Code: 9A02404

R09

B.Tech II Year II Semester (R09) Supplementary Examinations December/January 2014/2015

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 (a) State and explain Gauss's law.

(b) Four concentrated charges Q_1 = 0.3 µc, Q_2 = 0.2 µc, Q_3 = −0.3 µc, Q_4 = 0.2 µc are located at the vertices of a plane rectangle. The length of rectangle is 5 cm and breadth of the rectangle is 2 cm. Find the magnitude and direction of resultant force on Q1.

2 What is electric field intensity? Explain the concept of electric field and write down expression for the electric field due to point charge.

3 (a) Derive the expression for capacitance of the spherical condenser.

(b) Find the current in the circular wire, if the current density is $\overline{J} = (1-e^{-100r})a_z$ A/m^2. The radius of the wire is 2 mm.

4 (a) Determine the magnetic field intensity on the axis of an infinite solenoid.

(b) A current carrying circular wire of radius 'a' is centered on the origin in the plane z = 0. Obtain an expression for magnetic field intensity on the axis of the wire at (0, 0, 2).

5 (a) Explain the rotational vector operator. Give a physical example.

(b) Three infinite conductors are carrying a current of 1, 2, 3 Amp respectively in same direction. The conductors are arranged in a straight line at a distance of 1 m. The conductor carrying current 1 A is left most and that 3 Amp is right most. Find the H at a point 1 meter exactly above the conductor carrying 1 Amp current.

6 (a) Explain magnetic dipoles and magnetic moment.

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

7 A two-conductor transmission line is made up of conductors, which are separated by a distance of 2 meters. The radius of each conductor is 1 cm. The medium is air. Compute the exact value of inductance of each conductor per km length. Derive the formula used.

8 Write Maxwell's equations in good conductors for time varying fields and static fields both in differential and integral form.

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