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TE Electrical, V CBGS 18·11·14

Electromagn. Field & Waves

Q.P. Code : **14812**

(3 Hours) [Total Marks : 80

N.B. : (1) Question No. **1** is **compulsory**.
(2) Answer any **three** from the remaining **five** questions
(3) **Figures** to the **right** indicate **full** marks.

1 Solve any **four**:- 20

(a) Define, explain and give an example on divergence and curl.
(b) State and derive relationship between electric intensity and electric potential.
(c) What is Lorentz force equation for a moving charge? Enlist two applications.
(d) 'Magnetic field has nonexistence of monopole.' Justify the statement.
(e) Classify and explain different types of current densities.

2. (a) Derive an electric field intensity due to an infinite plane having density $\rho_s(C/m^2)$. **10**

(b) Two point charges of equal mass m, charge Q are suspended at a common point by two threads of negligible mass and length l. Show that at equilibrium the inclination angle a of each thread to the vertical is given by $Q^2 = 16\pi\varepsilon_0 : mgl^2 \sin^2\alpha \tan\alpha$ **10**

If a is very small, show that $\alpha = 3\sqrt{\frac{Q^2}{16\pi\varepsilon mgl^2}}$

3. (a) A current sheet $\bar{K} = 6a_x$ A/m, lies in the z=0 plane and current filament is located at y = 0, z = 4 m. Determine current and its direction if $\bar{H} = 0$ at (0,0,1.5)m. **10**

(b) Derive Magnetic Field intensity due to finite and infinite wire carrying a current I. **10**

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

(b) Region I, for which $\mu_{r1}=3$, is defined for $x < 0$ and region II, $x > 0$ has $\mu_{r2} = 5$. Given that $\bar{H}_1 = \overline{4a_x} + \overline{3a_y} - \overline{6a_2}$ (Aim). Find θ_2 and $\bar{H}_2$. **10**

5. Explain Maxwell's equation in the time and frequency domain. **10**

Given $\bar{H} = H_m e^{j(\omega t+\beta z)}\overline{a_x}$ in free space, find $\bar{E}$.

6. (a) Derive wave equation and explain changes in wave with different media. **10**

(b) Determine the propagation constant g for a material having $\mu_r = 1$, $\varepsilon_r = 8$ and $\sigma = 0.25$ pS/m, if the wave frequency is 1.6 MHz.

GN-Con. 5635-14.