Registration No. :

Total number of printed pages – 2

Sixth Semester Regular Examination – 2015

ELECTROMAGNETIC THEORY

BRANCH : ELECTRICAL

QUESTION CODE : J 205

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.

1. Answer the following questions :   2 ×10

    (a) Mention the importance of a unit vector.

    (b) Mention the conditions for the field to be irrotational.

    (c) Differentiate between conduction current and displacement current.

    (d) Find out the gradient of a scalar $\emptyset = x^2 + y^2 + 2xz$

    (e) State the Stokes's theorem. What do you infer from it ?

    (f) Write Laplace's equation in cylindrical coordinates.

    (g) What do you mean by homogeneous and isotropic medium ?

    (h) Mention the importance of a unit vector.

    (i) What is the physical definition of the curl of a vector field ?

    (j) How the electromagnetic waves propagate through the wave guide ?

2. (a) Deduce the Maxwell's equation for sinusoidal time varying fields.   5

    (b) Given $\bar{A} = \hat{x}(2x + 3y) - \hat{y}(2y + 3z) + \hat{z}(3x - y)$ Determine the unit vector parallel to $\bar{A}$ at point P(1, -1, 2)   5

3. Write different form of Maxwell's equation. Are all four Maxwell's equations independent ? Explain. 10

4. (a) Justify that the net Electric field within a conductor is always zero. 5

   (b) State and prove the Gauss's theorem. Explain why it is called the divergence theorem. 5

5. (a) Find a mathematical expression for electrostatics in terms of field quantities. 5

   (b) State Coulomb's law. Four like charges of $30\mu C$ each are located at the four corners of a square, the diagonal measures 8m. Find the force on a $100\ \mu C$ located at 3m above the centre of the square. 5

6. (a) Differentiate between linear, elliptical and circular polarization. 5

   (b) State and explain Biot-Savart's Law. 5

7. (a) Starting with Ampere's law, derive Maxwell's equation in integral form. 5

   (b) Discuss the Cartesian coordinate system. 5

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

   (a) Magnetic vector potential.

   (b) Pointing Theorem.

   (c) Divergence Theorem

   (d) Static and Time varying fields.