ using Runge-Kutta method of second order for $\frac{dy}{dx} = x - y$, given $y(0) = 1$.

Part - C (3 × 10 = 30)

Answer any **three** questions.

16. Fit a curve of the form $y = ab^*$ to the data :

x	1	2	3	4	5	6
y	151	100	61	50	20	8

17. Solve by Gauss - Seidel method, the following system.

$$28x + 4y - z = 32$$

$$2x + 17y + 4z = 35$$

$$x + 3y + 10z = 24$$

18. Find the value of y at $x = 21$ and $x = 28$ from the following data :

x	:	20	23	26	29
y	:	0.3420	0.3907	0.04384	0.4848

19. Evaluate $I = \int_0^1 \frac{1}{1+x}$. Correct to three decimal places.

Solve this example by both the trapezoidal and Simpson's rules with h= 0.05, 0.25 and 0.125 respectively.

20. Using Euler's method solve numerically the equation $y' = x + y, y(0) = 1, \text{for } x = 0, 0.2, 1.0$

Check your answer with the exact solution.

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AF-2792 **MPH1E2**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

First Semester

Physics

Elective — CRYSTAL GROWTH AND THIN FILMS

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** questions.

1. What are the characteristics of a solvent?

2. Draw the eutectic phase diagram.

3. What is the principle of gel growth?

4. Mention the types of gel.

5. Which factors affect the crystal growth from melt?

6. How do you classify crystal growth from vapour method?

7. Define sputter yield.

8. What do you mean by pyrolysis?

9. What is the principle of EDX?

10. What is meant by back scattered electrons?

Part - B (5 × 5 = 25)

Answer **all** questions.

11. (a) Write a note on Mier-TC diagram.

Or

(b) Explain solubility and super solubility.

12. (a) Explain double diffusion method.

Or

(b) Explain the structure of gel.

13. (a) Write a note on Czochralski technique.

Or

(b) Mention the advantages and limitations of Chemical vapour deposition technique.

14. (a) Write a note on Flash evaporation.

Or

(b) Write a note on transport conduction oxides.

15. (a) State the principle of Atomic absorption spectroscopy and mention its advantages.

Or

(b) Write a note on SEM.

Part - C (3 × 10 = 30)

Attempt any **three** questions.

16. Discuss about various Seed preparation techniques and Crystal mounting methods.

17. Write notes on :

(a) Single Diffusion Method

(b) Chemical Reaction Method

18. (a) Explain Bridgmann technique in detail.

(b) Mention the advantages of crystal pulling.

19. Explain with necessary diagram, electron beam method for deposition of metals.

20. Discuss in detail the principle, working and applications of XRD.

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AF-2793 **MPH2C1**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

Second Semester

Physics

ELECTROMAGNETIC THEORY

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** questions.

1. State Gauss's theorem.

2. Define Conservation of charge.

3. Explain Biot-Savart law.

4. Write short note on Magnetic susceptibility.

5. State Faraday's Laws of electromagnetic induction.

6. Explain the physical significance of Maxwell's First equation.

7. Define law of Reflection and Frequency.

8. What are the uses of the phenomenon of total internal reflection?

9. Explain the terms monopole, dipole and quadrupole.

10. Define total scattering cross-section.

Part - B (5 × 5 = 25)

Answer **all** questions.

11. (a) Explain multipole expansion of electric fields.

Or

(b) Show that energy density in an electrostatic field is given as

$$U = \frac{1}{2} D.E$$

12. (a) Derive an equation for Lorentz Force on a charged particle moving in an electromagnetic filed.

Or

(b) Prove that magnetic field of a Toroid is zero at all points except within the core.

13. (a) Derive the modified form of Ampere's law and also explain the term displacement current.

Or

(b) Derive and discuss about Lorentz gauge.

14. (a) Briefly discuss the propagation of plane electromagnetic waves in free space.

Or

(b) Explain frequency dispersion characteristics of dielectrics and plasmas.

15. (a) Write a note on Jetimenko's Equation

Or

(b) Write a note on Vector Diffraction Theory

Part - C (3 × 10 = 30)

Attempt any **three** questions.

