Code: 9A02404 **R09**

B.Tech II Year II Semester (R09) Supplementary Examinations December/January 2015/2016

ELECTROMAGNETIC FIELDS

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

Answer any FIVE questions
All questions carry equal marks
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1 Show that $\nabla.E=0$ for the field of an uniform sheet charge in all the three coordinate systems.

2 (a) Derive laplace and poisson's equation.
(b) Derive the expression for potential and field between two co-axial cylinders.

3 A parallel plate capacitor consists of two square metal plates with 500 mm side and separated by 10 mm. A slab of sulphur (ε_r = 4) 6 mm thick is placed on the lower plate and air gap is 4 mm. Find capacitance of capacitor.

4 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 field intensity at the surface of each conductor and also in space exactly midway between A and B.

5 (a) State and discuss Amperes Circuital law.
(b) Apply it to the case of an infinitely long coaxial transmission line carrying a uniformly distributed current to calculate the magnetic field intensity.

6 (a) Derive an expression for the force between parallel wires carrying currents in the same direction.
(b) 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/m^2. Find the torque on the coil for a current of 10 mA.

7 (a) Explain the concept of scalar and vector magnetic potentials.
(b) Given the magnetic vector potential A = - $\rho^2/4$ $\mathbf{a_z}$ Wb/m, calculate the total magnetic flux crossing the surface $\Phi = \pi/2$, $1 \le \rho \le 2$ m, $0 \le z \le 5$ m.

8 (a) Show that in a capacitor the conduction current and displacement current are equal.
(b) Given $\mathbf{H} = H_m e^{j(\omega t + \beta)}$ $\mathbf{a_x}$ A/m in free space. Find **E**. μ = 0.25 H/m, ϵ = 0.01 F/m.

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