Third Year B.Sc. Examination

Physics: Paper-302

OCt-2017

(Electrostatics, Electrodynamics, Laser, Fiber Optics, X-rays)

Time: *2* Hours] **[Total Marks: 75**

Code → 8938

Instructions: (i) Symbols have their usual meaning.

(ii) Figures on right hand side show marks of that question.

Q-1

(a). Derive relation between Electric field intensity ($\vec{E}$) , Polarisation ($\vec{P}$) & Electric displacement Vector ($\vec{D}$). **(10)**

(b). Explain with the help of Debye's modification of Claussius relation, the method to study the molecular structure. **(06)**

(c). Calculate the induced dipole moment per unit volume of He gas placed in an electric field of 5×10^{3}Volt/cm.(The molecular polarizability is 2.33×10^{-41} farad.m^2 and density of He gas is 20.6×10^{25}molecules/m^3. **(03)**

Q. 1

OR

(a). Derive Biot-Savart's law. **(10)**

(b). Prove that $\vec{\nabla}\cdot\vec{B} = 0$. **(06)**

(c). Define current density and derive Ohm's law in terms of current density. **(03)**

Q-2

(a). Discuss the propagation of electromagnetic waves in ionized media. Derive the formulae of (i) Wave propagation vector (Phase constant)
(ii) Phase Velocity v_p
(iii) Plasma frequency
and (iv) Refractive index of ionized gas (Plasma) **(10)**

(b). Prove that tangential component of magnetic intensity is continuous across the surface separating two dielectrics. **(06)**

(c). Write Maxwell's equation in linear isotropic media. **(03)**

(P.T.O.)

Q. 2

OR

(a). Discuss propagation of plane electromagnetic waves in ionized gas and derive the formula of conductivity $\sigma = -\frac{jNe^2}{m\omega}$ in an ionized media. **(10)**

(b). Prove that the tangential component of electric field intensity is continuous across boundary. **(06)**

(c). Write Maxwell's equations in free space. **(03)**

Q-3

(a). Justify with example that in order to achieve LASER action there must be at least three energy levels. **(07)**

(b). Discuss Auger effect in detail. **(10)**

(c). Define stimulated emission. **(02)**

Q. 3

OR

(a). Write short note on : Uses of LASER . **(07)**

(b). Explain Construction and working of He-Ne LASER . **(10)**

(c). Define population inversion. **(02)**

Q-4

(a). Explain the principle of light transmission in a optical fiber. Derive the formula for the Numerical aperture (NA) and explain acceptance angle and acceptance cone. **(12)**

(b). Explain various modes of propagation in optical fiber. **(06)**

Q. 4

OR

(a). Write in detail on optical fiber losses. **(11)**

(b). Explain uses of optical fiber. **(07)**