16. What is an electrical image? A point charge is situated near an infinite plane earthed conductor. Calculate:

(a) Surface charge density induced on the plane.

(b) The force between the plane and the charge.

17. State and prove Ampere's circuital law in circuital form.

18. Obtain the boundary conditions satisfied by the electromagnetic field vectors E, D, B and H on the plane interface between two media.

19. Briefly discuss about the propagation of plane electromagnetic waves in a conducting medium.

20. Prove that the total power radiated by an oscillating dipole is proportional to the fourth power of frequency.

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AF-2794 **MPH2C2**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

Second Semester

Physics

QUANTUM MECHANICS

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** questions.

1. State Heisenberg's Uncertainity principle.

2. State the postulates of wave mechanics.

3. What do you mean by tunneling through a barrier ?

4. Define Density of states.

5. What do you mean by Zeeman effect ?

6. What is the principle of perturbation theory ?

7. Define Total scattering cross section.

8. State two properties of diagonal matrix.

9. Write down the salient features of K.G. equations.

10. State any two properties of Dirac matrices.

Part - B (5 × 5 = 25)

Answer **all** the questions.

11. (a) Explain how wave function is interpreted.

(*Or*)

(b) Explain any two properties of Hermitian operator.

12. (a) Solve the Schröedinger wave equation for a rigid rotator with free axis.

(*Or*)

(b) Solve the radial equation for hydrogen atom.

13. (a) What are the advantages of variation method over perturbation method ?

(*Or*)

(b) Write a note on sudden approximation.

14. (a) Find the eigenvalues of J_+ and J_-.

(*Or*)

(b) Write a note on partial wave analysis.

15. (a) Write a note on Zitterbewegnug.

(*Or*)

(b) Explain charge and current densities.

Part - C (3 × 10 = 30)

Answer any **three** questions.

16. State and prove Ernfest theorem.

17. Solve and Schröedinger wave equation for a three dimentional harmonic oscillator and obtain its eigen functions and eigenvalues.

18. Give the stationary state perturbation theory for a non degenerate case. Calculate the first order correction to eigenenergy and eigenfunction.

19. Explain the commutation relations of J^2, J_+ and J_-.

20. Obtain KG equation for a charged particle in an electro magnetic field and discuss.

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AF-2795 **MPH2C3**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

Second Semester

Physics

SOLID STATE PHYSICS

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** the questions.

1. Define Linear lattice.

2. What is called a non-primitive (or) multiple cell ?

3. Define Lattice Site ?

4. State Hooke's law.

5. What is an extrinsic Semiconductor ?

6. Define Fermi level.

7. What is Paramagnetism ?

8. What are ferroelectric Substances ?

9. What is Super conductivity ?

10. What is Meissner effect ?

Part - B (5 × 5 = 25)

Answer **all** the questions.

11. (a) Explain the Bravais Lattices in two dimensions.

(*Or*)

(b) Explain in detail the Crystal Structure of

(i) Diamond and

(ii) Cs chloride with necessary diagram.

12. (a) Define the elastic constants for a Crystal ? Prove that the elastic stiffness constants are Symmetrical.

(*Or*)

(b) Obtain the Vibrational Spectrum of a linear diatomic lattice and show that the Spectrum Consists of two branches.

13. (a) Give the salient features of the band structure of Ge and Si.

(*Or*)

(b) Explain the Block functions and theorem.

14. (a) Explain the nature of diamagnetic Solids and Set up an expression for their Susceptibility.

(*Or*)

(b) Find an expression for the dielectric constants of an ionic System.

15. (a) Write brief report an Type I and Type II Super conductors.

(*Or*)

(b) Discuss the finite band gap between Super conducting and Normal states of electrons.

Part - C (3 × 10 = 30)

Answer any **three** questions.

16. (a) Calculate Madelung Constant for Ionic crystals.

(b) Calculate binding energy of NaCl Crystal.

