

Time: 3 Hours

Max. Marks: 70

PART-A

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

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|---|---|---|-----|----|----|
| 1 | a | Define position and displacement vectors? | CO1 | L2 | 2M |
| | b | Define dielectric constant. | CO1 | L2 | 2M |
| | c | Define Ampere's circuital Law. | CO2 | L2 | 2M |
| | d | An antenna radiates in free space and $H = 50 \cos(1000t - 5y) \hat{a}_x$ A/m. Calculate ω and β | CO2 | L2 | 2M |
| | e | Define skin depth | CO4 | L1 | 2M |
| | f | Define critical angle | CO4 | L1 | 2M |
| | g | Define Transmission line | CO5 | L1 | 2M |
| | h | What are the primary and secondary constants of transmission line? | CO5 | L1 | 2M |
| | i | Define input impedance of a transmission line | 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 | Convert the following Cartesian points to cylindrical and spherical coordinates: i). $P(2, 5, 1)$ ii). $R(6, 2, -4)$. | CO1 | L2 | 5M |
| | b | Define Coulomb's law and derive the force F that exists between two unlike charges. | CO1 | L3 | 5M |

OR

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|---|---|---|-----|----|----|
| 3 | 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. | CO3 | L3 | 5M |
| | b | Explain the maxwell's two equations for electrostatic fields. | CO1 | L2 | 5M |

UNIT-II

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|---|---|---|-----|----|----|
| 4 | a | Determine the Magnetic Field intensity due to Infinite line Current by applying Ampere's Circuital law. | CO3 | L3 | 5M |
| | b | An infinitely filamentary wire carries a current of 2A in the +z direction. Calculate B at $(-3, 4, 7)$. | CO1 | L3 | 5M |

OR

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| 5 | | Explain maxwell's equation in word statements. | CO3 | L2 | 10M |
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UNIT-III

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|---|---|---|-----|----|----|
| 6 | a | Derive the wave equations for perfect dielectric medium. | CO6 | L3 | 5M |
| | b | In a Nonmagnetic medium $E = 4 \sin(2\pi \times 10^7 t - 0.8x) \hat{a}_z$ v/m, find ϵ_r , η | CO4 | L3 | 5M |

OR

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|---|---|--|-----|----|-----|
| 7 | a | Derive the expressions for reflection coefficient and transmission coefficient for reflection of plane wave at oblique in parallel polarization. | CO4 | L3 | 10M |
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UNIT-IV

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| 8 | a | Define and explain the different types of transmission lines used in communication systems. | CO5 | L2 | |
| | b | Discuss about Transmission line Parameters. | CO5 | L2 | |

OR

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|---|---|--|-----|----|--|
| 9 | a | Explain briefly about phase velocity and group velocity. | CO5 | L2 | |
| | b | Find the phase velocity and group velocity for a transmission line where $L = 0.5 \mu\text{H/m}$ and $C = 25 \text{ pF/m}$. | CO5 | L1 | |

UNIT-V

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|----|---|---|-----|----|--|
| 10 | a | Derive the expression for the input impedance of a lossless transmission line. | CO5 | L3 | |
| | b | A transmission line of characteristic impedance 50Ω is terminated with a load of 100Ω . Calculate the reflection coefficient at the load. | CO5 | L3 | |

OR

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| 11 | | 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 $\Gamma = 0.6$ 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. | CO5 | L4 | |
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