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

Paper ID : 131407

B.TECH.

Theory Examination (Semester-IV) 2015-16

ELECTROMAGNETIC FIELD THEORY (EMFT)

Time : 3 Hours *Max. Marks : 100*

Section-A

Q1. Attempt all parts. All carry equal marks. Write answer of each part in short. (10×2=20)

(a) Find shape intersection surface where $p=2$, $z=1$ intersect each other.

(b) Define and derive divergence theorem for a vector.

(c) State point form of ohms law & Gauss's Law.

(d) Find electric field density for infinite line charge using Gauss's law.

(e) Explain Biot-Savart's Law.

(f) Write difference between magnetic and electric dipole.

(g) Define reflection coefficient of a plane wave at normal incidence.

(h) Explain the significance of loss tangent.

(i) Mention the properties of uniform plane wave.

(j) Define Laplace's equation for electric field.

Section-B

Q2. Attempt any five questions from this section. **(10×5=50)**

(a) Transform vector $A = y\hat{a}_x + (x+z)\hat{a}_y$ it into spherical coordinates system. Also evaluate it's value at P(-2, 6, 3).

(b) Find expression for electric field intensity for an infinite sheet charge.

(c) Define and derive Laplace's equation for electric field.

(d) Discuss Polarization in dielectric medium.

(e) Three point charges- $1nC$, $4nC$, $3nC$ are located at (0,0,0), (0,0,1), (1,0,0) find energy in the system.

(f) Derive continuity current equation. Also define relaxation time.

(g) Prove that magneto static energy is given by

$$W_m = \frac{1}{2}\int_V \varepsilon H^2 dv.$$

(h) What do you mean by displacement current also derive Ampere's law for time varying field.

Section-C

Note: Attempt any two questions from this section.

(15×2=30)

Q3. State and prove divergence theorem. Determine the flux over the closed surface of cylinder $0<z<1$, $p=4$ if $D=p^2 \cos 2(\varphi)\, \hat{a}_p + z \sin\varphi\, \hat{a}_\varphi$. Verify the divergence theorem for above mentioned case.

Q4. (i) Write down Maxwell's equation in all forms for static, dynamic and time harmonic fields with their significance.

(ii) Calculate electric field intensity due to continuous infinitely long sheet charge having line charge density p_s C/m^2.

Q5. State and prove boundary condition at interfaces for magneto static fields. Given that H1 = -2 $\hat{a}_x + 6\hat{a}_y + 4\hat{a}_x A/m$ in region y-x-2<0 where $\mu 1 = 5\mu_0$ calculate

(a) M1,B1

(b) H2 and B2 in region y-x-2>0 where $\mu 2 = 2\mu_0$.