Registration No. :

Sixth Semester (special / Back) Examination – 2013

ELECTROMAGNETIC THEORY

BRANCH : ELECTRICAL

QUESTION CODE : E 313

Full Marks – 70

Time : 3 Hours

Answer Question No. **1** *which is compulsory and any* **five** *from the rest.*
The figures in the right-hand margin indicate marks.

2×10

1. Answer the following questions :

   (a) What does curl of a vector signify ?

   (b) State Gauss's law for electric field.

   (c) State Uniqueness theorem. What is its significance ?

   (d) Define Laplacian of a scalar.

   (e) State Faraday's Law in differential form.

   (f) Define magnetic dipole moment? Give its unit.

   (g) What is electric scalar potential ?

   (h) What is motional emf ?

   (i) Mention two properties of the uniform plane wave in a dissipative medium.

   (j) Give the significance of characteristic impedance.

2. (a) Find the potential at any point along the axis of a uniformly charged disc of $\sigma \, C/m^2$. The disc has radius of 'a' meter.   5

   (b) Explain the term potential gradient and establish the relation $E = -\nabla V$.   5

P.T.O.

3. (a) State and prove Divergence theorem. 5

(b) The radius of the inner conductor of a co-axial line is 'a' and that of the outer conductor is 'b'. The potential of the inner conductor is V_a and that of the outer conductor is V_b. There is no volume charge density between 'b' and 'a'. Start from the Laplace equation to obtain the potential in the co-axial line. 5

4. (a) Deduce the Biot-Savart Law from Ampere's Circuital Law. 5

(b) Establish the relation $\bar{\nabla} \times \bar{H} = \bar{J}$. 5

5. (a) Derive Biot-Savart's law from Ampere's law. 5

(b) Explain how method of images is used in solving Poisson's equation. 5

6. (a) Differentiate conduction and displacement current. Derive these currents. 5

(b) State Maxwell's equation in point form applicable for steady electric and magnetic field, convert these equations into integral form. Hence modify static field equation under time varying conditions. 5

7. (a) Deduce the equation of the propagation of the plane electromagnetic waves in lossy dielectrics. 5

(b) Explain moment method as applied to the electromagnetic wave propagation equation. 5

8. Write short notes on any **two** of the following : 5×2

(a) Stoke's theorem

(b) Energy density in Electrostatic field

(c) Maxwell's equation for static field

(d) Poynting vector.