

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

B.Tech. II Year II Semester Supplementary Examinations December-2025

EM WAVES AND TRANSMISSION LINES

(Electronics & Communications Engineering)

Time: 3 Hours

Max. Marks: 70

PART-A

(Answer all the Questions 10 x 2 = 20 Marks)

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|---|---|--|-----|----|----|
| 1 | a | What are the co-ordinate systems? and write their co-ordinates. | CO1 | L1 | 2M |
| | b | Define convection current and current density. | CO1 | L1 | 2M |
| | c | Define inductance. | CO2 | L1 | 2M |
| | d | Define Ampere's circuital Law | CO2 | L1 | 2M |
| | e | What is total internal reflection? | CO3 | L1 | 2M |
| | f | What is the difference between normal incidence and oblique incidence? | CO3 | L1 | 2M |
| | g | What are the primary and secondary constants of transmission line? | CO4 | L1 | 2M |
| | h | Define Transmission line | CO4 | L1 | 2M |
| | i | Define VSWR. | CO5 | L1 | 2M |
| | j | What is a matched line? | CO5 | L1 | 2M |

PART-B

(Answer all Five Units 5 x 10 = 50 Marks)

UNIT-I

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|---|---|---|-----|----|----|
| 2 | 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. | CO1 | L3 | 5M |
| | b | Convert the following Cartesian points to cylindrical and spherical coordinates: i. P(2, 5, 1) ii. R(6, 2, -4) | CO1 | L2 | 5M |

OR

- | | | | | | |
|---|---|---|-----|----|----|
| 3 | a | Define Coulomb's law and derive the force F that exists between two unlike charges. | CO1 | L2 | 5M |
| | b | Define Electric field intensity and write its expression for N point charges. | CO1 | L2 | 5M |

UNIT-II

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|---|---|--|-----|----|----|
| 4 | a | Define magnetic flux density and state Maxwell's Equations for static EM Fields. | CO2 | L2 | 5M |
| | b | Determine the Magnetic Field Intensity due to a infinite sheet current. | CO2 | L3 | 5M |

OR

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|---|---|--|-----|----|----|
| 5 | a | Determine the force on the current element due to the magnetic field. | CO2 | L3 | 5M |
| | b | An infinitely filamentary wire carries a current of 2A in the +z direction. Calculate B at (-3,4,7). | CO2 | L4 | 5M |

UNIT-III

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|---|---|---|-----|----|----|
| 6 | a | Given that $\mathbf{E} = 40(108t - 3x)\mathbf{ayv}/m$, Determine the direction of wave propagation, velocity of the wave, wave length. | CO3 | L3 | 5M |
| | b | Derive the characteristics of plane wave in free space. | CO3 | L3 | 5M |

OR

- 7 a Evaluate the wave equation in lossy dielectric medium for sinusoidal time variations. **CO3 L4 5M**
 b What is the relation between E and H in uniform plane wave? **CO3 L1 5M**

UNIT-IV

- 8 a Discuss about Transmission line Parameters. **CO4 L3 5M**
 b Determine the equation for Characteristic Impedance of a Transmission line. **CO4 L3 5M**

OR

- 9 a Define a lossless transmission line. Derive the characteristics of a lossless transmission line. **CO4 L3 5M**
 b Determine the propagation constant and velocity for the distortion less line from the following parameters at 2 GHz. $R=20 \Omega/\text{km}$, $L=4 \text{ mH}/\text{km}$, $C=0.02 \mu\text{F}/\text{km}$, $G=0.1 \text{ mS}/\text{km}$. **CO4 L4 5M**

UNIT-V

- 10 a What is VSWR? How is it related to the reflection coefficient? **CO5 L2 5M**
 b Discuss the method of single stub matching. **CO5 L3 5M**

OR

- 11 a A 20 m long lossless transmission line with $Z_0 = 30 \Omega$ operating at 2 MHz is terminated with a load $Z_L = 30 + j 30 \Omega$. If $\beta = 0.6 \text{ C}$ on the line, find the reflection coefficient, the standing wave ratio S and the input impedance. **CO5 L3 5M**
 b What are the criteria that make a line a low-loss transmission line? **CO5 L2 5M**

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