17. Solve the equations governing the propagation of elastic waves for a Solid Possessing Cubic Symmetry when the propagation direction is [110]. What is the importance of waves propagating in this direction ?

18. Discuss De Hass Alphen effect.

19. Explain Polarizability of atoms and molecules. Discuss what are its sources.

20. Discuss briefly the BCS ground State of Super conductors.

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AF-2796 **MPH2E1**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

Second Semester

Physics

Elective—MATHEMATICAL METHODS IN PHYSICS

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** questions.

1. Define Fourier sine transform

2. State Convolution theorem.

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

4. Give the solution of two dimensional Laplace equation.

5. Show that the velocity of a fluid at any point is a contravariant vector of rank one

6. What are symmetric and antisymmetric Tensors.

7. Define Point groups.

8. What are symmetry elements ?

9. Give the orthogonality relations of Legendre's polynomial.

10. Define Gamma function.

Part - B (5 × 5 = 25)

Answer **all** questions.

11. (a) Obtain the Fourier series for

$$f(x) = \begin{cases} 0 & \text{when} \quad -\pi \, x \le 0 \\ x & \text{when} \quad 0 \le x < \pi \end{cases}$$

Or

(b) Find $L^{-1}\left\{\frac{1}{(s+1)(s+2)}\right\}$

12. (a) Solve $\frac{d^2y}{dx^2} - y = x \sin x + (Hx^2)\, e^x$.

Or

(b) Solve $\frac{d^2y}{dx^2} + \frac{2}{x}\frac{dy}{dx} + \frac{a^4}{x^4} y = 0$.

13. (a) If A_i are the components of an absolute contravariant (or) tensor rank one, show that $\frac{\partial A^i}{\partial x_j}$ are the components of a mixed tensor.

Or

(b) Define rank of a tensor. Show that piezo electricity is represented by a tensor of rank 3.

14. (a) State and prove orthogonality theorem for irreducible representation.

Or

(b) Prove that the order of a subgroup of a finite group is a divisor of the order of the group.

15. (a) Obtain the generating function for $P_n(x)$.

Or

(b) Show that

(i) $\lceil(n+1) = n \lceil(n)$

(ii) $\lceil(n+1) = n!$

Part - C

(3 × 10 = 30)

Answer any **three** questions.

16. Solve $\frac{d^2x}{dt^2} + \frac{3dx}{dt} + 2x = 0$ with $x_0 = x_1 = 0$.

17. Obtain the solution of two dimensional wave equation.

18. Show that the array T = $\begin{pmatrix} -xy & -y^2 \\ x^2 & xy \end{pmatrix}$ is a second rank tensor while the array $\begin{pmatrix} -xy & -y^2 \\ x^2 & -xy \end{pmatrix}$

19. Work out the character tables of C_2V and C_3V point groups.

20. Obtain the solution for Legendre's differential equation.

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AF-2797 **MPH2E2**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

Second Semester

Physics

Elective—NANOTECHNOLOGY

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** the questions.

1. How does atomic size vary in a periodic table ?

2. What are called assemblers ?

3. What is fumed silica ?

4. What is flame ionisation ?

5. What are the different allotropes of carbon ?

6. Mention the functions of lipids.

7. What are optoelectronic devices ?

8. What are surface plasmons ?

9. State Moore's law.

10. What are the major advantages of MEMS ?

Part - B (5 × 5 = 25)

Answer **all** the questions.

11. (a) Explain how elemental properties vary along periods and groups in the periodic table.

(*Or*)

(b) Define surface to bulk ratio. Explain how it affects the properties of nanomaterials.

12. (a) Explain the nanofabrication by Electrodeposition.

(*Or*)

(b) Explain any two Ball milling methods.

13. (a) Discuss how the carbon nanotubes can be purified.

(*Or*)

(b) Briefly explain the function of lipids as templates for the formation of nanomaterials.

14. (a) What is nanophotonics ? Explain their potential applications.

(*Or*)

(b) Explain the low cost energy efficient nanostructures and their applications.

15. (a) Explain briefly how a carbon nanotube can function as transistor.

