Code No: RR210204 **Set No. 1**

II B.Tech I Semester Supplementary Examinations, November 2006
ELECTROMAGNETIC FIELDS
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. Three equal positive charges of $4 \times^1 0 - 9$c each are located at three corners of a square of sides 20cm each. Determine the magnitude and direction of electric field at the vacant corner. [16]

2. (a) State and explain Gauss's law. [8]
   (b) Using gauss law Find E at any point due to long infinite charge wire. [8]

3. (a) A co axial cable with inner and outer conductor radii 'a' and 'b' respectively have the respective voltage Va and Vb. By using laplace?s equation, find E at all points. [10]
   (b) The construction of a paper capacitor is as follows: Aluminum foil of $100 - cm^2$ area is placed on both sides of paper of thickness 0.03 mm. If the dielectric constant of paper is given as 3, and its dielectric breakdown strength is 200 kV/cm , what is the rating of the capacitor? [6]

4. (a) Derive the integral form of continuity equation and also write its meaning. [10]
   (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. [6]

5. A wire of length L is formed into
   (a) a circle [4]
   (b) an equivalent triangle and [6]
   (c) a square [6]

   For the same current I, find the magnetic field **H** at the centre of each.

6. 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. [16]

7. Derive formula for self-inductance of a solenoid. Use this formula and find self-inductance of a solenoid having 500 turns, mean diameter equal to 10 cm and length equal to 5 cm. Assume medium to be air. [16]

8. Write the Maxwell's equations in free space. [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR210204 **Set No. 2**

II B.Tech I Semester Supplementary Examinations, November 2006
ELECTROMAGNETIC FIELDS
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. An infinitely large cylinder has a radius and a uniform charge of one micro coulomb per meter. Calculate the potential at a point 10m away from the cyclinder if zero potential point is taken to be at a radial distance of 1m. [16]

2. (a) Show that the intensity of electric field at any point inside a hollow charged spherical conductor is zero. [6]

   (b) A sphere of radius 'a' has the charge distribution ρ(r) C/m^3 which produces an electric field intensity given by,
   E_r = A r^4, for $r \leq$ a,
   = Ar^{-2}, for r>
   Where A is a constant. Find the corresponding charge distribution ρ(r). [10]

3. (a) Derive the expression for potential and field between two co-axial cylinders. [8]

   (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 $2\,\mu C/m^2$. [8]

4. (a) Derive the integral form of continuity equation and also write its meaning. [10]

   (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. [6]

5. State and prove Ampere's circuital law. Discuss few applications for the same.[16]

6. (a) What is the torque experienced by a closed circuit carrying a current of I amps and placed in a uniform magnetic field B Tesla. [8]

   (b) A galvanometer has a rectangular coil suspended in a radial magnetic field so that the magnetic field always acts across the plane of the coil. If the coil is 10mm by 10mm side and has the 1000 turns and if the magnet provides a constant flux density of 0.3 Tesla, find the torque entered on the coil for a current of 10mA. [8]

7. Two coils are connected in series and their total self-inductance is 4.4 mH. When one coil is reversed, the total self-inductance is 1.6 mH. All the flux in the first coil links with the second coil, but only 40% of the flux of the second coil links with the first coil. Find self-inductance of each coil and their mutual inductance. [16]

8. (a) State and explain the Faraday's laws in Electro magnetic induction? [6]

   (b) A stationary 10turns square coil of 1-meter side is situated with its lower left corner coincident with the origin and with side's x1 and y1 along x-axis and y-axis. If the field B is normal to the plane of the coil and has its amplitude given by $B_0 = sin\frac{\Pi x}{x1}\, sin\frac{\Pi y}{y1}$Tesla. Determine the r.m.s value of e.m.f. induced in the coil if **B** varies harmonically at a frequency of 1 KHz. [10]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR210204 **Set No. 3**

II B.Tech I Semester Supplementary Examinations, November 2006
ELECTROMAGNETIC FIELDS
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) State Gauss's Law and explain its applications. [6]
   (b) Electric potential in an electric field is given by v(x,y,z) = $-3x^2yz$ Compute the electric field intensity as a function of x,y and z. coordinates. Derive the formula used. [10]

2. (a) Show that the intensity of electric field at any point inside a hollow charged spherical conductor is zero. [6]
   (b) A sphere of radius 'a' has the charge distribution ρ(r) C/m^3 which produces an electric field intensity given by,
   E_r = A r^4, for $r \leq$ a,
   = Ar^{-2}, for r>
   Where A is a constant. Find the corresponding charge distribution ρ(r). [10]

3. (a) Calculate the capacitance of a parallel plate capacitor with following details.
   Plate area = 100 sq.cm.
   Dielectric $\epsilon_{r1} = 4$, d_{12} = 2mm
   Dielectric $\epsilon_{r2} = 3$, d_{12} = 3 mm
   If 200 V is applied caross the plates what will be the voltage gradient across each dielectric.

