Printed Pages : 2

EEC508

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

PAPER ID : 2110

Roll No.

B.Tech

(SEMESTER-V) THEORY EXAMINATION, 2012-13

FUNDAMENTALS OF E.M. THEORY

Time : 2 Hours]

[Total Marks : 50

Note : This questions paper has **three** sections. Section I is compulsory.

Section – I

1. Attempt **all** parts of the following : **10 × 1 = 10**

   (i) Define Coulomb's law.

   (ii) Define electric field intensity.

   (iii) Write Poisson's and Laplace's equations.

   (iv) Write the boundary conditions at the interface between two perfect dielectrics.

   (v) Mention the properties of uniform plane waves.

   (vi) Define Poyntings theorem.

   (vii) State Maxwell's fourth equation.

   (viii) What will happen when the wave is incident obliquely over dielectric-dielectric boundary ?

   (ix) Define imperfect dielectrics.

   (x) Why water has much greater dielectric constant than mica ?

Section – II

2. Attempt **three** parts from this section : **3 × 5 = 15**

   (a) Derive an expression for displacement and conduction current densities. Also obtain an expression for continuity current relation.

   (b) Briefly explain reflection by a perfect dielectric when a wave is incident normally on a perfect conductor.

(c) State and explain Faraday and Lenz law of induction and derive Maxwells' equation.

(d) Derive an expression for energy and energy density in a magnetic field.

(e) The electric vector E of an electromagnetic wave in free space is given by the expression

$Ex = Ez = 0$, $Ey = A \cdot \cos w \left(t - \frac{2}{c}\right)$ using Maxwell's equations for free space conditions determine expressions for the components of the magnetic vector H.

Section – III

Note : Attempt **all** parts of the following : **5 × 5 = 25**

3. Four positive charges of 10^{-9} C each are situated in XY plane at points (0, 0), (0, 1), (1, 0) and (1, 1). Find electric field intensity and potential at $\left(\frac{1}{2}, \frac{1}{2}\right)$.

4. What do you mean by uniform plane waves ? Derive for intrinsic impedance of free space is $\eta_0 = \sqrt{\frac{\mu_0}{\epsilon_0}} = 377 = 120\pi\ \Omega$.

5. What do you mean by displacement current ? Derive.

$$\nabla \times H = J + \frac{\partial D}{\partial t}$$

6. What do you mean by plane wave dispersion ? Explain in detail.

7. Explain the nature and behaviour of magnetic material. Write Laplace's and Poisson's equations for steady magnetic field.
