Code No: 136AF

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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 $\delta= -90^0$.   [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 $E_\theta(\theta,\varphi) = E_0 \cos^2\theta$ and
        $E_\varphi(\theta,\varphi) = 0$. 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 45^0 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.
  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.
  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.
  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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