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**SIDDHARTH INSTITUTE OF ENGINEERING & TECHNOLOGY:: PUTTUR**  
(AUTONOMOUS)

**B.Tech III Year I Semester Regular Examinations March-2023**  
**ELECTROMAGNETIC THEORY AND TRANSMISSION LINES**

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 60

(Answer all Five Units 5 x 12 = 60 Marks)

**UNIT-I**

- 1 a Define Electric Potential. Find the electric potential for a point charge is located at origin and Write Maxwell's second equation for electrostatic field. CO2 L3 8M
- b A point charge  $Q = 30 \text{ nC}$  is located at the origin in Cartesian co-ordinates. Find the electric flux density  $D$  at  $(1, 3, -4)$ . CO2 L2 4M

OR

- 2 a Deduce the electric field Intensity due to Surface charge. CO3 L4 6M
- b Determine the Electric flux density at a point P due to infinite sheet of Charge using Gauss law. CO2 L3 6M

**UNIT-II**

- 3 a Explain Biot-Savart's Law. CO1 L2 6M
- b A Positive Y-axis (Semi Infinite Line with respect to the Origin) Carries a Filamentary Current of 2 A in the -y Direction. Assume it is part of a large circuit. Find  $H$  at (i)  $A(2, 3, 0)$ . (ii)  $B(3, 12, -4)$ . CO2 L3 6M

OR

- 4 Explain any two applications of Ampere's Circuit law. CO3 L2 12M

**UNIT-III**

- 5 a In free space,  $E = 20 \cos(\omega t - 50x) \mathbf{a}_y \text{ V/m}$ . Calculate  $J$  and  $H$ . CO4 L3 8M
- b Why ampere's Law is In-consistent. CO2 L4 4M

OR

- 6 a Determine the Transformer EMF for the time varying fields. CO4 L3 6M
- b Explain the motional EMF and derive the expression for the maxwell equation. CO4 L3 6M

**UNIT-IV**

- 7 Discuss about power and Poynting vector. CO5 L2 12M

OR

- 8 a Evaluate the wave equation in lossy dielectric medium for sinusoidal time variations. CO5 L4 6M
- b Derive the expression for intrinsic impedance and propagation constant in a good conductor. CO5 L3 6M

**UNIT-V**

- 9 A 30 m long lossless transmission line with  $Z_0 = 50 \Omega$  operating at 2 MHz is terminated with a load  $Z_L = 60 + j 40 \Omega$ . If  $\rho = 0.6$  on the line, find the reflection coefficient, the standing wave ratio  $S$  and the input impedance.  
(i) without using smith chart (ii) Using smith chart CO6 L3 12M

OR

- 10 Deduce the equation for voltage and current at any point in a transmission line. CO6 L4 12M

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INSTITUTE OF ENGINEERING & TECHNOLOGY BUTTAR

(Autonomous)

S.Tech III Year I Semester Regular Examinations March-2023

ELITE PROGRAM IN THE ONLY AND TRANSMISSION LINES

(Electronics and Communication Engineering)

Max. Marks: 80

Time: 3 hours

Answer all Five (5) x 12 = 60 marks

Q.1

288-58

1. a. Define Electric Potential. Find the electric potential for a point charge  $q$  located at origin and write Maxwell's second equation for electrostatic field.  
 b. A point charge  $Q = 30 \mu\text{C}$  is located at the origin in Cartesian co-ordinates. Find the electric flux density  $D$  at  $(1, 2, -4)$ .

OR

2. a. Derive the electric field intensity due to surface charge.  
 b. Determine the electric flux density at a point  $P$  due to infinite sheet of charge having density  $\rho_s$ .

Q.2

3. a. Explain the concept of a line.  
 b. A positive  $7\text{-}\mu\text{C/m}$  linear charge is distributed along the  $z$ -axis from  $z = 0$  to  $z = 10$ . Determine the electric field  $E$  at  $(0, 0, 2)$  in  $\text{N/C}$ .

OR

4. Explain the concept of divergence of a vector field.  
 a. In the region  $0 < r < 10$  cm, the electric field  $E$  is given by  $E = 1000r^2 \hat{r}$  V/m. Find the total charge  $Q$  enclosed in a cylinder of radius  $10$  cm and height  $10$  cm.

Q.3

5. a. Derive the expression for the magnetic field  $H$  due to a long straight wire carrying current  $I$ .  
 b. Why magnetic flux is in-consistent?

OR

6. a. Determine the magnetic field  $H$  in the time varying field.  
 b. Explain the magnetic field and derive the expression for the Maxwell equation.

Q.4

7. Discuss about power and Poynting vector.  
 8. a. Evaluate the wave equation in loss dielectric medium for sinusoidal time variations.  
 b. Derive the expression for intrinsic impedance and propagation constant in a lossy medium.

Q.5

9. A  $50 \Omega$  lossless transmission line with  $V_0 = 100$  V operating at  $5$  MHz is terminated in a load  $Z_L = 60 + j40 \Omega$ . If  $V_{\text{max}} = 10$  V on the line, find the reflection coefficient, the standing wave ratio  $S$  and the input impedance (i) without using Smith chart (ii) using Smith chart.

OR

10. Derive the equation for voltage and current in any coil in a transmission line.