

ASSIGNMENT - 1, DEC - 2016.

M.Sc. (FINAL) SECOND YEAR DEGREE

PHYSICS

PAPER- V : ELECTROMAGNETIC THEORY AND MODERN OPTICS

Maximum : 30 MARKS

Answer ALL questions.

- 1) a) Derive Fresnel equation.
b) Discuss the amplitude of electromagnetic waves on reflection and refraction at the boundary of a dielectric interface.
- 2) a) From the wave vector surfaces, distinguish between uniaxial crystals and biaxial crystals.
b) Discuss Lienard – Wiechert potentials of a moving point charge.
- 3) a) What is population inversion?
b) Write various pumping schemes to achieve population inversion.
- 4) a) What is meant by coherence?
b) Explain the principle and working of He-Ne laser.
- 5) Answer the following:
a) Threshold condition.
b) Retarded potentials.

ASSIGNMENT - 2, DEC - 2016.

M.Sc. (FINAL) SECOND YEAR DEGREE

PHYSICS

PAPER- V : ELECTROMAGNETIC THEORY AND MODERN OPTICS

Maximum : 30 MARKS

Answer ALL questions.

- 1) a) Explain the principle and working of a hologram with neat sketch.
b) Differentiate Fresnel and Fourier transform holography.
 - 2) a) Write a brief note on fibre optic materials.
b) Obtain the expression for numerical aperture of a optical fibre.
 - 3) a) Explain signal distortion in optical fibers and various methods to minimize it.
b) Distinguish between step index fiber and graded index fiber structures.
 - 4) a) What is total internal reflection?
b) Give the experimental details of producing optical fibres.
 - 5) Answer the following:
 - a) Convolution integral.
 - b) Applications of lasers.
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PHYSICS

PAPER-VI: NUCLEAR PHYSICS, MOLECULAR AND RESONANCE SPECTROSCOPY

Maximum : 30 MARKS

Answer ALL questions.

- 1) a) Explain the terms dipole moment and quadruple moment.
b) Explain the theory of deuteron.
 - 2) a) Obtain an expression for Weizsacker semi empirical mass formula and explain various terms.
b) How this formula explain the behavior of an isobaric family.
 - 3) a) With suitable examples explain direct nuclear reaction.
b) Derive Briet – Wigner formula and explain its significance.
 - 4) a) Explain various interactions among elementary particles.
b) What are the conservation laws associated with elementary particles.
 - 5) Write a note on the following.
 - a) Liquid drop model.
 - b) Selection rules in β – transitions.
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PHYSICS

PAPER-VI: NUCLEAR PHYSICS, MOLECULAR AND RESONANCE SPECTROSCOPY

Maximum : 30 MARKS

Answer ALL questions.

- 1) a) Explain the theory of ESR spectroscopy.
b) What are the applications of ESR?
 - 2) a) Derive Bloch equations in NMR.
b) Briefly explain the relaxation mechanisms for nuclei with spin $\frac{1}{2}$.
 - 3) a) What are the various shapes of molecules and explain them in detail.
b) Calculate the energy levels of a diatomic molecule as a rigid rotator.
 - 4) a) Derive an expression for vibrational energy of a diatomic molecule in case of simple harmonic oscillator.
b) What are PQR branches.
 - 5) Write a note on the following.
 - a) Nuclear Quadruple Resonance.
 - b) Instrumentation for IR spectroscopy.
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PHYSICS

PAPER- VII : SOLID STATE PHYSICS – I

Maximum : 30 MARKS

Answer ALL questions.

- 1) a) Write about point groups and space groups.
b) Discuss the importance of symmetry operations in crystals.
 - 2) a) What is Bragg's law. Explain its importance in determining the crystal structure
b) Explain the Laue's interpretation of X-ray diffraction by crystals.
 - 3) a) Define cohesive energy. Distinguish between primary and secondary bonds. Write the Properties ionic and covalent bonds.
b) Obtain the dispersion relation of monoatomic one dimension infinite lattice.
 - 4) a) Derive the expression for normal modes in diatomic one dimension lattice.
b) Discuss the Reststrahlen effect in ionic crystals.
 - 5) Write a note on the following.
 - a) Different crystal systems
 - b) General theory of harmonic approximation
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M.Sc. (FINAL) SECOND YEAR DEGREE

PHYSICS

PAPER- VII : SOLID STATE PHYSICS – I

Maximum : 30 MARKS

Answer ALL questions.

- 1)
 - a) State and explain Dulong and Petit's law.
 - b) Discuss the Einstein theory of heat capacity and mention its failures.

 - 2)
 - a) Discuss the motion of electron in one dimension lattice (Kronig- Penney model)
 - b) Write about anharmonic effects.

 - 3)
 - a) Derive the expression for the carrier concentration in conduction band of intrinsic Semiconductor.
 - b) Discuss the variation of Fermi level in extrinsic semiconductor with temperature.

 - 4)
 - a) State and explain Quantum Hall effect.
 - b) Discuss the formation of p-n junction and give some examples for p-n junction devices.

 - 5) Write a note on the following.
 - a) Phonons properties
 - b) Magneto resistance
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M.Sc. (FINAL) SECOND YEAR DEGREE

PHYSICS

PAPER- VIII : SOLID STATE PHYSICS — II

Maximum : 30 MARKS

Answer ALL questions.

- 1) What are various polarizabilities? Discuss the classical theory of electronic polarizability and derive dispersion relation .
 - 2) What is piezoelectricity? Describe any two applications of piezoelectric effect in detail.
 - 3) Distinguish between edge and screw dislocations. Discuss the stress field around screw dislocation.
 - 4) With suitable examples distinguish between diamagnetism and paramagnetism. Derive an expression for diamagnetic susceptibility using quantum C theory.
 - 5) Write a note on the following.
 - a) Experimental determination of dielectric constant
 - b) Point defects
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M.Sc. (FINAL) SECOND YEAR DEGREE

PHYSICS

PAPER- VIII : SOLID STATE PHYSICS — II

Maximum : 30 MARKS

Answer ALL questions.

- 1) Draw a typical B-H curve of a ferromagnetic material and explain different stages of magnetization process based on the domain theory.
- 2) Discuss the Neel model of ferrimagnetism and explain the properties and applications of ferrites.
- 3) Explain the concept of energy gap in superconductor. Discuss how this concept is used to explain the fundamental properties of superconductors.
- 4) Discuss the Ginzburg- Landau theory of superconductivity.
- 5) Write a note on the following.
 - a) Weiss theory of ferromagnetism
 - b) BCS theory of superconductors
