

1E2003

Roll No. _____

[Total No. of Pages : 3]

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 e, g, D_1 and D_2 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 \AA and 5896 \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° . How much length of 10% solution shall cause 35° rotation? (4)
- c) A plane polarized light is incident on the following phase retardation plates at an angle 30° 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 \AA and 5889.99 \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° , 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 m^3 is 5×10^{28} . This is doped with *As*, $5 \times 10^{22} \text{ m}^3$. Given $n_i = 1.5 \times 10^{16}$ per 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)

* * * *