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PGIIIS-O-1512 B-18

M.Sc. III Semester (CBCS) Degree Examination

PHYSICS

Energy Physics - I

Paper - SCT 3.2

(Old)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer all the questions of 15 marks each and any two questions of 10 marks each.

1. a) What are replenishable energy sources? Explain.
   b) Estimate reserves of replenishable energy sources in the world. **(8+7)**

OR

2. a) Sun is earth's primary energy source justify.
   b) Discuss effects of earth's atmosphere on solar radiation. **(8+7)**

3. a) Discuss the thermodynamics of various conversion processes.
   b) Explain the working of a turbine. **(9+6)**

OR

4. a) Using P-V and T-S diagrams discuss the Otto cycle.
   b) Write a note on heat transport processes. **(10+5)**

5. a) What are photo emissive and photo voltaic solar cells? Explain.
   b) Explain briefly construction and working of a heterojunction solar cell. **(8+7)**

OR

6. a) What is a silicon solar cell? Compare its performance with other solar cells.
   b) Explain the performance of solar panels. **(9+6)**

7. a) Explain briefly construction and working of liquid flat plate collector.
   b) What are flat plate air collectors? List out the applications of solar air heaters. **(9+6)**

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OR

8. a) Discuss briefly the storage and utilization of solar energy.
   b) Explain the special features of focusing type of collectors. **(8+7)**

9. a) Enumerate the problems associated with energy utilization in ecological viewpoint.
   b) Solar energy is considered as clean energy. Justify it. **(7+3)**

10. State the second law of thermodynamics. Describe Carnot's cycle. **(10)**

11. What are solar concentrators? Discuss briefly the importance of receiver geometry. **(10)**

12. Discuss the factors affecting the efficiency of solar cells. **(10)**

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PGIIIS-N-1512 B-18

M.Sc. III Semester (CBCS) Degree Examination

PHYSICS

Energy Physics - I

Paper - SCT 3.2

(New)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer all the questions of 15 marks each and any two questions of 10 marks each.

1. Explain in detail the problems and viable solutions of energy utilization in ecological and sociological perspectives. **(15)**

OR

2. a) Define and discuss "Solar time" and Equation of time. **(5+10)**

   b) Give a brief account of effect of atmosphere on solar radiation.

3. a) What is an irreversible process? Give one example. **(5+10)**

   b) With the help of P-V diagram. Discuss Carnot cycle.

OR

4. Give the construction and working of a single stage reciprocating compressor. Obtain expression for **(8+5+2)**

   a) Amount of work expended to produce 1 kg of compressed gas and

   b) The power of the driving engine.

5. a) What are solar photovoltaic cells? **(5+10)**

   b) Discuss the solar cell characteristics efficiency and spectral response.

OR

6. Describe how a hetero junction solar cell is fabricated. Explain its working and mention the factors which affect the efficiency of these cells. **(15)**

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7. Carry out the thermal analysis of Liquid flat plate. (15)

OR

8. a) Why there is a need for focusing type collectors? (5+10)

b) Outline the construction and working of a solar tracking device.

9. Give the working of Pyranometer. (10)

10. Compare the efficiencies of different heat cycles. (10)

11. Give an account of homo junction solar cell. (10)

12. Explain storage and utilization of solar energy. (10)

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PGIIIS-O-1511 B-18

M.Sc. III Semester (CBCS) Degree Examination

PHYSICS

Nuclear Physics - I

Paper - SCT 3.2

(Old)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer all questions of 15 marks and any two questions of 10 marks each.

