B.E. (Full Time) DEGREE END SEMESTER EXAMINATIONS APRIL/MAY.2014
COLLEGE OF ENGINEERING GUINDY CAMPUS,ANNA UNIVERISTY,CHENNAI

**BRANCH : ELECTRICAL AND ELECTRONICS ENGINEERING**
**Third Semester**
**EE 8302 Electromagnetic Theory**
**(Regulations 2012)**

**Time: 3 Hours**                 Answer ALL questions                 **Max. Marks: 100**

## PART – A (10 x 2 = 20 Marks)

1. Show that the following vectors are orthogonal.
   $\bar{A} = 4\bar{a}_x + 6\bar{a}_y - 2\bar{a}_z$ and $\bar{B} = -2\bar{a}_x + 4\bar{a}_y + 8\bar{a}_z$.

2. Express in matrix form the unit vector transformation from the rectangular to cylindrical co-ordinate system.

3. What is Lorentz's Force?

4. Find charge in the volume defined by $0 \le x \le 1m$, $0 \le y \le 1m$ and $0 \le z \le 1m$ if $\rho_v = 60xy^2 C/m^3$.

5. Two current carrying wires carry $I_1$ and $I_2$ in opposite direction, determine the force between them assuming a separation 'd'.

6. Give four similarities between electrostatic and magnetic field.

7. Define mutual inductance.

8. Distinguish between transformer emf and motional emf.

9. Can a uniform plane wave exist in real life?

10. What are the wavelength and frequency of a wave propagation in free space when $\beta = 2$?

## PART – B (5 x 16 = 80 Marks)

11. Using fundamental Laws obtain the set of Maxwell's equation in integral and difference form for free space.                 **(16)**

12. a.  (i)  State and prove Stoke's theorem.                 **(8)**
        (ii) If $\bar{F} = (2z + 5) a_x + (3x - 2) a_y + (4x - 1)a_z$ verify the Stoke's theorem over the hemisphere $x^2 + y^2 + z^2 = 4$ and $z \ge 0$.                 **(8)**

(OR)

    b.  (i)  Show that over the closed surface of a sphere of radius b, $\oint ds = 0$.   **(6)**
        (ii) Show that the vector $\bar{E} = (6xy + z^3)\bar{a}_x + (3x^2 - z) \bar{a}y + (3xz^2 - y)\bar{a}_z$ is irrotational and Find its scalar potential.                 **(10)**

13. a. (i) A positive point charge $100 \times 10^{-12}$C is located in air at $x = 0$, $0.1$m and another such charge at $x = 0$, $y = -0.1$m. What is the magnitude and direction of **E**? **(6)**

   (ii) Obtain an expression for energy stored in an electric field and hence find the energy density. **(10)**

(OR)

   b. Explain the polarization and thus obtain electric field intensity and potential of a dipole. **(16)**

14. a. Obtain an expression for magnetic flux density and magnetic field intensity at any point along the axis of circular coil. **(16)**

(OR)

   b. Obtain an expression for inductances and torque on a long solenoid coil. **(16)**

15. a. (i) State Poynting theorem and thus obtain an expression for instantaneous power density vector associated with electromagnetic field. **(12)**

   (ii) A plane wave travelling in air is normally incident on a block of paraffin with $\in_r = 2.2$. Find the reflection coefficient. **(4)**

(OR)

   b. Obtain an expression for electromagnetic wave propagation in lossy dielectrics. **(16)**