1E2003

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1E2003

B. Tech. I Semester (Main/Back) Examination, Dec. - 2018

103 Engineering Physics - I

Common to all Branch

Time : 3 Hours **Maximum Marks : 80**

Min. Passing Marks : 26

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.*

Unit - I

1. a) With the help of a neat diagram show an experimental arrangement to produce Newton's rings by reflected light. Prove that in reflected light the diameter of dark rings is proportional to the square root of the natural numbers. **(4+4)**

   b) Michelson interferometer experiment is performed with a source of light having two wavelengths 4882 A^0 and 4886 A^0. Through what distance does mirror have to be moved between two positions that fringes disappear? **(8)**

OR

1. a) Write short notes on the following: **(4+4)**

   i. Interference filter

   ii. Anti reflection coating

   b) A convex surface of radius of curvature 1.0 m rests on a concave surface of radius curvature 2.0 m. If this system is used to observe Newton's rings under light of wavelength 600nm, find the difference in the squares of diameters in successive dark and bright rings. **(8)**

Unit - II

2. a) Explain idea of circularly and elliptically polarized light in terms of electric vector associated with light. Describe Laurent's half shade polarimeter giving its theory, construction and use. **(4+4)**

   b) What are quarter wave plates? Plane polarized light is incident on a quarter wave plates, discuss under which the plane polarized, circularly polarized light and elliptically polarized light are obtained. **(2+6)**

OR

2. a) What is optical activity? Write the laws of optical active solution. **(2+2)**

   b) Discuss double refraction in calcite crystal. How can a phase retardation plate be obtained from it? **(2+2)**

   c) The refractive indices of right handed and left handed circularly polarized light of wavelength 7620 A^0 for quartz are 1.53914 and 1.53920 respectively. Calculate the rotation of the plane of polarization of light in degrees produced by a plate of 0.5 mm thickness. **(8)**

Unit - III

3. a) What is plane diffraction grating? Show that the intensity of light diffracted from a plane transmission grating is given by

   $I = I_o\left(\frac{Sin\alpha}{\alpha}\right)^2\left(\frac{SinN\beta}{\beta}\right)^2$ where the symbols have their usual meanings. **(2+6)**

   b) A source emits 531.62 nm and 531.81 nm light, **(4+4)**

      i. What minimum number of lines is required for a grating that resolves the two wavelengths in the first order spectrum.

      ii. Determine the slit spacing for a grating 1.32 cm wide that has required minimum number of lines.

OR

3. a) Explain Ray leight criterion for resolution and apply it to distinguish between resolving power and dispersive power of a grating. **(2+2)**

   b) Out line the following for a plane transmission grating **(2+2+2)**

      i. Maximum orders of spectra obtainable.

      ii. Missing orders.

      iii. Overlapping spectra.

   c) The width of the slit is 0.012 mm. Monochromatic light is incident on it. The angular position of first bright line is 5.2^0 calculate the wavelength of incident light. **(6)**

Unit - IV

4. a) Based on the band theory of solids, distinguish between conductors, semiconductors and insulators. **(9)**

b) The x-ray analysis of a crystal is made with monochromatic x-ray. Two successive Bragg's reflection are obtained at angles of

i. 13.5^0 and ii. 20.5^0.

If the interplanner spacing of crystal is 2.57Å^0, calculate the wavelength of x- rays. (7)

OR

4. a) What is Hall effect? Give an elementary theory of Hall effect. Mention some important uses of Hall effect. (2+4+4)

b) Calculate the fermi energy for sodium. Given atomic weight 23.0 gm / mole and density of sodium 0.971 gm / cm^3. (Assume one free electron / atom) (6)

Unit - V

5. a) Define inertial frame of reference and derive Lorentz transformation. (2+6)

b) Calculate the percentage contraction of rod moving with a velocity 0.8 times the velocity of light in a direction at 60^0 to its own length. (8)

OR

5. a) Write down the postulates of special theory of relativity. Using Lorentz transformations, obtain the law of addition of velocities. (2+6)

b) Show that the relativistic kinetic energy is given by $(m-m_o)c^2$ and it approaches to non relativistic energy for $v << c$. (All symbols have their usual meanings) (8)