

(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
- $$W_m = \frac{1}{2} \int_V \epsilon H^2 dv.$$
- (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 ρ_s C/m².

Q5. State and prove boundary condition at interfaces for magneto static fields. Given that $H_1 = -2 \hat{a}_x + 6 \hat{a}_y + 4 \hat{a}_z$ A/m in region $y-x-2 < 0$ where $\mu_1 = 5\mu_0$ calculate

(a) M_1, B_1

(b) H_2 and B_2 in region $y-x-2 > 0$ where $\mu_2 = 2\mu_0$.

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