Code: 13A02401 **R13**

B.Tech II Year II Semester (R13) Supplementary Examinations December 2016

ELECTROMAGNETIC FIELDS

(Electrical & Electronics Engineering)

Time: 3 hours Max. Marks: 70

PART - A

(Compulsory Question)

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1 Answer the following: (10 X 02 = 20 Marks)

(a) Find the force of interaction between two point charges of $4 \times 10^{-8}\ C$ and $6 \times 10^{-5}\ C$ spaced 10 cm apart in vacuum.

(b) State with proper reason whether the field due to a point charge is uniform.

(c) A dielectric slab occupies a volume of 0.08 cubic meters and is uniformly polarized with 1.125 coulomb/m^2. Determine the dipole moment of the slab.

(d) Write the Maxwell's equations in integrals form for time varying fields.

(e) Give the expression for the magnetic field intensity at a point P due to an infinitely long conductor.

(f) Determine the force per meter length between two long parallel wires A and B separated by 5 cm in air and carrying currents of 40 A, in the same direction and in the opposite direction.

(g) Define coupling coefficient.

(h) Write down the expression for the inductance of a solenoid.

(i) What is the wave equation for a conducting medium?

(j) What does Poynting vector signify?

PART - B

(Answer all five units, 5 X 10 = 50 Marks)

UNIT - I

2 A fine straight line of charge of length 12 cm carries a uniformly distributed charge of $0.3 \times 10^{-6}\ C$ per cm length. Determine the magnitude and direction of the electric fields intensity at a point.

(a) Located at a distance of 3 cm above the wire and displaced 3 cm to the right of and beyond one end.

(b) Located at the distance of 3 cm from one end, in alignment with but beyond the wire.

OR

3 Derive the capacitance of co-axial cable with two dielectrics.

UNIT - II

4 A dielectric slab of flat surface with relative permittivity 4 is disposed with its surface normal to a uniform field with flux density 1.5 c/m^2. The slab occupies a volume of 0.08 m^3 and is uniformly polarized. Determine: (i) The polarization in the slab. (ii) The total dipole moment of slab.

OR

5 Derive the conditions at a boundary between dielectrics.

UNIT - III

6 Develop the expression for the torque developed on closed circuits.

OR

7 Prove that the force between two parallel conducting wires carrying current in the same direction is attractive whereas it is repulsive if the currents are in opposite directions.

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UNIT - IV

8 Develop an expression for flux density and inductance of a toroid and solenoid.

OR

9 Determine the error in assuming the mean circumference for the mean length of the magnetic path of a toroid having internal radius of 6 cm and external radius of 8 cm.

UNIT - V

10 A square coil with loop area 0.01 sq.m and 50 turns is rotated about its axis, at right angles to a uniform magnetic field B = 1.0 tesla. Calculate the instantaneous value of the e.m.f induced in the coil when its plane is: (a) At right angles to the field.

(b) At $45°$ to the field.

(c) In the plane of the field. Speed of rotation 1000 r.p.m.

OR

11 State and explain Poynting's theorem. List out its significance.

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