B.Sc. Semester–V
Physics –Paper: 502 (Code: 4295)
(Electrostatic, Fiber Optics, X-ray)
April-2016

Date:
[Time: 02:30 Hours]   [Total Marks: 70]

Instructions: (1) Symbols have their usual meaning.
                 (2) Figures on right hand side show marks of that question.

1. (a) Explain the polarization of polar-molecules and derive formula for net [12]

   polarization, $\vec{P_T} = \alpha_T \vec{E_{in}}$, where $\alpha_T = \alpha_i + \dfrac{P_p^2}{3kT}$

(b) Explain the term: Isotropic and anisotropic dielectric.   [02]

OR

1. (a) Define electric field intensity E, Polarization P and electric displacement
       Vector D. Establish relation between them.   [10]

  (b) Consider an electric charge -e moving in a circular orbit of radius a_0,   [04]
      about charge +e in a field directed at right angles to the plane of the
      orbit. Show that the polarizability α is approximately $4\pi\varepsilon_0 a_0^3$.

2. (a) What is molecular field? Derive equation of Clausius-Mossotti relation. [12]

   (b) Define the relative permittivity.   [02]

OR

2. (a) Write note on dispersion effect in fiber.   [10]

   (b) Explain Double cladded fiber index profile.   [04]

3. (a) Explain the principle of light transmission in a fiber and derive an   [12]
        expression for the numerical aperture of fiber optical system

(b) An optical fiber is made of glass with a reflective index of 1.56 and is clad with another glass with a refractive index 1.52. Launching takes place from air. Find acceptance angle and acceptanceccone. **[02]**

<div align="center">OR</div>

3. (a) Describe various modes of propagation of the wave in optical fiber. **[12]**

(b) Calculate the induced dipole moment per unit volume of helium gas placed in an electric field of 6×10^5volt/m. The molecular polarizability is 2.33×10^{-41} farad.m^2 and the density of helium is20.6×10^{25}molecules/m^3. **[02]**

4 .(a) Discuss characteristic absorption X-ray spectrum with graph of mass absorption co-efficient of the material (μ/ρ) against the wavelength (λ). **[08]**

(b) Describe the application of X-rays. **[06]**

<div align="center">OR</div>

4. (a) Explain incoherent scattering and derive equation for 'Compton shift'. Obtain relationship between θ and $\emptyset$. **[12]**

(b) Calculate the value of Plank's constant h from the experimental data in which X-rays of $1.377A^0$ wavelength from Cu target in X-ray tube produced at an operating tube voltage of 9000 volts. **[02]**

5. (a) Write notes on"Moseley's law and it's explaination". **[08]**

(b) Give the advantages of optical fiber. **[06]**

<div align="center">OR</div>

5. (a) Explain an Auger effect. **[08]**

(b) Write notes on scattering loss in fiber. **[06]**