1. a) Show that the deuteron can exist 96% of the time in 'S' state using magnetic moment of deuteron.

b) Explain the tensor nature of nuclear force. **(10+5)**

OR

2. a) Discuss the partial wave analysis of neutron-proton scattering at low energy.

b) Explain the effect of coulomb scattering on nuclear forces. **(10+5)**

3. a) Derive an expression for magnetic moment of odd A nuclei based on shell model.

b) Predict the ground state spin and parity of $^{57}_{28}Ni$ *and* $^{55}_{25}Mn$ **(10+5)**

OR

4. a) Distinguish between vibrational and rotational energy levels of even-even nuclei.

b) Describe the Fermi gas model of nucleus and obtain the expressions for Fermi energy and Fermi momentum of nucleons. **(5+10)**

5. a) Explain the scheme of classification of elementary particles based on their interactions.

b) Discuss the strangeness quantum number and Gellmann-Nishijima formula. **(5+10)**

OR

6. a) Why parity is not conserved in weak interaction? Explain.

b) Describe the invariance of change conjugation and CP symmetry in weak interactions. **(5+10)**

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7. a) Describe the quark model of elementary particles. Give the quark structure of mesons and baryons.

b) Explain the unification of basic interactions in elementary particles. **(10+5)**

OR

8. a) Discuss eight-fold symmetry for classification of elementary particles with inclusion of weight diagram and obtain Gellman-Okubo mass formula.

b) Explain the experimental evidences for the existence of quarks in nucleus. **(10+5)**

9. Obtain an expression for range of the tensor interaction from the knowledge of deuteron quadrupole moment. **(10)**

10. Arrive at the ground state energy level sequence of a nucleus based on shell model with infinite square well potential. **(10)**

11. Describe CPT invariance and its consequences in elementary particles. **(10)**

12. Discuss the grand unification theories of fundamental interactions and comment on supper symmetry. **(10)**

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PGIIIS-N-1510 B-18

M.Sc. III Semester (CBCS) Degree Examination

PHYSICS

Nuclear Physics - I

Paper - SCT 3.2

(New)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer all the questions of 15 marks and any two questions of 10 marks each.

1. a) What are the evidences for the non-central force in deuteron? **(5+10)**

b) Derive an expression for the magnetic moment of deuteron, assuming its wave function to be an admixture of S and D states and hence find the value of D state probability.

OR

2. a) Using partial wave analysis, obtain an expression for the total scattering cross section for n-p interaction. **(10+5)**

b) What do you mean by scattering length? Give its physical significance.

3. a) What is spin orbit interaction? Explain with necessary details, how spin orbit interaction leads to shell filling at magic numbers. **(12+3)**

b) Predict the spin and parities of ^{13}C and ^{17}O using independent particle model.

OR

4. a) Discuss the vibrational motion in a permanently deformed nucleus and show that this nucleus takes different shapes in α and β vibrations. **(10+5)**

b) Show that, if the collective vibrations exist within a nucleus, the first excited state will be the quadrupole phononic state.

5. What are fundamental interactions? Explain. Give the classification of elementary particles based on the fundamental interactions with suitable examples. **(15)**

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OR

6. a) What is parity symmetry? Explain how the violation of parity in the weak interaction can be verified experimentally. **(13+2)**

   b) Estimate the isospin third component I_3 of proton whose charge is +1, baryon number is 1 and strangeness is zero.

7. a) Discuss Eight fold way for arranging the baryons and mesons in geometrical patterns. **(8+7)**

   b) Give the quark compositions of baryons and mesons.

OR

8. a) Deduce Gellman-Okubo mass formula for baryons and describe how mass splitting can be explained. **(10+5)**

   b) Write a note on Standard model.

9. Explain, how the interpretation of p-p and n-p scattering results can establish the charge independence and charge symmetry of nuclear forces. **(10)**

10. State Nordheim's rules for odd-odd nuclei and illustrate their use with specific example. **(10)**

11. Write down Gell Mann - Nishijima formula. Arrange baryons and mesons separately in a table by listing their masses, isospin, charge, baryon number and strangeness. **(10)**

12. Explain briefly CPT theory and show that particles and antiparticles have the same mass. **(10)**

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PGIIIS-O-1512 AB-18

M.Sc. III Semester (CBCS) Degree Examination

PHYSICS

Biophysics - I

Paper - SCT 3.2

(Old)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer all questions of **15** marks and any **two** questions of **10** marks each.

