PVP 12

Code: EE3T2

II B.Tech - I Semester – Regular Examinations - December 2014

ELECTROMAGNETIC FIELDS
(ELECTRICAL & ELECTRONICS ENGINEERING)

Duration: 3 hours Marks: 5x14=70

Answer any FIVE questions. All questions carry equal marks

1 a) Given a point $P(-2,6,3)$ and a vector $A = ya_x + (x+z)a_y$. Express and evaluate A at P in the Cartesian and cylindrical systems. 7 M

b) State and explain Maxwell's law of electrostatics. 7 M

2 a) Define electrostatic energy. Obtain an expression for energy expended in moving a point charge in an electric field. 7 M

b) State and explain Uniqueness theorem. 7 M

3 a) Define electric dipole. Derive an expression for electric field due to the dipole with center at origin. 7 M

b) A coaxial cable contains an insulating material of conductivity σ. If the radius of the central wire is 'a' and that of the sheath is 'b', obtain the value of conductance of the cable per meter length. 7 M

4 a) If $J = \frac{1}{r^3}(2\cos\theta\, a_r + \sin\theta\, a_\emptyset) A/m^2$, calculate the current passing through a hemispherical shell of radius 20cm. 7 M

b) Obtain the boundary conditions for perfect dielectric materials. 7 M

5 a) State and explain Bio – Savart's law. 7 M

b) Explain Maxwell's equations for static magnetic fields. 7 M

6 a) Define torque. Derive an expression for the torque on a rectangular planar loop placed in a uniform magnetic field. 7 M

b) A rectangular coil of area $10cm^2$ is carrying current of 50A lies on plane $2x + 6y - 3z = 7$, such that the magnetic moment of the coil is directed away from the origin. Calculate the magnetic moment. 7 M

7 a) Derive the expression for self inductance and mutual inductances between two coaxial solenoids of radius R_1 and R_2, $R_2 > R_1$, carrying currents I_1 and I_2 with n_1 and n_2 turns/m respectively. 7 M

b) A toroid core has $\rho_0 = 10cm$ and a circular cross section with $a = 1cm$. If the core is made of steel ($\mu = 1000\mu_0$) and has a coil with 200 turns. Calculate the current that will produce a flux of 0.5m wb in the core. 7 M

8 a) State and explain Faraday's law. 7 M

b) A parallel plate capacitor with plate area of $5cm^2$ and plate separation of 3mm has a voltage $50\sin 10^3 t$ V applied to its plates. Calculate the displacement current assuming $\varepsilon = 2\varepsilon_0$. 7 M