

EEE-501

1013

Odd Semester Examination 2018-19

B.TECH. (SEMESTER-V)

ELECTROMAGNETIC FIELD THEORY

Time: 03:00 Hours

Max Marks : 100

Note : Attempt all section ,all section carry equal marks

1. Attempt **any four** questions: [4x5=20]

(a) Point charges 1 mC and -2 mC are located at (3, 2, -1) and (-1, -1, 4), respectively. Calculate the electric force on a 10nC charge located at (0, 3, 1) and the electric field intensity at that point.

(b) State and prove Divergence theorem.

(c) What is single stub matching and what is its requirement?

(d) Determine the divergence of the following vector fields and evaluate them at the specified points.

$$A = yz\mathbf{a}_x + 4xy\mathbf{a}_y + yz\mathbf{a}_z \text{ at } (1, -2, 3)$$

(e) Explain Brewster's angle

(f) State Gauss law and give its conditions.

2. Attempt **any four** questions : [4x5=20]

(a) Determine the curl of the following vector fields and evaluate them at the specified points.

$$B = \rho z \sin\Phi \mathbf{a}_\rho + 3\rho z^2 \cos\Phi \mathbf{a}_\phi \text{ at } (5, \pi/2, 1)$$

(b) State and Prove Stokes theorem.

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(1)

[P.T.O.]

- (c) Find the electric flux density at a point $P(r, \phi, z)$ due to an infinite charged line of ρl at z -axis.
- (d) Explain ideal transmission line and matching with the devices.
- (e) Define voltage reflection coefficient, current reflection coefficient and the standing wave ratio.

3. Attempt any two questions [2x10=20]

- (a) Find the expression for the capacitance of the coaxial spherical capacitor.
- (b) State Biot-savart's law. Find the expression of magnetic field intensity due to uniform current sheet.
- (c) Derive the transmission line equation.

4. Attempt any two questions : [2x10=20]

- (a) Transform vector in to cylindrical and spherical form.

$$\frac{\sqrt{x^2 + y^2} \mathbf{a}_r}{\sqrt{x^2 + y^2 + z^2}} - \frac{yz \mathbf{a}_z}{\sqrt{x^2 + y^2 + z^2}}$$

- (b) What is characteristic impedance? Derive its expression for lossless and distortionless line.
- (c) State and prove Poynting theorem.

5. Attempt any two questions [2x10=20]

- (a) A parallel-plate capacitor with plate area of 5 cm^2 and plate separation of 3 mm has a voltage $50 \sin 10^3 t \text{ V}$ applied to its plates. Calculate the displacement current assuming $\epsilon = 2 \epsilon_0$.
- (b) Two point charges of equal mass m , charge Q are suspended at a common point by two threads of negligible mass and length l . 'a' is the inclination angle of each thread to the vertical line. show that

$$Q = 16 \pi \epsilon_0 m g l^2 \sin^2 \alpha \tan \alpha \quad (2)$$

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- (c) Discuss in brief the case of wave propagation in lossy dielectric.
- (d) A certain transmission line 2 m long operating at $\omega = 10^6 \text{ rad/s}$ has $\alpha = 8 \text{ dB/m}$ and $\beta = 1 \text{ rad/m}$, and $Z_{in} = 60 + j40 \text{ ohm}$. If the line is connected to a source of $10 \angle 0^\circ \text{ V}$, $Z_L = 40 \text{ ohm}$ and terminated by a load of $20 + j50 \text{ ohm}$, determine
 - (i) The input impedance
 - (ii) The sending end current
 - (iii) The current at the middle of the line