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

II B.Tech. I Semester Regular Examinations, November -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 circular disc of radius "a" m is charged uniformly with a charge density of σ c/m^2 Find the electric field intensity at a point "h" m from the disc along its axis. [16]

2. (a) Two long metal plates of width 1 m each held at an angle of 10^0 by an insulated hinge(plates are electrically separated) using laplace's equation determine potential function. [8]

   (b) Potential distributions are given by V=$4/(x^2+y+z^2)$ Find the expression for E. [8]

3. A parallel plate capacitor has a plate area of 1.5 Sq.m. and a plate separation of 5 mm. There are two dielectrics in between the plates. The first dielectric has a thickness of 3 mm with a relative permittivity of 6 and the second has a thickness of 2 mm with relative permittivity 4. Find the capacitance . Derive the formula uses. [16]

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. Derive an expression for force between two straight long parallel current carrying conductors. What will be the nature of force if the current are in the same and opposite direction? [16]

7. A circuit has 2000 turns enclosing a magnetic circuit of 30 sq. cm. cross section. A current of 5 Amps in the circuit produces a flux density of 1 Tesla. When the current is doubled, the flux density increases by only 50 per cent. Determine mean value of inductance of the circuit between 5 Amps and 10 Amps. Find e.m.f. induced in the coil when current increases uniformly from 5 Amps to 10 Amps in 0.1 second. [16]

8. (a) Distinguish between conduction and displacement currents? [6]

(b) A Faradays copper disc 0.3 m diameter is rotated at 60 rps on a horizontal axis perpendicular to and though the center of the disc, the axis lying in a horizontal field of 20 micro Tesla. Determine the EMF measured between the brushes. [10]

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(Electrical & Electronic Engineering)

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

Answer any FIVE Questions
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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) 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) Two parallel conducting plates 3 cm apart and situated in air are connected to a source of constant potential difference of 72 kv. Find the electric field intensity between the plates. Is it within permissible value? If a mica sheet ($\epsilon_r = 4$) of thickness 1 cm is introduced between the plates determine the field intensities in air and mica. Given the dielectric strength of air and mica as 30kv/cm and 1000 kv/cm respectively. [10]
   (b) Derive and expression for the potential difference at any point between spherical shells in terms of applied potential using Laplace equation. [6]

4. One medium is a dielectric with permitivity $\in_1$ and the other is a conductor Find the angle $\theta 1$ between the normal and a field line in medium1 incident on the conductor(medium 2). [16]

5. (a) Derive an expression for the force between two current carrying conductors in the same direction. [8]
   (b) Derive the boundary conditions at the magnetic interfaces and show that $\tan {}^{\theta_1}/_{\theta_2} = {}^{\mu_{r1}}/_{\mu_{r2}}$ [8]

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. Prove that the internal inductance of a non-magnetic cylindrical wire of radius 'a' carrying a uniformly distributed current I is $\mu_0/8\pi$Henries per mt. [16]

8. (a) State Maxwell's equations in their general point form and derive their form for harmonically varying fields. [10]

(b) In a material for which $\sigma = 5.0(\Omega m)^{-1}$ and $\sigma_r = 1$ the electric field intensity is $E = 250\,sin\,10^{10}t\,V/m$. Find the conduction and displacement current densities and the frequency at which they have equal magnitudes. [6]

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

II B.Tech. I Semester Regular Examinations, November -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. 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) 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) Find potential function at any point in a spherical shell in terms of applied potential using laplace equation. [8]
   (b) A parallel plate capacitor consists of two square metal plates with 500 mm side and separated by 10 mm. A slab of sulphur ($\epsilon_r = 4$) 6 mm thick is placed on the lower plate and air gap of 4 mm Find capacitance of capacitor. [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 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. Define and explain the term scalar magnetic potential inside a magnetic field. What is the usefulness of this parameter? State its limitations. How can we determine this quantity as a function of X, Y and Z co-ordinates in space? [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]

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

II B.Tech. I Semester Regular Examinations, November -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. Find the electric field intensity produced by a point charge distribution at P(1,1,1) caused by four identical 3 nc point charges located at P_1(1,1,0) , P_2(-1,1,0) , P_3 (-1,-1,0) and P_4(1,-1,0) . [16]

2. (a) A charge of Q is distributed uniformly throughout the volume of a sphere of radius R mts. Find electric field at any point using gauss law. [10]
   (b) Find electric field at any point due to infinite charge surface using Gauss law. [6]

3. (a) Two parallel conducting plates 3 cm apart and situated in air are connected to a source of constant potential difference of 72 kv. Find the electric field intensity between the plates. Is it within permissible value? If a mica sheet ($\epsilon_r = 4$) of thickness 1 cm is introduced between the plates determine the field intensities in air and mica. Given the dielectric strength of air and mica as 30kv/cm and 1000 kv/cm respectively. [10]
   (b) Derive and expression for the potential difference at any point between spherical shells in terms of applied potential using Laplace equation. [6]

4. (a) Three point charges 1nC, 3nC and 4nC are located (0,0,0),(0,0,1) and (1,0,0) respectively. Find the energy in the system. [8]
   (b) Find the expression for the energy per unit volume of the dielectric due to electric field in a charged capacitor. [8]

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 wire is bent in to the form of a square coil. Each side of the coil has a length of 20 cm. The coil carries a current of 10 Amps. The medium is air. Find vector magnetic potential at the centre of the coil. [16]

8. A square loop of wire 25 cm by 25 cm has a voltmeter (of infinite impedance) connected in series with one side. Determine the voltage induced by the meter when the loop is placed in an alternating field, the maximum intensity of which is 1 AMP per metre. The plane of the loop is perpendicular to the magnetic field varying at a frequency of 10 MHz. [16]

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