(*Or*)

(b) Write a note on quantum computation.

Part - C (3 × 10 = 30)

Answer any **three** questions.

16. Explain the significance of arrangement of elements in the periodic table.

17. Explain Sol-gel synthesis of nanomaterials.

18. Explain the different types of nanotubes, their properties and applications.

19. Mention the optical properties of materials at the nanoscale and give their applications.

20. Describe micro and nanofabrication by Optical lithography.

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AF-2798 **MPH3C1**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

Third Semester

Physics

STATISTICAL PHYSICS

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** questions.

1. State Second Law of Thermodynamics.

2. Write down the condition for reversibility of any heat process.

3. State any *two* postulates of Kinetic theory.

4. What is the effect of pressure on viscosity ?

5. Define phase space and phase point.

6. Give the condition for statistical equilibrium.

7. State the postulates of quantum mechanics.

8. What is the entropy of Bose Einstein gas ?

9. Define specific heat.

10. Mention any two draw backs of Debye's theory.

Part - B (5 × 5 = 25)

Answer **all** questions.

11. (a) Write a note on phase transition.

(*Or*)

(b) State and prove the principle of increase of entropy.

12. (a) Discuss the validity of Bollzmann transport equation.

(*Or*)

(b) Write a note on hydro dynamics.

13. (a) Prove the principle of conservation of extension in phase space.

(*Or*)

(b) Briefly discuss the principle of equipartition energy.

14. (a) Write a note on Bose-Einstein distribution.

(*Or*)

(b) Write a note on electron gas.

15. (a) Write a note on blackbody radiation.

(*Or*)

(b) List down the properties of ideal Fermi gas.

Part - C (3 × 10 = 30)

Answer any **three** of the questions.

16. What is Helmholtz function ? Show that it represents the free energy of the system in reversible isothermal process or the energy available for work.

17. Briefly explain the term mean tree path.

18. Write notes on canonical and grand canonical ensemble.

19. Explain Fermi-Dirac statistics in detail.

20. Explain in detail, Pauli's theory of paramagnetism.

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AF-2799 **MPH3C2**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

Third Semester

Physics

NUCLEAR AND PARTICLE PHYSICS

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** questions.

1. What are Non-central forces ?

2. What do you mean by spin independence of nuclear forces ?

3. State the basic principle of particle detector.

4. Give the properties of α-particles.

5. Explain the principle of Cyclotron.

6. Explain 'Pinch effect' in nuclear fusion.

7. What is stripping reaction ?

8. Explain radioactive capture with example.

9. Define Charge Conjugation.

10. What are quarks ?

Part - B (5 × 5 = 25)

Answer **all** the questions.

11. (a) Write down Semi-empirical mass formula and explain the terms involved.

(*Or*)

(b) What are magic numbers ? State the reason why they called so ?

12. (a) Explain the working principle of an Ionization Chamber.

(*Or*)

(b) Explain the phenomenon of internal Conversion.

13. (a) Write a short note on breeder reactor.

(*Or*)

(b) Derive four factor formula for a thermal nuclear reactor.

14. (a) Write and explain Wigner's dispersion formula.

(*Or*)

(b) Explain any five kinds of nuclear reactions with example.

15. (a) What are strange particles ? What strangenesis they possess ?

(*Or*)

(b) Discuss various types of interactions involved in elementary particles.

Part - C (3 × 10 = 30)

Answer any **three** questions.

16. Give the theory of deuteron and obtain its ground state.

17. Discuss Fermi's theory of β-decay.

18. Give the Bohr-Wheeler's theory of nuclear fission process.

19. What do you understand by the term excitation energy of the compound nucleus ? Obtain an expression for excitation energy.

20. (a) How are the elementary particles classified on the basis of their mass and interaction.

(b) Explain CP violation in neutral K-meson decay.

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AF-2800 **MPH3E1**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

Third Semester

Physics

Elective—ENERGY PHYSICS AND ENVIRONMENTAL SCIENCE

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** questions.

