

ENGINEERING PHYSICS-I

Time : 3 Hours

Min. Passing Marks : 24

Total Marks : 80

Instruction to Candidates :

Attempt any five questions. Selecting one question from each unit. All questions carry equal marks. (Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.)

Unit-I

- (a) Explain the working of Michelson's interferometer. How circular fringes be produced with it. [3+3]
- (b) Show that michelson's interferometer is used to find the wavelength of light. [4]
- (c) Write short note on
 - Antireflection coating and
 - Interferences filters
 [3+3]

OR

- (a) Show that the diameter of n^{th} dark ring in reflected light in Newton's ring experiment is directly proportional to square root of natural numbers. [8]
- What are the conditions for obtaining
 - St. line fringes in Michelson's interferometer
 - Circular fringes in Michelson's interferometer
 [4+4]

Unit-II

- (a) What do you understand by the term 'polarization of light'. Distinguish between polarized and unpolarized light in details. [3+5]
- (b) What is meant by plane polarized, circularly polarized and elliptically polarized light. State malus law. [6+2]

OR

- (a) Define specific rotation. How will you determine it using biquartz polarimeter. [4+4]
- (b) An optical rotation of 8° occurs when plane polarized light is sent through certain length of 3% solution of glucose. If polarized light is sent through 6% solution of glucose then what length of solution is needed to produce an optical rotation of 10° . [8]

Unit-III

- Discuss the phenomenon of fraunhofer's diffraction at a single slit and derive expression for the intensity of diffracted light. Show that the relative intensity of successive maximum are nearly

$$1 : \frac{4}{9\pi^2} : \frac{4}{25\pi^2} : \frac{4}{49\pi^2} : \dots$$

[16]

OR

- A grating has 9600 lines uniformly spaced over a width of 3.00 cm and is illuminated by light from mercury vapour lamp. Find
 - dispersion in the third order in the vicinity of green line of wavelength 5460 Å
 - resolving power of grating in fifth order
 [16]

Unit-IV

- (a) Describe the formation energy bands in solids and hence explain how it helps to classify the materials into conductors and semiconductor. [4+4]
- (b) The energy gap of two intrinsic semiconductors A and B are 0.36 eV and 0.72 eV respectively. Compare the intrinsic carrier density of A to B at 300K (Given $m_h = m_e = 9 \times 10^{-31}$ kg and $2KT = 0.052$ eV) [8]

OR

- (a) Explain what is 'covalent bonding'. Explain how the force of attraction between two atoms or ions as those are brought closer. [4+4]
- (b) Define Fermi function and Fermi energy. Also explain with graph the variation of fermi function with temperature. [4+4]

Unit-V

- (a) State the postulates of special theory of relativity and deduce from those the Lorentz transformations. [2+6]
- (b) Show that the quantity $x^2 + y^2 + z^2 - c^2t^2$ is invariant under lorentz transformation. [8]

OR

- (a) Show that mass of a body moving relativistic

velocity is given by $m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}$ [8]

- (b) An observer on the earth finds that a rocket takes 2μ s to its entire length across a reference mark. If proper length of the rocket is 50 meter then what is its velocity relative to earth. [8]