Code No: NR210204 **NR**

II B.Tech I Semester Supplementary Examinations, May 2005
ELECTROMAGNETIC FIELDS
(Electrical & Electronic Engineering)

Time: 3 hours **Max Marks: 80**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Find the total charge in a volume defined by six planes for which $1 \leq x \leq 2$, $2 \leq y \leq 3$, and $3 \leq z \leq 4$ if $D = 4xI_x + 3x^2I_y + 2z^3I_z$ C/m^2 .
   (b) Three equal charge of 1 micro coulomb are placed at corner of a square of length 10 cm. Find the direction and magnitude of E at vacant corner.

2. (a) Derive the expression for potential and field between two co-axial cylinders.
   (b) Find the capacitance of parallel plate capacitor when A = 1sq mt distance between the plate 1 mm voltage gradient is $10^5\, V/m$ and charge density on the plate is $2\,\mu C/m^2$.

3. (a) Derive the integral form of continuity equation and also write its meaning.
   (b) What is the Capacitance of a Capacitor consisting of two parallel plates 30 cm by 30 cm, Separated by 5 mm in air. What is the energy stored by the capacitor if it is charged to a potential difference of 500 volts.

4. (a) Derive an expression for force per meter length between two straight long parallel wires situated in space, separated by a distance 'd' m carrying a steady current of I amp. in the opposite direction.
   (b) Two long straight parallel wires in air 2 m apart carry currents I_1 & I_2 in same direction. The field intensity H at mid way is 7.5 AT/m. If the force on each wire per unit length is $2.5 \times 10^{-4} N$, Determine the values of I_1 & I_2.

5. A single-phase circuit comprises two parallel conductors A and B, each 1 cm diameter and spaced 1 m apart. The conductors carry current of +100 and -100 Amps. respectively. Determine the filed intensity at the surface of each conductor and also in space exactly midway between A and B.

6. A torroid is made up of two semicircular rings of iron and steel held together tightly. Cross sectional area of each part is 5 sq.cm and mean radius of torroid is 20 cm. Relative permeabilities of steel and iron are respectively 2000 and 500. The exciting coil has 500 turns. Find inductance of the system.

7. (a) Write down Maxwell's equations in their general integral form. Derive the corresponding equations for fields varying harmonically with time.
   (b) Show that the ration of the amplitude of the conduction current and displacement current density is $\frac{\sigma}{\omega\varepsilon}$for the applied field $E = E_{max}$ Cos wt V/m.

8. (a) Derive the wave equation for a conducting medium.

(b) A plane-traveling wave in free space has an average poynting vector of 1.5 watts/m^2. Calculate the average energy density.

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