

(Following Paper ID and Roll No. to be filled in your Answer Book)

PAPER ID : 2110

Roll No.

081612100C

B.Tech.(SEM. V) ODD SEMESTER THEORY EXAMINATION
2010-11**FUNDAMENTALS OF E.M.THEORY**

Time : 2 Hours

Total Marks : 50

Note : Attempt all questions.

1. Attempt any **four** of the following : (5×4=20)

- (a) State and prove divergence theorem.
- (b) Given two vectors $R_A = -a_x - 3a_y - 4a_z$, $R_B = 2a_x + 2a_y + 2a_z$ and C(1,3,4). Find :
- R_{AB}
 - $|R_A|$
 - a_A
 - a_B
 - Unit vector directed from C toward A.
- (c) Derive an expression of energy density in electrostatic field.
- (d) The potential in free space is given by :
- $$V = (50/r), a < r < b \text{ (spherical)}$$
- Show $\rho_v = 0$ for $a < r < b$
 - Find the energy stored in region $a < r < b$.

(e) Define scalar field and vector field with suitable example.

(f) Discuss different coordinate system. Show various parameter with diagram.

2. Attempt any **two** of the following : (5×2=10)

(a) Discuss electrostatic boundary condition between conductor and free space.

(b) Define continuity equation in point form and integral form.

(c) A capacitor with two dielectric is as follows :

Plate areas = 100 cm², dielectric 1 thickness = 3 mm, $\epsilon_{r1} = 3$, dielectric 2 thickness = 2 mm, $\epsilon_{r2} = 2$, if the potential of 100 V is applied across plate. Find the energy stored in each dielectric & potential gradient in each dielectric.

3. Attempt any **two** of the following : (5×2=10)

(a) Derive Maxwell's equation from Faraday's law and Ampere circuital law.

(b) A current element $I_1 \Delta L_1 = 10^{-5} a_z$ AM is located at $P_1(1,0,0)$ while a second element $I_2 \Delta L_2 = 10^{-5}(0.6a_x - 2a_y + 3a_z)$ AM is located at $P_2(-1,0,0)$ both in free space. Find the vector force on element 2 by element 1.

(c) Derive an expression of magnetic field intensity due to infinite long straight conductor using Ampere's circuital law.

4. Attempt any **two** of the following : (5×2=10)

(a) Derive the condition for polarization of uniform plane wave.

Write a short note on linear polarization of uniform plane wave.

(b) Derive an expression of uniform plane wave in free space and good conductor.

(c) A medium is characterized by $\epsilon_r = 2.5$, $\mu_r = 4$, $\sigma = 10^{-3}$ S/m at frequency of 10 MHz.

Find :

(i) Attenuation constant

(ii) Phase constant

(iii) Propagation constant

(iv) Velocity of propagation

(v) Intrinsic impedance.