

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)

- 1 Answer the following: (10 X 02 = 20 Marks)
- State Coulomb's law and write its expression in vector form.
 - The potential at point A is 10 V and at B is 15 V. If a charge is $Q = 10 \mu C$ is moved from A to B, what is the work required to be done?
 - What is the difference between self inductance and mutual inductance?
 - State Faraday's law.
 - Define displacement current and displacement current density.
 - What is relaxation time?
 - What is polarization of uniform plane waves?
 - What is the significance of loss tangent?
 - Define wavelength and velocity of propagation.
 - 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 Poisson's 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 straight 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 $\nabla \times E = -\frac{dB}{dt}$.

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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- 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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