

1E2003

Roll No. _____

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B. Tech I Sem. (Main/Back) Exam. Jan. 2016
103 Engineering Physics-I
Common to all Branches

Time: 3 Hours

Maximum Marks: 80
Min. Passing Marks: 24

Instructions 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.

Use of following supporting material is permitted during examination.

1. NIL

2. NIL

UNIT-I

- Q.1 (a) Describe the construction and working of Michelson interferometer. How may it be used to measure the wavelength of monochromatic light? [6+4=10]
- (b) Newton's rings are observed in reflected light of wavelength 5×10^{-5} cm. The diameter of 10th dark ring is 0.5cm. Find radius of curvature of lens and thickness of the air film at the ring. [6]

OR

- Q.1 (a) Write short notes on the following - [4+4=8]

- (i) Anti - reflection coating
- (ii) Interference filter

- (b) Explain Newton's ring method for determining the wavelength of monochromatic light. Why is the centre of the ring dark and how can we get a bright centre. [8]

UNIT-II

- Q.2 (a) Describe the construction and working of a Laurent's half shade polarimeter. [10]
- (b) Calculate the thickness of a half wave & quarter wave plate of quartz for a wavelength of $5000\text{\AA}$. Here $\mu_o = 1.553$ & $\mu_E = 1.544$. [6]

OR

- Q.2 (a) What is optical activity? Write the laws of optical activity of optically active solution. [6]
- (b) A retardation plate of thickness 8.56×10^{-7} m introduces a phase difference in the path of polarized light of wavelength of $5890\text{\AA}$. The principle refractive indices are $\mu_o = 1.658$ & $\mu_E = 1.486$. Find the nature of retardation plate. [6]
- (c) State and explain law of Malus. [4]

UNIT-III

- Q.3 (a) Derive an expression for the intensity of diffracted light in fraunhofer's diffraction due to single slit. [8]
- (b) The distance between the first and sixth minima in the diffraction pattern of a single slit is 0.5mm. The screen is 0.5m away from the slit. If the wavelength of light used is $5000\text{\AA}$, determine the slit width. [8]

OR

Q.3 (a) Explain Rayleigh Criteria of just resolution of two spectral lines of equal intensities giving suitable intensity distribution curve. Show how the resolving power of a plane transmission grating depends on -

(i) No. of ruled lines

(ii) Width of ruled space. [8]

(b) Show that the intensity of light diffraction from a plane transmission grating is given by -

$$I = I_0 \frac{\sin^2 \alpha}{\alpha^2} \left(\frac{\sin N\beta}{\sin \beta} \right)^2$$

where symbols carry their usual meaning. [8]

UNIT-IV

Q.4 (a) Explain the term bonding in crystals? What are the distinguishing characteristics of metallic bonding? [8]

(b) What is Hall Effect? Briefly discuss the physical origin of Hall effect. [8]

OR

Q.4 (a) The resistivity of doped Silicon sample is $8.9 \times 10^{-3} \Omega\text{m}$. The Hall coefficient was measured to be $3.6 \times 10^{-4} \text{ m}^3/\text{C}$. Assuming single carrier conduction, find the mobility and density of charge carriers. [8]

(b) Classify the soil as Conductor, Semiconductor and Insulator according to band structure. [8]

UNIT-V

- Q.5 (a) A Spaceship (at rest) of length 100m takes $3\mu\text{s}$ to pass an observer on earth. What is its velocity relative to the earth? [8]
- (b) Derive an expression for the variation of mass with velocity. [8]

OR

- Q.5 (a) Write short notes on relativistic time dilation and examples. [4]
- (b) State the postulates of special theory of relativity and deduce the Lorentz transformation. [8]
- (c) What is the total energy of an electron at rest, mass 9.1×10^{-31} kg moving with speed of 0.956? [4]
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