1. Describe the Cell doctrine. **(15)**

OR

2. Describe Kreb's cycle. **(15)**

3. Describe the van't Hoff equations. **(15)**

OR

4. Describe Nernst-Planck equation. **(15)**

5. Discuss the physics of sensory organs. **(15)**

OR

6. Describe the mechanism of muscle contractility and motility. **(15)**

7. Describe immunological memory. **(15)**

OR

8. Describe the recombinant technology transgenic systems. **(15)**

9. Explain photophosphorylation. **(10)**

10. Explain synaptic transmission. **(10)**

11. Explain the mechanism of sound perception. **(10)**

12. Write a note on genetic information. **(10)**

(5)

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PGIIIS-N-1512 AB-18

M.Sc. III Semester (CBCS) Degree Examination

PHYSICS

Biophysics - I

Paper - SCT 3.2

(New)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer all questions of 15 marks and two questions of 10 marks each.

1. Describe the general organization and composition of the cells. **(15)**

OR

2. Discuss the mechanism of energy trapping and transfer. **(15)**

3. Describe the active and passive processes of cell membranes. **(15)**

OR

4. Give the details of Hodgk-in-Huxley model. **(15)**

5. Describe the mechanism of image formation of a biophysical process. **(15)**

OR

6. Discuss the mechanism of muscle contractility and motility. **(15)**

7. Describe cellular basis of immunal responses. **(15)**

OR

8. Describe the recombinant technology transgenic systems. **(15)**

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9. Write a note on respiratory chain. (10)

10. Explain membrane permeability. (10)

11. Explain Generator potentials. (10)

12. Write a note on Cybernetics. (10)

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PGIIIS-O-1504 B-18

M.Sc. III Semester (CBCS) Degree Examination

PHYSICS

Mathematical Physics - II

Paper - HCT 3.2

(Old)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer all questions of **15** marks each and any **two** questioins of **10** marks each.

1. a) State and prove Parseval theorem.

b) For $F(x) = 2x$ and $0 \leq x \leq 4$ find the Fourier cosine transform. **(8+7)**

OR

2. a) Prove the convolution theorem for Laplace transform.

b) Solve the Poisson's equation for electrostatic potential function $\nabla\phi(r) = \frac{\rho(r)}{\varepsilon}$ using the three dimensional Fourier transform method. **(6+9)**

3. a) State the important properties of the one dimensional Green's function.

b) Determine the Green function associated with the boundary value problem involving the Bessel function $x^2\left(d^2y/dx^2\right)+x\left(dy/dx\right)+\left(k^2x-n^2\right)y=f(x)$ with $y(0)$ is finite and $y(x = a) = 0$. **(5+10)**

OR

4. a) Find the derivative of Green function $G(x,\xi)$ at $x = \xi$.

b) Solve the following integral equation by the Neumann series method;

$$\phi(x) = x + \frac{1}{2}\int_{-1}^{+1}(t-x)\phi(t)dt.$$ **(5+10)**

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5. a) Explain the Bisection and iterative methods of solving differential equation.

b) Starting with $x_0 = 3$, find a root of $x^3 - 3x - 5 = 0$ correct to three decimal places using Newton-Raphson method. **(8+7)**

OR

6. a) Solve $\frac{dy}{dx} = 2x + y$ by fourth order Runge-Kutta method with $y(0) = 1$ hence find $y(1)$ taking $h = 0.5$.

b) Obtain Lagrange's interpolation formula. **(8+7)**

7. a) What are constants and variables? Explain.

b) Write a C program to find the roots of an equation. **(8+7)**

OR

8. a) What is Euler's modified formula? Write a C program to solve $\frac{dy}{dx} = x + 3y$ subject to $y(0) + 1$ and $x = 1$.