1. What are the constituents of Bio-gas ?

2. Expand the term OTEC.

3. Define Solar constant.

4. Distinguish heat Convection from Conduction.

5. What are the basic components of Solar air heaters ?

6. What are concentrators ?

7. State the principle of SPV.

8. Give any two applications of Solar cells.

9. Differentiate Contaminants from Pollutants.

10. Name the control devices that can be used for controlling water pollution.

Part - B (5 × 5 = 25)

Answer **all** the questions.

11. (a) Write a note on nuclear energy.

(*Or*)

(b) Give the status of solar energy utilization in India.

12. (a) Derive an expression for overall loss coefficient.

(*Or*)

(b) What are Pyrometers ? Explain.

13. (a) What are the advantages and drawbacks of Solar water heaters ?

(*Or*)

(b) Give the theory of concentrating collector.

14. (a) Explain the characteristics of solar cells.

(*Or*)

(b) Give the applications of SPV.

15. (a) What are the sources of water and air pollution ?

(*Or*)

(b) Discuss the role of Control devices in air pollution.

Part - C (3 × 10 = 30)

Answer any **three** questions.

16. Write an essay on Renewable energy sources.

17. Using Pyroheliometer, arrive an expression for Solar Constant.

18. Describe the functioning of Evacuated tube Collector.

19. Give the basic principle and working of a Fuel cell.

20. Water we drink, air we breathe, all are being contaminated because of rapid industrialization and urbanization.—Comment.

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AF-2801 **MPH3E2**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

Third Semester

Physics

Elective—COMMUNICATION ELECTRONICS

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** questions.

1. Define Modulation.

2. Write any one difference between Internal and External noise.

3. Define PAM.

4. Define Error control coding.

5. What are the characteristics of Gunn diode ?

6. Define CW radar ?

7. Write the sources to fiber launching.

8. What are the general signal degradation of fibers ?

9. Define Eclipses.

10. What are the cellular standards ?

Part - B (5 × 5 = 25)

Answer **all** the questions.

11. (a) Discuss the terms Noise and Noise temperature.

(*Or*)

(b) Write a short note on Antennas.

12. (a) Write the theory of pulse width modulation.

(*Or*)

(b) What is frequency shift keying ? Give details.

13. (a) How will you generate the microwaves ? List the methods.

(*Or*)

(b) Write briefly multicavity Klystron.

14. (a) What is power launching in communication ?

(*Or*)

(b) Write a note on general optical communication systems.

15. (a) Write a note on satellite links.

(*Or*)

(b) Give the concept of Cellular.

Part - C (3 × 10 = 30)

Answer any **three** questions.

16. Give the theory and explain.

    (a) Amplitude modulation

    (b) Frequency modulation and

    (c) Resonant, Non resonant antenna.

17. Discuss the following in detail :—

    (a) Frequency shift keying.

    (b) Amplitude shift keying

    (c) Differential and quadrapolar phase shift keying.

18. Describe how the microwaves and detected by using IMPATT and TRAPATT.

19. Define Fiber optics. What are the different types of fibers and how the power launching and coupling are performed ?

20. Explain how modulation takes place in GSM and in CDMA and also write the principle of Telemetry.

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AF-2802 **MPH3E3**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

Third Semester

Physics

Elective—MICROPROCESSORS AND MICRO CONTROLLERS

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** questions.

1. Why is the data bus - bidirectional ?

2. Specify the two 8085 signals that are used to latch data in an output port.

3. Define Simplex and Duplex transmission.

4. What is baud rate ?

5. What are the contents of Program Counter (PC) upon RESET of the 8051 μC ?

6. What happens if a higher priority interrupt is activated while the 8051 is serving a lower priority interrupt ?

7. Which parts of the 8051 are bit addressable ?

8. List the addressing modes of 8051 μC ?

9. List the key press mechanisms.

10. In LCD interfacing, which pin is used to recognise information at the data pins as data ?

Part - B (5 × 5 = 25)

Answer **all** questions.

11. (a) Write a note on any two addressing modes of 8085 μP.

(*Or*)

(b) Write a program to add, sub, multiply and divide any two 8-bit numbers using 8085 μP.

