

PGIIS-N 1500 B-15
M.Sc. IIIrd 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, two questions of 10 marks each.

1. a) Write down the characteristics of an ideal op-amp
b) Describe the adder and subtractor amplifiers with their circuit diagrams using op-amp and prove the same for them (5+10)

OR

2. a) Explain the Wein bridge Oscillator using op-amp and deduce the expression for frequency and gain of the circuit
b) Describe the weighted resistor digital to analog converter using Op-amp. (8+7)
3. a) What do mean by encoder? Explain the decimal -to -BCD encoder using diode- matrix encoder
b) What are flip flops? Explain clocked SR flip flop with circuit diagram and verify its truth table (8+7)

OR

4. a) What do mean by decoder? Explain BCD -to -Decimal decoder
b) What are shift registers? Describe the series in and series out shift register circuit (8+7)

5. a) What are the transducers? Explain the classification and principles of transducers
b) Describe the Piezo-electric transducer and obtain the voltage sensitivity of the crystal (8+7)

OR

6. a) Describe in detail about the principle and working of LVDT transducer
b) What is semiconductor transducer? Explain (10+5)
7. a) What is meant by vacuum? Explain the different levels of vacuums and pumping techniques
b) Explain the production and measurement of high vacuum using diffusion pump(6+9)

OR

8. Describe the principle and working of SEM and TEM with neat diagram and explain how these are useful in analyzing the surface properties (15)
9. Describe the generator of square wave using an Op-amp. (10)
10. Write a note on ROM, PROM and EPROMs (10)
11. Describe the working and principle of photomultiplier tube and photodiode (10)
12. Explain the construction and working of TGA. (10)
-

PGIIS-N 1507 B-15
M.Sc. IIIrd Semester (CBCS) Degree Examination
Physics
(Materials Physics - I)
Paper : SCT 3.1
(New)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

Answer **All** the questions of **Fifteen** marks each and two questions of **Ten** marks each.

1. a) Give an account on general classification of materials with representative examples and typical properties.
- b) Explain the structure-property relationship in engineering materials. (7+8)

OR

2. a) List out the factors influencing the formation of non crystalline. States
- b) What are covalent bonds? Discuss the properties of covalent bonds. (5+10)
3. a) Describe with a neat sketch the bridgmann technique of crystal growth from melt.
- b) Discuss zone refining method of crystals. (9+6)

OR

4. a) Explain with a neat sketch the screw and edge dislocations.
- b) Discuss the concept of Burger vector and Burger circuit. (7+8)
5. a) What are substitutional and interstitial solid solutions? State Hume-Ruthery empirical rules for the formation of substitutional solid solutions. (9+6)
- b) State and explain the Gibbs phase rule.

OR

6. a) With a schematic diagram, discuss the Fe-Fe₃C phase diagram.
- b) Write a note on Lever rule. (10+5)

7. a) Discuss the influence of nucleation and growth on the phase transformations.
b) Discuss the phase transformations in steel. (8+7)

OR

8. a) Explain the mechanism of diffusion through solids. Derive the Fick's laws for diffusion in solids.
b) Mention the applications of diffusion. (10+5)
9. Discuss the structure of silicates. (10)
10. Describe the hydrothermal method of crystal growth. (10)
11. Define first, second and third order phase transitions with examples. (10)
12. Discuss the crystallization and grain growth. (10)
-

PGIIS -N 1505 B - 15**M.Sc IIIrd Semester (CBCS) Degree Examination****Physics****(Solid State Physics - I)****Paper - SCT 3.1****(New)**

Time : 3 Hours

Maximum Marks : 80

Instructions to CandidatesAnswer **all** questions of **15** marks each and if any **two** questions of **10** marks.

1. a) Describe the dispersion curves in the nearly free electron model in the reduced and extended zone schemes.
- b) Show that the energy gap, $E_g = 2|V_{-2\pi/a}|$ Where $V_{-2\pi/a}$ is the Fourier component of the crystal potential. (10+5)

OR

2. a) Distinguish between direct lattice and reciprocal lattice.
- b) Show that $\psi_k(r) = \exp(ik \cdot r) u_k(r)$, for a periodic potential $V(r)$. (5+10)
3. a) Discuss Van Hove singularity. (5+10)
- b) Discuss diffraction by a crystal with and without lattice vibrations.

