Code: EE3T5

II B.Tech - I Semester–Regular/Supplementary Examinations
November 2016

ELECTROMAGNETIC FIELDS
(ELECTRICAL AND ELECTRONICS ENGINEERING)

Duration: 3 hours   Max. Marks: 70

PART – A

Answer *all* the questions.   All questions carry equal marks
$$11x\ 2 = 22\ M$$

1.
   a) Define Potential difference.
   b) Name the various electric charge distributions.
   c) List out the properties of conducting materials.
   d) Define polarization in dielectric materials.
   e) Distinguish between convection and conduction currents.
   f) State ampere's circuital law.
   g) Define mutual inductance and write the expression for it.
   h) Write the expression for force on a differential current element in magnetic fields.
   i) Define displacement current.
   j) Write Maxwell's I equation and II equation for time varying fields.
   k) What is an Amperian path?

PART – B

Answer any ***THREE*** questions. All questions carry equal marks.

$$3 \text{ x } 16 = 48 \text{ M}$$

2.

  a) State and explain Gauss law in both point form and integral form.   **8 M**

  b) A charge of 0.5µC is located at A(30, -25, 15)cm and a second charge of 0.8µC is located at B(12, -8, 10)cm. Find the electric field strength at

    i) origin   ii) point P (15, 20, 50)cm.   **8 M**

3.

  a) Derive the expressions for potential and electric field intensity due to a dipole.   **8 M**

  b) If $V=3x^2y+2yz^2+2xyz$ Volts, find Electric field intensity at (1, 2, 1)m and the energy stored in a cube of side 2 m centred at the origin.   **8 M**

4.

  a) Using Ampere's circuital Law obtain an expression for magnetic field strength due to infinitely long straight current carrying conductor.   **8 M**

  b) A wire of length L is formed into i) circle and ii) equilateral triangle. For the same current I, find the magnetic field strength at the centre of each.   **8 M**

5.
   a) Obtain the expression for torque on a current loop placed in a magnetic field.   8 M

   b) A point charge of Q = -1.2C has velocity $\vec{V} = (5\bar{a}_x + 2\bar{a}_y - 3\bar{a}_z)\ m/s$. Find the magnitude of the force exerted on the charge if,
   i)$\vec{E} = (-18\bar{a}_x + 5\bar{a}_y - 10\bar{a}_z)\ V/m$,
   ii) $\vec{B} = (-4\bar{a}_x + 4\bar{a}_y + 3\bar{a}_z)\ T$.
   iii) both are present simultaneously   8 M

6.
   a) Derive the Maxwell's curl equations of Electric field and Magnetic field for time harmonic case.   8 M

   b) Explain the following
   i) Motional EMF   ii) Transformer EMF   8 M