

R18

Code No: 156AF

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, January/February - 2025

ANTENNAS AND PROPAGATION
(Electronics and Communication Engineering)

Time: 3 Hours

Max. Marks: 75

Note: i) Question paper consists of Part A, Part B.

ii) Part A is compulsory, which carries 25 marks. In Part A, Answer all questions.

iii) 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

(25 Marks)

- 1.a) What is an isotropic antenna? [2]
- b) Define (i) Beam efficiency (ii) Bandwidth. [3]
- c) How to increase the directivity of end-fire array? [2]
- d) Differentiate Linear and Binomial arrays. [3]
- e) What is Fermat's Principle of horn antenna? [2]
- f) Write about the constructional advantages for Horn Antenna. [3]
- g) Find the HPBW of a parabolic dish which provides a power gain of 50dB at 10GHz. [2]
- h) Write about image principle in reflectors. [3]
- i) Define Skip Distance. [2]
- j) What are the features of multi-hop propagation? [3]

PART – B

(50 Marks)

- 2.a) Define the Effective Aperture and calculate the Effective aperture of 0.25λ dipole.
 - b) Explain the radiation mechanism and derive the emf equation for Loop antenna. [5+5]
- OR**
- 3.a) Define reciprocity theorem and prove it in the case of antenna systems.
 - b) Prove that the directivity of a $\lambda/2$ aerial is 0.39dB more than that of a short dipole. [5+5]

- 4.a) Derive the expression for field of arrays of 2 Isotropic Sources for end-fire array.
- b) Write about the radiation pattern measurement. [6+4]

OR

- 5.a) Derive the expression for array factor of a linear broadside array of 'n' isotropic elements.
- b) Draw the radiation pattern of a 10-element uniform linear end-fire array of isotropic point sources of spacing $\lambda/2$. [6+4]

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6.a) Sketch and explain the construction, operation and design considerations for a Yagi-Uda antenna.

b) Derive the expression for input impedance of folded dipole antenna. [5+5]

OR

7.a) Write the design considerations for Helical Antenna.

b) Design an End-fire circularly polarized helix having HPBW of 45° and a circumference of 60cm at a frequency of 500MHz. Determine the turns needed, directivity and axial ratio. [5+5]

8.a) Calculate the FNBW and the power gain of a parabolic dish with a diameter of 30 m operating at 3GHz.

b) Explain about the geometry of Parabolic Reflectors. [5+5]

OR

9.a) Design a rectangular microstrip patch antenna with FR4-epoxy substrate with dielectric constant $\epsilon_r=4.4$ at 5.2GHz. Assume the thickness of the substrate is 1.6mm.

b) Explain the geometry of corner and flat sheet reflectors. [5+5]

10.a) Discuss the different modes of wave propagation.

b) Derive the fundamental equation for free space propagation. [5+5]

OR

11.a) Derive the expression for LOS range in space wave Propagation.

b) Explain about different layers of sky wave propagations. [5+5]

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