OR

4. a) Obtain the dispersion relation for a linear diatomic lattice. Comment on low pass and band pass mechanical filters.
- b) What is the significance of Debye-Waller factor? Explain. (10+5)

5. a) Obtain the Debye's T^3 law in the continuum model approximation.
b) Explain, how $C_v \rightarrow 3R$, in both Einstein and Debye models. (10+5)

OR

6. a) Explain Stress and Strain tensors.
b) Describe ultrasonic interference method for the determination of elastic constants of solids. (5+10)
7. a) Explain the method of construction of Fermi surface in a square lattice.
b) Describe Harrison's construction of Fermi surface. (8+7)

OR

8. a) Describe electron dynamics in a magnetic field.
b) Write a note on Landau quantization. (8+7)
9. Explain Augmented Plane Wave method of band structure calculations. (10)
10. Explain quantization of normal modes. (10)
11. Explain the terms: Anharmonicity and Thermal expansion. (10)
12. Explain dHVA effect in the study of Fermi surface. (10)
-

PGIIS-N 1503 B - 15
M.Sc IIIrd 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 each and Two questions of 10 marks each.

1. a) Define Fourier series. What are cosine and sine series? (6)
b) Expand in a Fourier series

$$f(x) = 0 \quad (-\pi \leq x \leq 0)$$
$$n(0 \leq X \leq \pi) \quad (9)$$

OR

2. a) Define Laplace Transform. List out applications of Laplace transforms (7)
b) Obtain the Laplace transform of (i) t (ii) t^n (8)
3. a) Obtain the Fredholm integral equation and their solution (9)
b) Give an account of examples of linear integral equations of first and second kind (6)

OR

4. a) Explain Green function method of solving boundary value problems. (9)
b) List out the applications of Greens functions (6)
5. a) Explain Newton-Raphson method of solving the differential equation (9)
b) Use Newton-Raphson method to find the real root of $X \sin X + \cos X = 0$ near $X = \pi$. Carry out the iterations upto 4 decimals of accuracy. (6)

OR

6. a) Obtain Lagranges interpolation formula (9)
b) Using Lagrange's interpolation formula. Find Y at X=10 given (6)

X	5	6	9	11
Y	12	13	14	16

7. a) Explain the various input and output statements in C (9)
b) Write a C program to evaluate $\int dx/(1+x^2)$ by employing simpson 1/3 rule (6)

OR

8. a) Explain the various loop and switch statements in C (9)
b) Write a C program to evaluate $y(0.2)$ for the equation $\frac{dy}{dx} = \frac{y-x}{y+x}$, where $y(0)=1$ taking $h=0.2$ (6)
9. State and prove convolution theorem for Fourier transform (10)
10. Obtain the Voltaire integral equation and their solution (10)
11. Explain the modified Euler method for solving the ordinary differential equations (10)
12. Explain the various constants and variables in C. (10)
-

PGIIS - N 1510 B - 15
M.Sc. IIIrd Semester 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 **two** questions of **ten** marks each

1. Obtain the relationship between the range and depth of the nuclear force from the deuteron problem, assuming square well shape for the nuclear potential. (15)

OR

2. Prove that the ground state of deuteron is an admixture of S and D states. (15)
3. a) Starting with the expression for the energy eigen values for single particle states in the infinite harmonic oscillator well, obtain expression for nuclear energy levels in the extreme single particle shell model. (15)
- b) How does this lead to the explanation of giant resonance in photonuclear reactions

OR

4. Discuss nuclear deformations and collective motion of nucleons. (15)
5. Give the classification of the elementary particles based on their masses and name at least two members in each class. (15)

OR

6. What is Parity? Discuss non conservation of parity in weak interactions. (15)
7. Explain the terms Isotopic spin, strangeness and hypercharge with examples and illustrate the conservation principles involved. (15)

OR

8. What are quarks? Describe the nucleon structure in terms of quark model (15)
 9. Write a note on properties of nuclear forces. (10)
 10. Write a note on Nordheim's rules. (10)
 11. Discuss briefly time reversal symmetry. (10)
 12. Write short note on GUT (10)
-

PGIIS-N 1512 B-15
M.Sc. IIIrd Semester (CBCS) Degree Examination
Physics
(Bio Physics - 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.

