Code No: R201207 **R20** SET - 1

I B. Tech II Semester Supplementary Examinations, March- 2022

APPLIED PHYSICS

(Common to **EEE, ECE, EIE, ECT, CSE-AI&ML, CSE-AI, CSE-DS, CSE-AI&DS, AI&DS)**

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) Explain how Newton's rings are formed and describe the method for the determination of the wavelength of light using Newton's rings. (7M)

   b) The diameter of the 10^{th} dark ring is 5 mm when the light of wavelength 5500Å is used in Newton's rings experiment. If the space between lens and glass plate is filled with a liquid of refractive index 1.75, what will be the diameter of the 10^{th} dark ring? (3M)

   c) Distinguish between interference and diffraction. (4M)

Or

2. a) Give the theory of Fraunhofer diffraction due to a double slit. (7M)

   b) In double-slit Fraunhofer diffraction, calculate the fringe spacing on a screen 50 cm away from the slits if they are illuminated with the blue light of wavelength 480 nm. Slit separation and width are 0.1 mm and 0.020 mm respectively. (3M)

   c) Explain how a Nicol's Prism could be constructed. (4M)

UNIT-II

3. a) Define population inversion. Discuss various pumping mechanisms to achieve population inversion. (7M)

   b) Discuss the construction and working of Ruby laser with neat energy level diagram. (7M)

Or

4. a) Obtain an expression for acceptance angle for an optical fibre. How is it related to numerical aperture? (8M)

   b) Distinguish between step-index and graded-index optical fibres. (6M)

UNIT-III

5. a) What are the Matter waves? Obtain an expression for the de Broglie wavelength of matter waves. (7M)

   b) Solve the Schrodinger wave equation for a material particle confined to a one-dimensional infinite potential box of width to obtain eigenvalues. (7M)

Or

6. a) Derive the expression for the electrical conductivity of material using quantum free electron theory. (8M)

   b) Based on band theory, distinguish between conductors, semi conductors and insulators. (6M)

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UNIT-IV

7. a) Define the following terms and explain their importance in dielectrics (6M)
   i) Polarization vector ii) Displacement vector iii) Electric field vector

   b) What is electronic polarization? Show that the electronic polarization depends on the volume of the constituent atom. (8M)

Or

8. a) Explain the origin of magnetic moment in magnetic materials. (8M)

   b) Distinguish between hard and soft magnetic materials. (6M)

UNIT-V

9. a) Derive an expression for majority carrier concentration of a P-type semiconductor. (9M)

   b) Explain how the Fermi energy level of intrinsic semiconductors is dependent on carrier concentration and temperature. (5M)

Or

10. a) Explain the effects of temperature and magnetic field on superconductors. (8M)

    b) Write short note on Josephson junction. (6M)