



MARRI LAXMAN REDDY INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(AN AUTONOMOUS INSTITUTION)

(Approved by AICTE, New Delhi & Affiliated to JNTUH, Hyderabad)

Accredited by NBA and NAAC with 'A' Grade & Recognized Under Section 2(f) & 12(B) of the UGC act, 1956

III B.Tech II Sem Regular End Examination, June 2022

Antennas and Propagation (Electronics and Communication Engineering)

Time: 3 Hours.

Max. Marks: 70

Note: 1. Question paper consists: Part-A and Part-B.

2. In Part - A, answer all questions which carries 20 marks.

3. In Part - B, answer any one question from each unit.

Each question carries 10 marks and may have a, b as sub questions.

PART- A

(10*2 Marks = 20 Marks)

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|---|----|-----|----|
| 1. a) What is isotropic radiator? | 2M | CO1 | L1 |
| b) The radial component of the radiated power density of an antenna is given by $W_{rad} = \frac{A_0 \sin^2 \theta}{r^2} \hat{a}_r$ W/m ² where A ₀ is the peak value of the power density, θ is the usual spherical coordinate, and \hat{a}_r is the radial unit vector. Determine the total radiated power. | 2M | CO1 | L3 |
| c) How the excitation currents are distributed in Binomial array. | 2M | CO1 | L2 |
| d) What are the advantages of arrays? | 2M | CO1 | L1 |
| e) What is folded dipole? What is the value of its impedance? | 2M | CO1 | L3 |
| f) What type of polarization is obtained from helical antenna in axial and normal modes? | 2M | CO1 | L4 |
| g) What is mean by fringing in Microstrip antennas? | 2M | CO1 | L2 |
| h) What is spill over in parabolic reflector? | 2M | CO1 | L2 |
| i) What is wave tilt? | 2M | CO3 | L1 |
| j) Write the relationship between MUF and skip distance | 2M | CO3 | L2 |

PART- B

(10*5 Marks = 50 Marks)

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|---|-----|-----|----|
| 2 a) Define the terms with respect to antenna:
(i) Gain (ii) Efficiency (iii) Beam width | 6M | CO1 | L1 |
| b) Derive the equation for input impedance of antenna in transmission and receiving modes. | 4M | CO1 | L3 |
| OR | | | |
| 3 Derive the field equations for a half wave dipole starting from Maxwell's equations. | 10M | CO1 | L3 |
| 4 a) Derive the equation for gain of broad side array with neat diagrams. | 5M | CO1 | L3 |
| b) Explain how the radiation pattern of antenna is measured. | 5M | CO2 | L2 |

OR

- 5 The z-plane array factor of an array of isotropic elements placed along the z-axis is given by (assume $\beta = 0$) $AF(z) = (z + 1)^4$. Determine the
- Number of elements of the discrete array to have such an array factor.
 - Normalized excitation coefficients of each of the elements of the array (the ones at the edges to be unity).
 - Classical name of the array design with these excitation coefficients.
 - Angles in θ in degrees of all the nulls of the array factor when the spacing d between the elements is $\lambda_0/4$.
 - Half-power beamwidth (in degrees) of the array factor when $d = \lambda_0/2$.
 - Maximum directivity (dimensionless and in dB) of the array factor when $d = \lambda_0/2$.
- 6 a) Draw the geometry of helical antenna in normal mode and determine the value of axial ratio. 5M C01 L2
- b) Draw the structure of Yagi-uda antenna and write its advantages. 5M C01 L2
- OR
- 7 What are the different types of horns? Draw its structures and explain the construction procedure of pyramidal horn. 10M C01 L3
- 8 a) Define the effective dielectric constant of microstrip antenna and Derive the equation for it 5M C01 L4
- b) Derive the equation for far fields of 90° corner reflector and draw its geometrical location and polarity of images. 5M C01 L4
- OR
- 9 What are the different feeding methods are there for microstrip antenna and explain them with neat diagrams. 10M C01 L3
- 10 a) Explain the effects of earth curvature on wave propagation. 5M C03 L3
- b) How Multi path propagation will increase the coverage distance? Explain 5M C03 L4
- OR
- 11 Draw and explain Ionosphere structure and how these layers are used for wave propagation. 10M C03 L3

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