Code: 13A04403 **R13**

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

ELECTROMAGNETIC THEORY & TRANSMISSION LINES

(Electronics and Communication 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) List out the applications of 'Smith chart'.
(b) List out the properties of dielectric.
(c) Write the phase shift constant formula for good dielectric.
(d) Define reflection coefficient.
(e) Define Ampere's Circuital Law.
(f) List out the applications of Gauss's Law.
(g) Write the Brewster angle formula.
(h) Define Biot-Savart Law.
(i) Write the equation for $\nabla \times A$ in spherical coordinate system.
(j) Write the formula for Poisson's equation.

PART – B

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

UNIT – I

2 (a) Derive an expression for static electric field due to infinite line charge using Coulomb's law.
(b) If $D = 3y^2 \overline{a}_x + 3x^2y \overline{a}_y + 5 \overline{a}_z$ C/m^2. Find the total charge enclosed within the region 0 < x, y, z < 2 by evaluating one or more surface integrals.

OR

3 (a) Define potential? Derive an expression for electric field due to a dipole.
(b) Obtain the expression for stored energy density in Electrostatic field.

UNIT – II

4 (a) Using Ampere's circuital law, find H due to infinite sheet of current.
(b) Derive the expression for the energy stored in a magnetic field.

OR

5 (a) Explain the concept of scalar and vector magnetic fields.
(b) Given that $H = 20\rho^2 \overline{a}_\varphi$ A/m. (i) Determine J. (ii) Current enclosed by the circular surface ρ = 1, 0 < φ < 2π, z = 0.

UNIT – III

6 (a) Discuss about inconsistency of Ampere's law and Displacement current density.
(b) List out Maxwell's Equations in point form for Time varying fields and word statements.

OR

7 (a) Assume a homogeneous material of infinite extent with σ = 0, ε = 2 × 10^{-10} F/m and μ = 1.25 × 10^{-5} H/m. Let E = 400cos(109t-βz) ax V/m. Use Maxwell's equations and find D, B and H.
(b) Drive the boundary conditions for time varying fields.

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UNIT – IV

8 (a) State and prove Poynting theorem.

(b) Derive the expression for reflection coefficient for oblique incidence on a perfect dielectric in parallel polarization.

OR

9 (a) Determine the intrinsic impedance in free space for a uniform plane wave.

(b) Define polarization. Write a short note on circular polarization.

UNIT – V

10 (a) Determine the reflection coefficient and voltage standing wave ratio when:

(i) Z_L = short circuit.

(ii) Z_L = open circuit.

(iii) Z_L = purely reactive.

(iv) $Z_L = Z_O$.

(b) A 30 m long lossless line with Z_O = 50 Ω operating at 2 MHz is terminated with a load Z_L = 60+j40 Ω. If v = 0.6C on the line, find: (i) Reflection coefficient. (ii) Standing wave ratio. (iii) Input Impedance.

OR

11 (a) Derive the expression for input impedance of a transmission line.

(b) Explain the technique of single stub matching in a lossless transmission line.

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