1. Describe the biological energy cycle and energy currency. (15)
OR
2. Give an account of photosynthesis- mechanism. Explain the different parts of photosynthetic apparatus. (15)
3. Explain the structure and function for cell membrane. What are different models of cell membrane? (15)
OR
4. Discuss information processing in neural systems. (15)
5. Discuss the mechanism of chemical , somatic acid visceral receptors. (15)
OR
6. What is temporal organization? Explain. Elucidate the basic principle of biorhythms. (15)
7. Give an account of cellular basis of immunal responses. (15)
OR
8. Discuss in detail about the genetic code and genome organization (15)
9. Write a note on Kreb's cycle. (10)
10. Explain Hodgkin - Huxley model. (10)
11. Discuss in brief the physics of sensory organs. (10)
12. Give a detailed account of recombinants technology transgenic systems. (10)

PGIIS-N 1513 B-15
M.Sc. IIIrd Semester (CBCS) Degree Examination
Physics
(Mechanics)
Paper : OET 3.1
(New)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

Answer All the questions of Fifteen marks each and any two questions of ten marks each.

1. State and explain the conservation law for total energy of a system of particles. (15)

OR

2. a) Write the properties of Poisson - Brackets.
b) Derive canonical equation in terms of Poisson - Brackets notation. (6+9)
3. a) Write a note on postulates of special theory of relativity
b) Write down the Lorentz transformations and explain simultaneity. (6+9)

OR

4. a) Explain Michelson - Morley experiment and mention the conclusions drawn from it.
b) Explain Minkowski space. (6+9)
5. Write down the postulates of quantum mechanics. And obtain one dimensional schroedinger equation. (15)

OR

6. a) Derive the eigen functions and eigen values of the Harmonic oscillator.
b) Explain about the zero point energy in Harmonic oscillator. (9+6)

7. a) Explain the concept of entropy.
b) Define ensembles and explain different types of ensembles with neat diagram. (6+9)

OR

8. a) State and explain Boltzmann equipartition theorem.
b) What are bosons and fermions? Explain their properties. (9+6)
9. State and explain the principle of virtual work? (10)
10. Explain in detail the relativistic Doppler Effect. (10)
11. Explain the significance of Ehrenfest's theorem. (10)
12. What is Gibb's paradox? How can it be resolved. (10)
-

PGIIS-O 1501 B-15
M.Sc. IIIrd Semester (Non - CBCS) Degree Examination
Physics
(Applied Physics)
Paper : 3.1
(Old)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

Answer any **SIX** questions of **12** marks and **TWO** questions of **4** marks.

1. Explain Chandrasekhar's limit. Discuss how it is useful in classification of stars. (12)
2. Give an account of pulsars and quasars. (12)
3. Draw a neat diagram of a cell and explain the chemical composition. (12)
4. What are biomolecules? Explain the structure and functioning of biomolecules. (12)
5. What is population inversion? Mention the population inversion techniques. Discuss any two population inversion techniques. (12)
6. What is a holography? Explain recording and reconstruction of an image. Give any two applications of holography. (12)
7. Discuss the motion of charged particles in time dependent and time independent electric and magnetic fields. (12)
8. What is plasma? Discuss the difficulties faced in confining the plasma. How they can be overcome? (12)
9. Comment on black hole. (4)
10. Comment on the cell doctrine. (4)
11. Write a note on fiber optic communication. (4)
12. Explain briefly plasma applications. (4)

PGIIS-O 1508 B-15
M.Sc. IIIrd Semester (Non-CBCS) Degree Examination
Physics
(Nuclear Physics-I)
Paper - 3.3
(Old)

Time : 3 Hours

Maximum Marks : 80

Instructions to Candidates:

Answer any **six** questions of **12** marks each and **Two** questions **4** marks each.

1. Give the theory of ground state of deuteron (12)
2. Using the partial wave analysis obtain an expression for the elastic scattering and reaction cross sections in neutron-proton collisions (12)
3. Give an account of the assumptions made in the shell model of the nucleus, which lead to the understanding of the magic numbers, ground state angular moments and magnetic moments of nuclei (12)
4. What are giant resonances in photonuclear reactions? How are they explained on the basis of extreme single particle shell model? (12)
5. Discuss the main features of the collective model of the nucleus with reference to rotational and vibrational spectra Give examples (8+4)
6. Considering the neutrons and protons of the nucleus as independent, fully degenerate Fermi gas, obtain expression for the Fermi energy of protons and neutrons (12)
7. Name the basic interactions of nature and give their characteristic features (12)
8. Discuss unification of fundamental interactions and describe the grand unification theory (12)
9. Write a note on : Magnetic moments of deuteron (4)
10. Explain the phenomenon of nuclear isomerism (4)
11. Write a note on CPT invariance (4)
12. Write a note on Quark theory (4)