Code: 13A02401 **R13**

B.Tech II Year II Semester (R13) Regular Examinations May/June 2015

ELECTROMAGNETIC FIELDS

(Electrical and 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 the electric field intensity and write the equation for a point charge.
(b) Write the Laplace's and Poisson's equations and their physical significance.
(c) Define polarization.
(d) Write the differences between the conductors and insulators.
(e) Write the statement of Amperes circuital law.
(f) Define the magnetic dipole and magnetic dipole moment.
(g) Define the vector magnetic potential for various configurations and write its unit.
(h) Define self and mutual inductance.
(i) What are the differences between the statically and dynamically induced emfs and give the example for each one.
(j) Write the Maxwell's equations in integrals form for time varying fields.

PART – B

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

UNIT – I

2 (a) State and explain Coulomb's law indicating clearly the units of quantities in the equation of force.
(b) State and prove Gauss's law and write limitations of gauss law.

OR

3 A charge Q_0, located at the origin in freee space, produces a field for which $E_2 = 1\ kV/m$ at point $P(-2,1,-1)$. (a) Find Q_0. Find E at M(1,6,5) in. (b) Cartesian coordinates. (c) Cylindrical coordinates.

UNIT – II

4 (a) What is the necessity of studying the dielectric boundary conditions?
(b) Derive the continuity equation and write its physical significance.

OR

5 Four 0.8 nC point charges are located in free space at the corners of a square 4 cm on a side.
(a) Find the total potential energy stored.
(b) A fifth 0.8 μC charge is installed at the centre of the square. Again find the total energy stored.

UNIT – III

6 (a) Derive an expression for magnetic field strength H due to a current carrying conductor of finite length using Biot Savart's law.
(b) Derive the expression for torque produced on a closed current carrying when placed in a magnetic field.

OR

7 (a) Find H in Cartesian components at P (2,3,4) if there is a current filament on the Z axis carrying 8 mA in the a_z direction.
(b) Repeat if filament is located x = -1, y = 2.
(c) Find H if both filaments are present.

UNIT – IV

8 Derive the expression for self inductance of solenoid and toroid.

OR

9 A toroid is constructed of a magnetic material having a cross sectional area of 2.5 m^2 and an effective length of 8 cm. There is also a short air gap of 0.25 mm length and an effective area of 2.8 cm^2. An mmf of 200 AT is applied to the magnetic circuit. Calculate the total flux in the toroid if the magnetic material (a) is assumed to have a infinite permeability. (b) is assumed to be linear with $\mu_r = 1000$. (c) is silicon steel.

UNIT – V

10 (a) Get the expression for Faradays laws of electromagnetic induction in integral form and point form and write its physical significance.
(b) What is displacement current? Explain briefly.

OR

11 (a) Define pointing vector and derive the expression for pointing theorem.
(b) Derive an expression for motional and transformer induced emf.

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