Code: 15A02403 **R15**

B.Tech II Year II Semester (R15) Regular Examinations May/June 2017

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) Define electrified intensity and develop relationship with force and charge.

(b) Write Maxwell's equation in electrostatic field in point forces and explain the terms.

(c) What is meant by equipotential surface? Explain.

(d) Explain what is meant by point form of Ohm's law.

(e) Distinguish between Poisson's and Laplace equations in electrostatic fields.

(f) "Magnetostatic field is not conservative". Explain.

(g) Is it possible to have isolated magnetic charges? Explain.

(h) Discuss about Maxwell's equation in differential form which is obtained from Faraday's law.

(i) Explain what is meant by scalar magnetic potential.

(j) "Time varying electrostatic field is not conservative". Explain.

PART - B

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

UNIT - I

2 (a) Derive the expression for resultant force on 'n' charges using the principle of superposition.

(b) Point charges 2nc and -1nc are located at (1, 2, 1) and (-1, 1, 3) respectively. Calculate the electric force on a 5nc charge, located at (2, 3, 1) and electric field intensity at that point.

OR

3 (a) Derive the expressions for electric field intensity of a finite line charge.

(b) A finite sheet of $1 \leq x \leq 2m, 1 \leq y \leq 2m$ on the z = 0 plane has a charge density of xy. Find the charge on the sheet.

UNIT - II

4 (a) Define energy density and derive the expression for it.

(b) Three point charges 1nc, 2nc, 3nc are located at (1, 1, 1), (2, 2, 2) and (3, 3, 3) respectively. Find the energy in the system.

OR

5 (a) Describe the expression for capacitance of a spherical capacitor.

(b) Conducting spherical shells with radii of 5 cm, and 15 cm are maintained at a potential difference of 45 V. Determine V, Q, E, C.

UNIT - III

6 Derive the expression for magnetic field intensity of an infinitely long coaxial transmission line.

OR

7 (a) State and explain Biot-Savart's Law.

(b) Given magnetic vector potential $-\frac{\rho}{2} az \ wb/m$, calculate the total magnetic flux density crossing the surface $\phi = \frac{\pi}{2}, \ 2 \leq \rho \leq 3m, \ 1 \leq z \leq 2m.$

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UNIT - IV

8 (a) Determine the expression for self inductance of a coaxial cable of inner and outer radii a and b respectively.

(b) Write Maxwell's equation for static electromagnetic fields is differential and integral forms and describe.

OR

9 (a) Develop the Lorentz force equations.

(b) Define and distinguish between magnetic dipole and dipole moment, deriving necessary expressions.

UNIT - V

10 (a) Show that net power flowing out of a given volume is equal to the time rate of decrease in energy stored within the volume without conduction losses.

(b) Explain what is meant by displacement current deriving necessary expressions.

OR

11 (a) Explain what is meant by intrinsic impedance of a medium and derive the necessary expressions for the same.

(b) Derive the expressions for wave equations in electric field in free space.

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