b) Explain the various loop and switch statements in C language. **(9+6)**

9. Obtain Fredholm integral equation and their solutions. **(10)**

10. Describe Trapezoidal method to evaluate an integral equation. **(10)**

11. Illustrate eigen function method of expansion of Green's function. **(10)**

12. Write a C program to determine the eigen values and eigen vectors of 3×3 matrix. **(10)**

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PGIIIS-N-1503 B-18

M.Sc. III Semester (CBCS) Degree Examination

PHYSICS

Mathematical Physics - II

Paper - HCT 3.2

(New)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer all questions of 15 marks and Two questions of 10 marks.

1. a) Define Fourier series. Explain the complex form of the Fourier series.
   b) Expand $f(x) = x^2$ for $-\pi \le x \le \pi$ in a Fourier series. **(9+6)**

OR

2. a) Define Fourier transform. Explain the cosine and sine Fourier transforms.
   b) Find the Fourier transform of the Gaussian distribution function $f(x) = N\, e^{-\alpha x^2}$, where N and α are constants. **(8+7)**

3. a) Give the classification of integral equations with suitable examples.
   b) Derive an equivalent Fredholm integral equation to the following boundary value problem. $y'' + 4y = \sin x,\ 0 \le x \le 1 : y(0) = 0,\ y(1) = 1$. **(7+8)**

OR

4. a) Explain how a Green's function can be constructed for a given boundary value problem.
   b) Determine the Green's functions associated with the boundary value problem $d^2y/dx^2 = f(x)$ with $y(0) = 0\, y'(1) = 0$. **(7+8)**

5. a) Explain Newton-Raphson method of solving the differential equation.
   b) Use Newton - Raphson method to find the real root of $x \sin x + \cos x = 0$ near $x = \pi$. Carry out the iterations up to 4 decimals of accuracy. **(9+6)**

OR

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6. a) Describe the least square method of fitting a polynomial through a set of points.

b) Solve $dy/dx = 2x + y$ by fourth order Runge-Kutta method with $y(0) = 1$. Hence, find $y(1)$ taking $h = 0.25$. **(7+8)**

7. a) Give an account of the constants, input and output statements in C.

b) Write a C program to find the roots of $x^2 + 2x + 1 = 0$. **(8+7)**

OR

8. a) Give an account of control and looping statements with examples.

b) Write a C program to find the eigen values of 3×3 matrix. **(8+7)**

9. Using Laplace transformation, solve $y'' + 2y' + y = e^{-x} \sin x$ with $y(0) = 0$ and $y'(0) = 3$. **(10)**

10. Explain the relationship between integral and differential equations. **(10)**

11. Explain second order Runge-Kutta method. **(10)**

12. Describe structure and use of different types of functions in C program with an example. **(10)**

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PGIIIS-O-1506 B-18

M.Sc. III Semester (CBCS) Degree Examination

PHYSICS

Solid State Physics - I

Paper - SCT 3.1

(Old)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer all the questions of 15 marks and any two questions of 10 marks each.

1. a) What are Brillouin zones?
   b) What is tight binding approximation? Show that the wave function used in tight binding approximation satisfies the Bloch's theorem. **(5+10)**

OR

2. a) What is effective mass? Explain its significance.
   b) Explain the augmented plane wave method and compare it with k.p method. **(5+10)**

3. What is van-Hove singularity? Explain the X-ray diffraction by a crystal having lattice vibrations. **(15)**

OR

4. Obtain the vibrational spectra of linear diatomic lattice. Discuss its various modes of vibrations. **(15)**

5. a) Explain Debye's theory of specific heat.
   b) Compare it with Einstein's theory. **(10+5)**

OR

6. a) Explain Hooke's law of elasticity.
   b) Describe an experimental method of determining the elastic constants. **(5+10)**

7. a) Describe the dynamics of an electron in a magnetic field.
   b) Explain the quantization of orbit in k space. **(10+5)**

