1E 2003

B. Tech. (Semester I) (Main/Back) Examination, 2015

103

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'

1. (*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

(i) Antireflection coating and

(ii) Interferences filters [3+3]

OR

1. (*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

(i) St. line fringes in Michelson's interferometer

(ii) Circular fringes in Michelson's interferometer [4+4]

Unit-'II'

2. (*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

2. (*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'

3. 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

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

[16]

OR

3. A grating has 9600 lines uniformly spaced over a width of 3.00 cm and is illuminated by light from mercury vapour lamp. Find

(i) dispersion in the third order in the vicinity of green line of wavelength 5460 Å

(ii) resolving power of grating in fifth order [16]

Unit-'IV'

4. (*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 career density of A to B at 300K (Given $m_h = m_e = 9\times10^{-31}$ kg and 2KT = 0.052ev) [8]

OR

4. (*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'

5. (*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

5. (*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 2 μ 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]