

R16

Code No: 136AF

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD

B. Tech III Year II Semester Examinations, May - 2019

ANTENNAS AND WAVE PROPAGATION

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 75

Note: This question paper contains two parts A and B.

Part A is compulsory which carries 25 marks. Answer all questions in Part A. Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART - A

(25 Marks)

- 1.a) Define Beam area and how does it related with Directivity of the antenna. [2]
- b) Find the gain of a parabolic antenna with a 6 meters diameter dish and dipole feed at a frequency of 10GHz. [3]
- c) List the applications of horn antennas. [2]
- d) How is a folded dipole used in an antenna designed for TV reception? [3]
- e) What are the advantages of microstrip antennas? [2]
- f) What is offset feeding of parabolic reflector antenna? [3]
- g) Differentiate Linear and Binomial arrays. [2]
- h) Find the HPBW of a uniform linear array consisting of 16 isotropic point sources with spacing $\lambda/4$ and phase difference $\delta = -90^\circ$. [3]
- i) Define optimum usable frequency of an ionospheric layer. [2]
- j) What is multi-hop propagation? [3]

PART - B

(50 Marks)

- 2.a) Define the half-power beam width and directivity of an antenna. And derive the relation between them.
- b) The far field of an antenna along the (θ, ϕ) direction is given by $E_\theta(\theta, \phi) = E_0 \cos^2 \theta$ and $E_\phi(\theta, \phi) = 0$. Calculate the maximum directivity of the antenna. [5+5]

OR

3. Derive the field components and radiation resistance of a half wave dipole. [10]

- 4.a) Explain the Radiation characteristics of a pyramidal horn antenna with neat diagrams.
- 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]

OR

- 5.a) Explain the impedance transformation characteristics of a folded dipole.
- b) Sketch and explain the construction, operation of a helical antenna. [5+5]

6.a) Explain the characteristics of an active corner reflector with the help of image principle. [5+5]

b) Illustrate the geometrical features of parabolic reflectors: [5+5]

OR

7.a) Draw the radiation characteristics of rectangular microstrip antenna.

b) Calculate the FNBW of a 2.5 m parabolic reflector used at 6GHz. What will be its gain in decibels? [6+4]

8.a) Derive the expression for array factor of a linear broadside array of n isotropic elements.

b) Find the array factor and plot the normalized radiation pattern of a broadside array of 5 isotropic radiators of spacing $\lambda/2$. [5+5]

OR

9.a) Explain the 3-antenna method of measurement of the gain of a horn antenna with necessary relations. [5+5]

b) List different sources of errors in antenna measurements. [5+5]

10.a) Discuss the salient features of sky wave propagation. Bring out the various problems associated with this mode of propagation. [5+5]

b) Write short notes on D-layer and sporadic-E layer. [5+5]

OR

11.a) Find the relation between Maximum usable frequency and Skip distance.

b) Calculate the maximum usable frequency for a high frequency radio link between two points at a distance of 2500km on the surface of earth. Consider the height of ionosphere is 200km and the critical frequency is 5MHz. [5+5]

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