Code: 13A02401 **R13**

B.Tech II Year II Semester (R13) Supplementary Examinations May/June 2017

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) Give the limitations of Gauss's law.
(b) Write the Poisson's equation.
(c) What is polarization?
(d) What is the difference between conductor and dielectric?
(e) State Lorentz force equation.
(f) State Blot – Savarat's law.
(g) Define self and mutual inductance.
(h) What is the difference between solenoid and toroid?
(i) State Maxwell's fourth equation.
(j) State Faraday's laws of electromagnetic induction.

PART – B

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

UNIT – I

2 (a) State and explain Gauss's law of electromagnetic in integral form.
(b) The non uniform field E = $ya_x + xa_y + 2a_z$, determine the work expended in carrying 2 C from B(1, 0, 1) to A(0.8, 0.6, 1) along the shorter arc of the circle, $x^2 + y^2 = 1$, z = 1.

OR

3 (a) Derive Laplace's equation from fundamentals.
(b) The radii of two concentric spheres differ by 4 cm. The capacity of the spherical condenser is $53.33\ pF$. If the outer sphere is earthed, what are the radii of the spheres? Assume air as the dielectric.

UNIT – II

4 (a) State and prove the boundary conditions at the dielectric surface.
(b) Write short notes on conduction and convection.

OR

5 (a) Derive an expression for energy density in a static electric field.
(b) State and explain Ohm's law in point form.

UNIT – III

6 (a) Derive Maxwell's second equation div (B) = 0.
(b) Define a magnetic dipole. What is the magnetic moment? Describe how a differential current loop behaves like a magnetic dipole.

OR

7 (a) State and explain Ampere's circuital law. Describe any two applications of Ampere's circuital law.
(b) Evaluate the inductance of a solenoid of 2800 turns wound uniformly over a length 0.6 m on a cylindrical paper tube 4 cm in diameter. The medium is air.

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UNIT – IV

8 (a) Derive an expression for mutual inductance, use Neumann's formulae.

(b) Current in a coil is increased from zero to 15 amps at a uniform rate in 6 seconds. It is found that this coil develops self induced e.m.f of 150 volts whereas an e.m.f of 25 volt is produced in a neighboring coil. Compute self inductance of the first coil and the mutual inductance between the two coils.

OR

9 (a) Describe the scalar magnetic potential and list its limitations.

(b) Find the vector magnetic potential for an infinitely long solenoid with T turns per unit length, radius 'a' and current I.

UNIT – V

10 (a) Explain the significance of displacement current.

(b) State and prove Pointing theorem. Explain the terms: Instantaneous, Average and Complex pointing vectors.

OR

11 (a) Write and explain the differential and integral forms of Maxwell's equation.

(b) A square coil rotates at a constant speed of 500 rpm about an axis perpendicular to a stationary uniform field of magnetic induction 0.75 Tesla. The coil has mean dimension of 15 cm x 15 cm and is wound with 100 turns. Determine dynamically induced e.m.f in the coil when the plane of the coil is: (i) In the same plane as the field. (ii) At right angles to the field. (iii) Inclined 60° to the field.

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