   [8]

   (b) The permitivity of the dielectric of parallel plate capacitor increases uniformly from ϵ_1 at one plate to ϵ_2 at the other. If A is the surface areas of the plate and d is the thickness of dielectric, derive an expression for capacitance. [8]

4. (a) Derive the integral form of continuity equation and also write its meaning. [10]
   (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. [6]

5. A conductor is in the form of a Regular polygon of n sides inscribed in a circle of radius R. Show that the expression for **B** at the center for a current is given by
   $|B| = \left(n\mu_o {}^{I}/_{2\pi R}\right) Tan\, {}^{\pi}/_{n}$ [16]

6. (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. [8]

(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 $I_1 \& I_2$. [8]

7. State Neumans's formulae and explain the significance of these formulae in the study of electro magnetic fields. [16]

8. A circular cross section conductor of radius 1.5 mm carries a current $i_c = 5.5\, sin\ 4{*}10^{10} t\mu A$. What is the amplitude of the displacement current? [16]

⋆ ⋆ ⋆ ⋆ ⋆

Code No: RR210204 **Set No. 4**

II B.Tech I Semester Supplementary Examinations, November 2006
ELECTROMAGNETIC FIELDS
(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
All Questions carry equal marks

⋆ ⋆ ⋆ ⋆ ⋆

1. (a) State and explain Coulomb's law. [6]
   (b) Four like charges of 30μC each are located at the four corners of a square the diagonal of which measures 8m. Find the force on a 150μ C charge located at 3m above the center of the square. [10]

2. (a) Show that the intensity of electric field at any point inside a hollow charged spherical conductor is zero. [6]
   (b) A sphere of radius 'a' has the charge distribution ρ(r) C/m^3 which produces an electric field intensity given by,
   E_r = A r^4, for $r \leq$ a,
   = Ar^{-2}, for r>
   Where A is a constant. Find the corresponding charge distribution ρ(r). [10]

3. (a) Find electric potential due to electric dipole. [8]
   (b) The potential difference between two concentric sphere of radii r_1 and $r_2(r_2 > r_1)$ is V_1 show that electric field E at the surface of inner sphere is minimum of 2V/r_1 for $r_1 = r_2/2$. [8]

4. The parallel plate capacitor with a flat slab of dielectric material between the plates shown in below figure 4. Assuming top plate as the charged, calculate $\bar{D}$ and $\bar{P}$ [16]

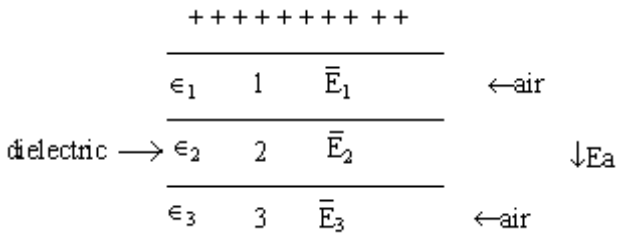

Figure 4

5. State and prove Ampere's circuital law. Discuss few applications for the same.[16]

6. (a) What is the torque experienced by a closed circuit carrying a current of I amps and placed in a uniform magnetic field B Tesla. [8]
   (b) A galvanometer has a rectangular coil suspended in a radial magnetic field so that the magnetic field always acts across the plane of the coil. If the coil is 10mm by 10mm side and has the 1000 turns and if the magnet provides

a constant flux density of 0.3 Tesla, find the torque entered on the coil for a current of 10mA. [8]

7. A torroid is made of closed iron ring wound with 300 turns of insulated copper wire. The cross sectional area of the ring in 5 sq. cm. The mean radius of the ring in 10 cm. Relative permeability of iron is 1000. Find self-inductance and derive formula used. [16]

8. (a) Explain what is meant by the term displacement current. Deduce equation of continuity of current div ($\mathbf{J}$+d$\mathbf{D}$/dt)=0. [8]

   (b) Find the displacement current density within a parallel plate Capacitor where $\epsilon = 100\epsilon_0$, a=0.01m^2, d=0.05 mm and the capacitor Voltage is 100 sin 200 πt volts? [8]

⋆ ⋆ ⋆ ⋆ ⋆