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OR

8. a) What is periodic zone scheme?
   b) Explain the Harrison constructions. **(7+8)**

9. Explain the reciprocal lattice properties. **(10)**

10. Explain the different modes of vibration in a monatomic lattice. **(10)**

11. Explain the procedure for reduction of elastic constants from symmetry. **(10)**

12. Write a note on Landau quantization. **(10)**

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PGIIIS-N-1505 B-18

M.Sc. III - Semester (CBCS) Degree Examination

PHYSICS

Solid State Physics - I

Paper - SCT 3.1

(New)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer all questions of 15 marks and any two questions of 10 marks each.

1. a) Define periodic potentials of lattice. Show that the volume of a unit cell of the reciprocal lattice is inversely proportional to the volume of a unit cell of the direct lattice.

   b) Show that Bloch function, $\psi_k(r) = u_k(r)\exp(ik.r)$ satisfies Bloch's theorem. **(5+10)**

OR

2. a) Explain Periodic and Reduced zone schemes.

   b) Describe the Tight binding model of band structure calculations. Explain how the band width depends upon the overlap integral. **(5+10)**

3. a) What are lattice vibrations? Obtain the vibrational spectra of a linear one-dimensional monatomic lattice under nearest neighbor interaction approximation.

   b) Sketch and explain the two dispersion branches of a diatomic lattice clearly showing the frequency gap. Assume that mass, $M_1 < M_2$. **(10+5)**

OR

4. a) Explain Normal and Umklapp electron scattering processes.

   b) Explain how Ewald's construction of Ewald's sphere satisfies the geometrical conditions in reciprocal space for diffraction of electrons by an ideal crystal. **(8+7)**

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5. a) Describe Einstein's theory of specific heat of solids. Show that for temperature, $T < \theta_E$, C_v is proportional to $\exp(-\theta_E / T)$.

b) Calculate the Einstein frequency for copper.

Given : $\theta_E = 240$ K, $k_B = 1.38 \times 10^{-23}$ J/K and $h = 6.62 \times 10^{-34}$ J-s. **(10+5)**

OR

6. a) Obtain expressions for strain components e_{xx}, e_{yy} and e_{zz} of an elastic solid considering infinitesimal strains at room temperature.

b) Describe an experimental method of determination of elastic stiffness constants C_{11}, C_{12} and C_{14} of a cubic crystal. **(5+10)**

7. a) Sketch and explain different orbits of motion in a magnetic field of the wave vector of an electron on the Fermi surface.

b) Describe a method for construction of Fermi surfaces for a square lattice. Explain the procedure to construct Fermi surfaces for nearly free electrons. **(5+10)**

OR

8. a) What are Landau levels? Explain quantization of orbits in a magnetic field.

b) Explain the phenomena of cyclotron resonance. **(7+8)**

9. Explain Augmented Plane Wave method of band structure calculations. **(10)**

10. Explain how Debye-Waller factor accounts for decrease in XRD pattern intensity due to lattice vibrations. **(10)**

11. Explain Stress and Strain tensors. **(10)**

12. What are extremal orbits? Explain.

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PGIIIS-O-1513 B-18

M.Sc. III Semester (CBCS) Degree Examination

PHYSICS

Mechanics

Paper - OET 3.1

(Old)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer all questions of 15 marks and any two questions of 10 marks each.

1. a) Explain Kepler's laws of planetary motion. **(6+9)**
   b) Define constraints of motion. Obtain Lagrange's equation of motion from D Alembert's principle.

OR

2. a) Explain variational principle. **(6+9)**
   b) Obtain Hamilton's equation of motion from legendre transformation.

3. a) State and prove the postulates of the special theory of relativity. **(8+7)**
   b) Explain the Minkowski space.

OR

4. a) What are Galilean Transformations? Explain. **(7+8)**
   b) State and explain the aims and objectives of Michelson-Morley experiment.

