

II B.Tech I Semester(R07) Supplementary Examinations, May/June 2010

ELECTROMAGNETIC FIELDS

(Common to Electrical & Electronic Engineering and Electronics & Control Engineering)

Time: 3 hours

Max Marks: 80

Answer any FIVE Questions
All Questions carry equal marks

- 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]
- Let $V=2xy^2 z^3$ and $\epsilon = \epsilon_0$. Given the point P(1,2,-1) then find:
 - V at P
 - E at P
 - ρ_v at P
 - The equation of the stream line passing through P. [16]
- 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. [16]
- Derive the boundary condition for the magnetic field at the interface between two magnetic mediums with and without surface current at the interface. [16]
- Describe the applications of ampere's circuital law. [16]
- Derive an expression for the force between parallel wires carrying currents in the same direction.
 - A galvanometer has a rectangular coil suspended in a radial magnetic field which acts across the plane of the coil. The coil 0.01 m by 0.01 m has 1000 turns and the flux density is 3 wb/m². Find the torque on the coil for a current of 10 mA. [8+8]
- Derive an expression for the magnetic field strength H about a long parallel wire using vector potential A.
 - Given magnetic field intensity $\frac{J_0}{3a\rho} (\rho^2 - a^2) a_\phi$ due to a current carrying conductor (Current direction along a_z). Find the magnetic potential in this region. [8+8]
- Write and explain differential and integral form of Maxwell's equations for fields varying harmonically with time.
 - A parallel plate capacitor with plate area of 5 cm² and plate separation of 3 mm has a voltage $50 \sin 10^3 t$ volts applied to its plates. Calculate the displacement current assuming $\epsilon = 2\epsilon_0$. [8+8]