12. (a) Briefly explain Synchronous and Asynchronous data transfer schemes.

(*Or*)

(b) Write a note on DMA controller 8257A.

13. (a) Compare microprocessor and microcontroller.

(*Or*)

(b) Briefly explain the data memory of 8051 μC.

14. (a) Explain the data transfer instructions with suitable examples.

(*Or*)

(b) Write a program to find sum of 'N' numbers using 8051 μC.

15. (a) Write a note on A/D converter interfacing using 8051 μC.

(*Or*)

(b) Briefly explain how pulse measurement in done using 8051 μC.

Part - C (3 × 10 = 30)

Answer any **three** questions.

16. Draw the block diagram of 8085 μP and explain its architecture.

17. Explain the operation of 8255 A PPI.

18. Explain the function of counters and timers of 8051 μC.

19. Write an assembly language program to find biggest and smallest numbers in an array.

20. Explain the stepper motor interfacing with suitable diagrams.

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AF-2803 **MPH3E4**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

Third Semester

Physics

Elective—DIGITAL SIGNAL PROCESSING

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** questions.

1. Define various classifications of signals.

2. Define Sample and Hold.

3. List the properties of Z-transform.

4. Define Transfer function.

5. List the properties of FFT.

6. Write the formula to find IDFT.

7. List the different types of FIR filters.

8. Give the features of IIR filters.

9. Define Hardward architecture.

10. List various types of addressing modes in DSP.

Part - B (5 × 5 = 25)

Answer **all** questions.

11. (a) Explain the advantages of DSP.

(*Or*)

(b) Explain various types of representations of discrete time signal.

12. (a) Write a note on ROC of Z-transform.

(*Or*)

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

13. (a) Discuss the properties of DFT.

(*Or*)

(b) Compare Linear convolution with Circular convolution.

14. (a) Compare IIR and FIR digital filters.

(*Or*)

(b) Write a note on bilinear transformation.

15. (a) Write a note on analog interface circuit.

(*Or*)

(b) Write a note on memory addressing.

Part - C (3 × 10 = 30)

Answer any **three** questions.

16. Explain the various classification of discrete time system.

17. Explain various properties of Z-transform.

18. Explain Decimation in Time and Decimation in frequency algorithm.

19. Write the design procedure of digital filter through impulse invariant method.

20. Explain the instruction set of DSP with example.

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AF-2804 **MPH4C1**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

Fourth Semester

Physics

ATOMIC AND MOLECULAR PHYSICS

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** questions.

1. Define Degeneracy of a system.

2. What are symmetric and antisymmetric wave functions ?

3. What is Stark effect ?

4. How does covalent bond differ from ionic bond ?

5. Why all molecules do not show rotational spectra ?

6. Why do molecules show band spectra rather than line spectra ?

7. What are Stoke's and anti-Stokes lines in Raman spectrum ?

8. Why translational motion is not involved in molecular spectra ?

9. Explain the term nuclear magnetic resonance.

10. Why water and alcohol are not suitable solvents for ESR studies ?

Part - B (5 × 5 = 25)

Answer **all** the questions.

11. (a) Explain the Hydrogen atom spectrum on the basis of Bohr's theory.

(*Or*)

(b) Show how Pauli's exclusion principle. Determines the number of electrons in different shells of an atom.

12. (a) Give the explanation of normal Zeeman effect on classical theory and obtain an expression for Zeeman effect.

(*Or*)

(b) Outline the Hückel's molecular approximation.

13. (a) Show that in rotational spectra the energy levels are not equally spaced whereas the frequencies are equally spaced.

(*Or*)

(b) What is the effect of electronic excitation on a Polyatomic molecule ?

14. (a) How is Raman effect explained on the basis of quantum theory ?

(*Or*)

(b) In an experiment in the study of Raman effect using mercury green radiation of λ = 546.1nm, a Stokes line of wavelength 554.3nm was observed. Find the Raman shift and wavelength corresponding to Anti-Stokes lines.

15. (a) Write notes on :

(i) Chemical shift.

