Roll No ....

EC - 402

B.E. IV Semester Examination, December 2014
Electro-Magnetic Theory

Time : Three Hours

Maximum Marks : 70

Note: i) Answer five questions. In each question part A, B, C is compulsory and D part has internal choice.

ii) All parts of each questions are to be attempted at one place.

iii) All questions carry equal marks, out of which part A and B (Max.50 words) carry 2 marks, part C (Max.100 words) carry 3 marks, part D (Max.400 words) carry 7 marks.

iv) Except numericals, Derivation, Design and Drawing etc.

Unit - I

1. a) Explain Coulomb's law?

    b) Define electric dipole and dipole moment?

    c) What is electric field intensity?

    d) State and prove Gauss's law?

OR

A potential field in free space is expressed as $V = \dfrac{60\sin\theta}{r^2}$ volts. Find the electric flux density and hence the volume charge density at the point (r = 3m, θ = 60°, φ = 25°) in spherical co-ordinates.

Unit - II

2. a) Explain uniqueness theorem.

    b) Explain Biot-savart's law?

    c) What is amperes circuital law?

    d) Write a short note on image theory?

OR

Give a mathematical analysis for solution of Laplace's equation in Cartesian co-ordinate system?

Unit - III

3. a) Write Maxwell's equations in differential and integral forms for free space and harmonically time varying fields.

    b) Derive continuity equation.

    c) Explain Faraday's law.

    d) State and prove poynting vector theorem.

OR

Derive wave equations for conducting and non-conducting medium?

Unit - IV

4. a) Define linear, circular and elliptic polarization.

   b) Explain Hoss tangent.

   c) Discuss plane wave propagation in a good conductor?

   d) Discuss the concept of skin depth? Find the skin depth d at a frequency of 1-6 MHz in aluminium where $\sigma = 38.2$ Ms/m and $\mu_r = 1$. Also find the propagation constant and wave velocity.

OR

Discuss surface current density and transmission line analogy.

Unit - V

5. a) Define Brewsters angle.

   b) Explain total internal reflection.

   c) Discuss retarded potential.

   d) What is normal and oblique incidence? A perpendicularly polarized wave propagates from a region having $\varepsilon_r = 8.5$, $\mu_r = 1$, $\sigma = 0$ to free space with an angle of incidence of 15°. The incident field is 1.0 μV/m, find the reflected and transmitted electric field incident, reflected and transmitted magnetic field.

OR

Discuss surface impedance of a conductor. Explain magnetic vector potential.

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