5. a) Explain the fundamental postulates of quantum mechanics. **(5+10)**
   b) Establish time independent one-dimensional Schrodinger wave equation.

OR

6. Explain "Uncertainty" and "Complementarity" principles. **(15)**

7. a) State and explain the first law of thermodynamics. **(6+9)**
   b) State and prove Ehernfest's theorem.

OR

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8. a) Explain the distribution laws in statistical mechanics. (7+8)
   b) Compare properties of Bose-Einstein and Fermi-Dirac distribution laws.

9. Write a note on 'Virtual work' and 'Generalized coordinates'. (10)

10. Mention the applications of Doppler effect. (10)

11. Write a note on square well potential. (10)

12. Write a note on black body radiation. (10)

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PGIIIS-N-1513 B-18

M.Sc. III Semester (CBCS) Degree Examination

PHYSICS

(Mechanics)

Paper - OET 3.1

(New)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer all questions of 15 marks each and any two questions of 10 marks each.

1. a) Define the terms linear momentum and angular momentum. **(7+8)**

   b) State and explain the three basic Kepler's laws of motion.

OR

2. a) State the D'Alembert's principle. **(5+10)**

   b) Derive Lagrangian equation of motion on the basis of D'Alembert's principle.

3. a) What do you mean by Galilean transformations? Explain. **(8+7)**

   b) Explain the significance of Ether hypothesis.

OR

4. a) State and explain the basic postulates of special theory of relativity. **(8+7)**

   b) Explain the meaning of time dilation in the theory of relativity.

5. a) What is wave function? Express the condition of ortho-normality. **(6+9)**

   b) Explain the principle of uncertainty by taking complimentary parameters.

OR

6. a) Explain the physical meaning of wave function. **(5+10)**

   b) Briefly explain the quantum mechanics of a harmonic oscillator.

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7. a) Explain the meaning of phase space and ensemble. (7+8)

b) What is ensemble average, probable and most probable distributions? Explain.

OR

8. a) State the Gibb's paradox. (5+10)

b) Explain the Boltzmann equaipartition theorem and derive its relation.

9. What is Hamiltonian formalism? Give its significance. (10)

10. Explain Doppler effect and mention some of its applications. (10)

11. Explain some of the basic postulates of quantum mechanics. (10)

12. Explain the basic theory of black body radiation that leads to formation of photons. (10)

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PGIIIS-O-1508 B-18

M.Sc. III Semester (CBCS) Degree Examination

PHYSICS

Materials Physics - I

Paper - SCT 3.1

(Old)

Time : 3 Hours Maximum Marks : 80

Instructions to Candidates:

Answer all questions of 15 marks and any two questions of 10 marks each.

1. a) Brief the properties of engineering materials.
   b) What are the factors affecting the properties of engineering materials? (8+7)

OR

2. a) Distinguish between crystalline and non crystalline state.
   b) Explain the structure of silica and silicates. (7+8)

3. a) Explain the Czochralski's technique of growing single crystals.
   b) Explain the zone refining technique of purifying the crystals. (9+6)

OR

4. a) What are point imperfections? Explain.
   b) Obtain the equilibrium concentration of Frenkel defects at a temperature T. (5+10)

5. a) Brief about the solid solutions and two component alloy system.
   b) Discuss the phase diagram of two component Cu-/n alloy system. (5+10)

OR

6. a) Explain first and second order phase transitions.
   b) Discuss the phase diagram of Pb-Sn alloy. (8+7)

7. a) Give the theory of nucleation and growth.
   b) Explain the process of precipitation,solidification and crystallization in steel. (7+8)

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OR

8. a) What is self-diffusion in solids? Explain Kirkendal effect.
   b) Explain any one of the applications of diffusion. (10+5)

9. Explain the structure of metals and alloys. (10)

10. Explain the crystal growth by Hydrothermal method. (10)

11. Explain the phase diagram of $Fe\text{-}Fe_2O_3$. (10)

12. Explain experimental determination of activation energy for diffusion in solids. (10)

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PGIIIS-O-1501 B-18

M.Sc. III Semester (CBCS) Degree Examination

PHYSICS

Electronics & Instrumentation

Paper - HCT 3.1

(Old)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer all questions of 15 marks and any two of 10 marks each.

