

**1E2003****1E2003**

**B.Tech. I Semester (Main/Back) Examination, Dec. - 2016**  
**103 Engineering Physics - I**

**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. of 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.*

Calculator (Non Programmable)

**Unit - I**

1. a) How shall you measure the wavelength separation of two closely spaced spectral lines c, g, D<sub>1</sub> and D<sub>2</sub> lines of Na? Derive the formula used. (4,4)
- b) Newton's rings are formed using sodium light, between plano-convex lens and plane glass plate. What shall be the order of the ring which has twice the diameter of 20th dark ring? (4)
- c) Two  $\lambda/4$  thick layers are deposited on an ophthalmic glass ( $\mu = 1.52$ ) to reduce reflection loss. The first layer has refractive index  $\mu = 1.38$ . Find the refractive index of the material of second layer. (4)

**OR**

1. a) While measuring wavelength of light using Newton's rings why
  - i) Higher order rings are used? (4)
  - ii) The center of ring system is chosen to be dark? (4)
- b) Calculate the distance between two successive positions of movable mirror of Michelson's interferometer giving distinct fringes in case of sodium light having wavelengths  $5890 \text{ \AA}$  and  $5896 \text{ \AA}$ . (4)
- c) In Newton's ring experiment the diameters of 15th and 5th rings are measured to be respectively, 0.59 cm and 0.336 cm. If radius of curvature of the plano-convex lens be 1.0m, calculate the wavelength of light used. (4)

## Unit - II

2. a) Explain construction and working of a quarter wave plate. (4,4)
- b) 5% solution of cane sugar of length 40 cm causes an optical rotation of  $20^\circ$ . How much length of 10% solution shall cause  $35^\circ$  rotation? (4)
- c) A plane polarized light is incident on the following phase retardation plates at an angle  $30^\circ$  with optic axis what will be the state of polarization of the outgoing light?
- i) QWP (2)
- ii) HWP. (2)

## OR

2. a) Define specific rotation. On what factors does it depend. How shall you measure specific rotation of glucose solution using biquartz polarimeter. (1,1,6)
- b) Evaluate state of polarization of the following wave whose electric field is given by,  $\vec{E} = \hat{j} a \cos(kx - wt) + \hat{k} b \sin(kx - wt)$  (4)
- c) How shall you discriminate two sources identical in appearance, one is elliptically polarized and the other is mixture of circularly polarized and plane polarized. (4)

## Unit - III

3. a) The intensity of light on diffraction through single slit is given by (Donot derive it)  $I = I_0 \left( \frac{\sin \alpha}{\alpha} \right)^2$ ,  $\alpha = \frac{\pi}{\lambda} a \sin \theta$  where symbols have their usual meanings.
- i) Find positions of maxima and minima (6)
- ii) Show that central maximum has angular width  $\frac{2\lambda}{a}$  (2)
- iii) Find the intensities of successive maxima. (4)
- b) The wavelengths of sodium  $D_1$ ,  $D_2$  lines are respectively,  $5895.93 \text{ \AA}$  and  $5889.99 \text{ \AA}$ . What is minimum number of lines plane transmission grating must have, to resolve these lines in first order. (4)

## OR

3. a) Explain, how does grating forms a spectrum of composite light falling normally on it. (8)
- b) A diffraction grating used at normal incidence, gives green light of wavelength

$\lambda_1 = 5400 \text{ \AA}$  in certain order coincident with violet line of wavelength  $\lambda_2 = 4050 \text{ \AA}$  in next higher order. If angle of diffraction be  $30^\circ$ , how many lines are there per centimeter width of the grating. (8)

#### Unit - IV

4. a) How shall you determine energy band gap of a semiconductor in the laboratory? (8)
- b) Why diamond is a insulator and graphite is a conductor. (4)
- c) Mica is an electric conductor but thermal insulator why? (4)

#### OR

4. a) Why x-rays are diffracted from crystals? Derive Bragg's law. (2,6)
- b) State what is Hall effect. What does positive Hall effect indicate? (2,2)
- c) The number of *si* atoms per  $\text{m}^3$  is  $5 \times 10^{28}$ . This is doped with *As*,  $5 \times 10^{22} \text{ m}^3$ . Given  $n_i = 1.5 \times 10^{16}$  per  $\text{m}^3$ , find hole concentration if donar is completely ionized. (4)

#### Unit - V

5. a) Write postulates of special theory of relativity. (4)
- b) What is time dilation? Through an experiment, how can it be verified. (8)
- c) At what velocity the mass of a moving electron will be doubled? (4)

#### OR

5. a) A particle is moving with relativistic velocity 'v' find (4,4)
- i) Kinetic energy
- ii) Show graphically the increase in mass.
- b) A cube of side 'a' is moving with velocity  $v = 0.8 C$ ,  $C$  being velocity of light. find the volume of the cube as observed by the observer at rest in laboratory (4)
- c) The mass of an electron is  $9.1 \times 10^{-31} \text{ kg}$ . What is equivalent energy of electron in Mev. (4)

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