Q.P.Code: 38369

Time: 3 Hours **Total Marks – 80**

N.B: (1) Q. No. 1 is compulsory
(2) Attempt **any three** out of remaining questions
(3) Figures to right indicate full marks & assume data wherever necessary

Q1 Attempt **any four** out of the following **(20)**

(a) State and explain Gauss law of electrostatics.

(b) Explain point form of continuity equation.

(c) State and explain Lorentz force equation.

(d) Find force on Q_2=200μc at P_1 (0, 4, 0) due to Q_1 = -150μc at P_2 (-3, 0, 0) in free space.

(e) Define characteristics impedance and propagation constant.

Q2 (a) Prove that the tangential component of E is continuous across a dielectrics Interface and D is discontinuous **(10)**

(b) $\mathbf{D}= (10r^3 /4)\ \mathbf{a_r}\ (c/m^2)$ in cylindrical co-ordinates. Evaluate both sides of divergence theorem for the volume enclosed by r=1 and r=2m, z=0 and z=10m. Calculate the outward flux. **(10)**

Q3 (a) Explain magnetic scalar and vector potentials and derive the expression for them **(10)**

(b) Current density $\mathbf{J}=10^2 \sin\theta\ \mathbf{a_r}\ A/m^2$ in spherical co-ordinate. **(10)**
Find current crossing the spherical shell of radius r=0.02m

Q4 (a) Define inductance and mutual inductance. Derive inductance of solenoid **(10)**

(b) Find the potential variation, e-field and capacitance between two spherical shells of radius a and b. When inner shell placed at a potential V_o and outer shell is grounded. **(10)**

Q6 (a) Define uniform plane wave and derive the expression for lossy dielectrics. **(10)**

(b) Given $\mathbf{E}$= Em sin (wt-βz) $\mathbf{a_y}$, in free space. Find **D, H, B** at t=0 **(10)**

Q7 (a) A 300 MHz plane wave propagates through fresh water (σ=0) μr=1, ε_r =78. Calculate η, v, λ, β, alpha and delta. **(10)**

(b) State Maxwell's equation in AC and DC form. **(10)**

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