1. a) What are the characteristics of an ideal Op-Amp?
   b) Explain with circuit diagram inverting and non-inverting Op-Amps and obtain their gains in a closed loop condition.
   c) Explain the input and output impedances of an Op-Amp in closed loop condition. **(5+5+5)**

OR

2. a) Explain how Op-Amp can be used as an adder circuit.
   b) Describe the RC phase shift oscillator using Op-Amp and obtain the expression for frequency and gain. **(8+7)**

3. a) What are Multiplexers and Demultiplexers? Explain operation of 8:1 line multiplexer circuit with its truth table.
   b) Explain RAM, ROM and PROMS. **(10+5)**

OR

4. a) What are Flip-Flops? Explain the working of master slave RS-flip-flop with its circuit diagram and truth table.
   b) What are Shift Registers? Describe the parallel in and series out Shift Registers. **(8+7)**

5. a) What are the classifications of Transducers? Describe the principles on which they are classified.
   b) Describe the piezo-electric transducer and obtain the voltage sensitivity of the crystal. **(7+8)**

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OR

6. a) Explain the principle and working of 1.VDT transducer.
   b) What are photo conductive and Thermoelectric transducers? Explain. **(9+6)**

7. Explain the principle and working of NMR and ESR spectrometers. **(15)**

OR

8. Describe the principle and working of TGA and DSC with neat diagrams and explain how these are useful in analyzing the thermal properties. **(15)**

9. Describe the Wien bridge oscillator circuit using an Op-Amp. **(10)**

10. Write a note on Microprocessor. **(10)**

11. Describe the working principle of resistive gauge transducer. **(10)**

12. Explain the construction and working of SEM. **(10)**

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PGIIIS-N-1500 B-18

M.Sc. III Semester (CBCS) Degree Examination

PHYSICS

(Electronics and Instrumentation)

Paper - HCT 3.1

(New)

Time : 3 Hours **Maximum Marks : 80**

Instructions to Candidates:

Answer all questions of 15 marks and any two questions of 10 marks each.

1. a) Obtain expressions for voltage gain, input impedance and output impedance of non-inverting OP-Amp using closed loop condition.

   b) Define offset voltage and slew-rate of OP-Amp. **(10+5)**

OR

2. a) Discuss the design criteria and operation of OP-Amp based Wien bridge oscillator circuit.

   b) With use of circuit explain the working and applications of current to voltage converter circuit. **(10+5)**

3. a) Explain the working of J-K flip-flop with truth table.

   b) Draw logic diagram, truth table of 4-1 multiplexer and explain its working. **(10+5)**

OR

4. a) Describe the operation and limitation of S-R clocked flip-flop.

   b) Discuss the architecture of 8085 Microprocessor. **(5+10)**

5. a) Define gauge factor. Give an account on semiconductor gauge.

   b) What is thermistor? Show how this is used for temperature measurement. **(7+8)**

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OR

6. a) Discuss operating principles and applications of Piezoelectric and Photoelectric transducers.

   b) Show how instrumentation amplifier is built using OP-Amps and list out its characteristics. **(10+5)**

7. a) Discuss the working features and uses of Thermo Gravimetric Analyser.

   b) Describe the principle of operation of Scanning Electron Microscope. **(9+6)**

OR

8. a) Discuss the principle and working of ESR.

   b) Describe how the vacuum can be generated using a Rotary pump. **(9+6)**

9. Discuss the working of Adder and Subtraction circuits. **(10)**

10. Give an account on ROM and EPROM. **(10)**

11. Discuss the operation of Photomultiplier tube. **(10)**

12. Give an account on DTA. **(10)**

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