Code: 13A04403 **R13**

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

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) State Coulomb's law and write its expression in vector form.

(b) The potential at point A is 10 V and at B is 15 V. If a charge is Q = 10 μC is moved from A to B, what is the work required to be done?

(c) What is the difference between self inductance and mutual inductance?

(d) State Faraday's law.

(e) Define displacement current and displacement current density.

(f) What is relaxation time?

(g) What is polarization of uniform plane waves?

(h) What is the significance of loss tangent?

(i) Define wavelength and velocity of propagation.

(j) What causes reflections on a transmission line and how they can be made zero?

PART – B

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

UNIT – I

2 (a) Using divergence theorem and Gauss's law, relate the electric flux density D to the volume charge density ρ_v.

(b) Derive Poisons and Laplace's equations and mention their applications.

OR

3 (a) Explain and derive continuity equation.

(b) A point charge of 5 nC is located at the origin. If V = 2V at (0, 6, -8), find: (i) The potential at A (-3, 2, 6). (ii) The potential difference V_{AB}.

UNIT – II

4 (a) A strait solid wire segment carrying a current 2 $\hat{a}_y$ A extends from a point (0,1,2) to another point (0,4,2) in free space. This wire is subjected to the magnetic field of an infinite current filament lying along the z – axis and carrying 25 A in the $\hat{a}_z$ direction. Find the vector torque on the wire segment about an origin at a point (0, 0, 2).

(b) Derive Ampere's circuital law in differential form.

OR

5 (a) Write short notes on magnetic flux density and magnetic torque.

(b) Derive the expression for the energy stored in a magnetic field.

UNIT – III

6 (a) Derive the boundary conditions between conductor and dielectric.

(b) Prove the Maxwell's equation $\nabla X E = -\frac{dB}{dt}$.

OR

7 (a) Explain: (i) Motional e.m.f. (ii) Transformer e.m.f.

(b) Write Maxwell's equations for static fields and explain.

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UNIT – IV

8 (a) Explain the characteristics of wave in perfect dielectric.

(b) Explain uniform plane wave propagation.

OR

9 (a) State and prove Poynting theorem.

(b) Derive the expressions for reflection coefficient and transmission coefficient for a obliquely incident wave having parallel polarization.

UNIT – V

10 (a) Derive the expressions for current and voltage at any point along a line which is terminated by Z_0.

(b) Derive the expression for loss less transmission line.

OR

11 (a) Explain principle of impedance matching with quarter wave transformer.

(b) A transmission line has a characteristic impedance of 300 ohms and terminated in a load Z_L = (150+j 150) ohms. Find VSWR and reflection coefficient.

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