(ii) Resonance.

(*Or*)

(b) Write down the biological applications of ESR spectroscopy.

Part - C (3 × 10 = 30)

Answer any **three** questions.

16. Describe Stren and Gerlach experiment with necessary theory. Discuss its significance.

17. Give Heilter London theory for the hydrogen molecule and discuss the exchange degeneracy.

18. Solve the Schröedinger's equation for a rigid rotator with a free axis.

19. State and explain the Franck-Condon Principle.

20. Describe the experimental setup for studying NMR.

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AF-2805 **MPH4E1**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

Fourth Semester

Physics

Elective—MEDICAL PHYSICS

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** the questions.

1. Define Airway resistance.

2. Name some common Lung diseases.

3. What are ultrasonic waves ?

4. At about what frequency is the ear insensitive ?

5. What is meant by population inversion ?

6. How do we get vision ?

7. What are X-rays ?

8. What is Luminescence ?

9. Expand the term COPD.

10. Define the term Biopotential.

Part - B (5 × 5 = 25)

Answer **all** the questions.

11. (a) What is surfactant ? Explain its role in the functioning of an Alveoli

(*Or*)

(b) Explain why different Pairs of electrodes are used on specific locations on the body for an ECG.

12. (a) How does a stethoscope transmit heart sounds to the human ear ?

(*Or*)

(b) Write a note on hearing aids.

13. (a) Describe the role of SEM in the field of medicine.

(*Or*)

(b) Explain why and how pressure within the eyeball is measured.

14. (a) Give the properties of X rays.

(*Or*)

(b) How is branchy therapy carried out ? Explain.

15. (a) What are the functions of Blood ? Explain.

(*Or*)

(b) Draw the block diagram of Pacemaker.

Part - C (3 × 10 = 30)

Answer any **three** of the questions.

16. Describe the functioning of Electro encephalagram.

17. Give the anatomy and physiology of human ear.

18. What are vision defects ? Explain them and give the remedy.

19. Describe the advantages of using nuclear medicine.

20. Sketch the anatomy of the heart chambers and valves and show the direction of blood flow.

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AF-2806 **MPH4E2**

M.Sc. DEGREE EXAMINATION, NOVEMBER 2010

Fourth Semester

Physics

Elective—BIOMEDICAL INSTRUMENTATION

(CBCS—2008 onwards)

Time : 3 Hours Maximum : 75 Marks

Part - A (10 × 2 = 20)

Answer **all** questions.

1. What are the different blocks of a basic biomedical instrumentation system ?

2. What are microelectrodes ?

3. Define Electro encephalograph.

4. What is Montage System ?

5. What are the different methods used for measuring Cardiac output ?

6. List out the different types of brain waves with their frequency ranges.

7. Define Specific acoustical impedance.

8. Give any three biological effects of Ultrasound.

9. Mention the different types of Pacemaker.

10. What is a Synchronised d.c. defibrillator ?

Part - B (5 × 5 = 25)

Answer **all** the questions.

11. (a) Write short notes on central nervous system.

(*Or*)

(b) Write about depth and needle electrodes.

12. (a) Explain the description of an Electromyograph.

(*Or*)

(b) Explain in detail biofeed back instrumentation.

13. (a) Explain the Fick's method for the determination of Cardiac output.

(*Or*)

(b) Describe a method to determine the total lung capacity.

14. (a) Explain B-mode display in Ultrasonic imaging System.

(*Or*)

(b) Explain the working of Digital Scan Converter with a neat block diagram.

15. (a) Explain the working of Ventricular Synchronous pacemaker.

(*Or*)

(b) Write a note on double square pulse defibrillator.

Part - C (3 × 10 = 30)

Answer any **three** questions.

16. Explain different electrodes used in ECG.

17. Explain the description of an phono cardiograph with a neat block diagram.

18. Discuss the principle and working of Electromagnetic blood Flowmeter.

19. Explain the working of NMR imaging System with a neat block diagram. Give some advantages of NMR imaging system.

20. Discuss the different types of diathermy.

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