B. Sc. (Physics) Semester – V

Paper – 502 (Subject Code : 4295) : Electrostatics , Fiber Optics , X-ray

Time: 2-30 Hours] March – 2015 **[Total Marks70**

Instructions: 1. Symbols have their usual meaning.

2. Figures on right hand side show marks of that question.

1. (a) Discuss the Potential and field inside due to a Polarized sphere of radius R. [07]

(b) Discuss the validity of Claussius-Mossotti relation for Non-Polar molecule [07]

OR

1. (a) Discuss the behavior of point charge in dielectric medium and show that the electric field in a dielectric is smaller than when medium were absent. [07]

(b) The polarization of NH3 molecule is found approximately by the measurement of dielectric constant as 2.42 X 10^{-39} Coulomb^2 .m.newton^{-1} and 1.74 X 10^{-39} Coulomb^2 .m.newton^{-1} at 300 °K and 500 °K respectively, Calculate the polarizability due to permanent dipole moment and due to deformation of molecules for each temperature. [04]

(c) Explain the terms : Anisotropic Di-electric & non polar Di-electric [03]

2. (a) Explain different types of Fiber Index profile. [07]

(b) An In an optical fiber, the refractive indices of Core & Cladding materials are 1.7 and 1.4 respectively, calculate the Critical angle and value of acceptance cone. [04]

(c) Explain the term: " Total internal reflection " How is it used in Optical fiber ? [03]

OR

2. (a) Explain different types of losses in fiber. [07]

(b) Discuss the advantages and disadvantages of Optical fiber. [07]

3. (a) What is scattering? Explain coherent & incoherent scattering. [05]

(b) What is Compton effect ?derive equation for " Compton shift ", also obtain relationship between θ & φ. [07]

(c) Calculate the minimum voltage that must be applied to an X-ray tube to produce X-ray photon of $\lambda = 3.5$ Å [02]

OR

3. (a) Write notes on : " Auger effect " [07]

(b) Calculate the value of Plank's constant h from the experimental data in which X-rays of 1.377 Å wavelength from Cu target in an X-ray tube produced at an operating tube voltage of 9000 Volts. [03]

(c) Write note on : A close survey of emission spectra. [04]

4. (a) Explain the polarization of polar- molecules and derive formula for net polarization. [07]

(b) Write Moseley's law and explain it on the basis of Bohr Atom Model. [07]

OR

4. (a) Discuss Characteristic absorption X-ray spectrum with graph of mass absorption coefficient of the material (μ/ρ) against the wavelength (λ) . [07]

(b) Discuss the behavior of point charge in dielectric medium and show that the electric field in a dielectric is smaller than when medium were absent. [07]

5. (a) Describe various applications of optical fiber. [07]

(b) Explain the terms : ' Free charge density & bound charge density 'Show that bound charge density is always less than free charge density. [07]

OR

5. (a) Discuss the polarization of polar molecules, how it differs from polarization of non polar molecules. Write Clausius - Mossotti relation and obtain Debye's relation for Polar molecule. [09]

(b) Compare Optical spectra and X-ray spectra [05]

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