Code No: **R201117** **R20** **SET - 1**

I B. Tech I Semester Supplementary Examinations, July/August-2023

APPLIED PHYSICS

(Common to CSE, CSE-CS&T, IT , CSE-CS, CSE-IOT&CS incl BCT, CSE-CS & BS, CSE-IOT,CS,IOT)

Time: 3 hours Max. Marks: 70

Answer any five Questions one Question from Each Unit
All Questions Carry Equal Marks

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UNIT-I

1. a) Discuss the phenomenon of interference in thin films. Obtain the conditions for maxima and minima. [10M]

   b) In Frauhofer diffraction at a single slit, the first diffraction maxima falls at 15° with a slit width of 2.5 μm. Find the wavelength of the light. [4M]

(OR)

2. a) Obtain the condition for primary and secondary maxima in Fraunhofer diffraction due to a single slit and derive an expression for width of the central maximum. [10M]

   b) Find the minimum thickness of half wave and quarter wave plates of quartz for a light beam of wavelength 589.3 *nm*. (If μ_o = 1.65833 and μ_e = 1.48640). [4M]

UNIT-II

3. a) Derive relation between the probabilities of spontaneous emission and stimulated emission in terms of Einstein's coefficients [10M]

   b) The ratio of population of two energy levels at 300K is 10^{-30}. Find the wavelength of radiation emitted. [4M]

(OR)

4. a) What is meant by acceptance angle for an optical fiber? Obtain mathematical expression for acceptance angle and numerical aperture. [10M]

   b) The numerical aperture of an optical fiber is 0.39. If the fractional refractive index change of the material of its core and cladding is 0.05, calculate the refractive index of the material of the core. [4M]

UNIT-III

5. a) Discuss the mathematical properties of wave function graphically which satisfy the Schrodinger wave equation and give the probabilistic interpretation of wave function of a particle. [10M]

   b) Calculate the Fermi energy for copper, given that the number of conduction electrons per unit volume is $8.49\times10^{28}\ m^{-3}$. [4M]

(OR)

6. a) What is effective mass? Derive an expression for effective mass of an electron. [10M]

   b) Explain the Fermi-Dirac distribution function of electrons. [4M]

UNIT-IV

7. a) What is electronic polarization? Show that the electronic polarization depends on the volume of the constituent atom. [10M]

   b) A solid elemental dielectric with density 3×10^{28}atoms per m^3shows an electronic polarizability $10^{-40}\ F\text{-}m^2$. Assuming the internal electric field to be a Lorentz field, calculate the dielectric constant of the material. [4M]

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(OR)

8. a) Derive the relation between magnetic moment and angular momentum of an atom. What is Bohr magneton? [10M]

   b) Distinguish ferromagnetic materials on the basis of the hysteresis loop. [4M]

UNIT-V

9. a) Write the expressions for electron and hole concentrations in an intrinsic semiconductor and hence derive the expression for Fermi energy in it. [10M]

   b) If the effective mass of electron is equal to twice the effective mass of hole, determine the position of the Fermi level in an intrinsic semiconductor from the centre of forbidden gap at room temperature. [4M]

(OR)

10. a) Outline qualitatively the BCS theory of superconductivity. [7M]

    b) How are the superconductors classified? Explain their properties. [7M]

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