Code: 15A04501

R15

B.Tech III Year I Semester (R15) Regular Examinations November/December 2017

ANTENNAS & WAVE PROPAGATION

(Electronics and Communication Engineering)

Time: 3 hours

Max. Marks: 70

PART – A
(Compulsory Question)
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1   Answer the following: (10 X 02 = 20 Marks)
  (a) Define effective area and effective length of antenna.
  (b) Differentiate broadside and end-fire arrays.
  (c) State the principle of pattern multiplication.
  (d) Draw the radiation patterns of dipole of length $\lambda, 2\lambda$ respectively.
  (e) Give the far field expressions for small loop antenna.
  (f) What are the advantages of binomial arrays?
  (g) Give the advantages of micro strip antennas.
  (h) What are the different types of losses in reflector antenna?
  (i) Differentiate between radio horizon and optical horizon.
  (j) Explain the concept of super refraction.

PART – B
(Answer all five units, 5 X 10 = 50 Marks)

UNIT – I

2   (a) Obtain the relations between the potentials and their sources.
  (b) Derive the expression for the power radiated by an alternating current element and hence its radiation resistance.

OR

3   (a) The radiation intensity of major lobe of many antennas can be adequately represented by:

$$v(\theta,\phi) = B_O \cos\theta \quad for \quad 0 \le \theta \le \Pi/2 \quad \&$$

$$0 \le \phi \le 2\Pi$$

Find the directivity.
  (b) Define the terms radiation intensity, beam width, bandwidth and beam efficiency.

UNIT – II

4   (a) What is a travelling wave antenna? Explain with sketches the principle and operation of rhombic antenna.
  (b) Describe the construction and basic principles of operation of a helical antenna:
       (i) Normal mode of operation. (ii) Axial mode of operation.

OR

5   (a) Draw the diagram of pyramidal horn antenna and explain its operation.
  (b) The radius of a small loop of constant current is $\lambda/25$. Find the physical area of the loop and compare it with its maximum effective aperture.

UNIT – III

6   (a) With the help of diagrams and equivalent circuits, explain feeding mechanisms of micro strip antenna.
  (b) Design a rectangular micro strip antenna using a substrate with dielectric constant of 2.2, h = 0.1588 cm so as to resonate at 10 GHz.

OR

7   (a) Draw the schematic diagram of parabolic reflector with Cassegrain feed and explain different feed patterns.
  (b) Explain the working of lens antenna and zoning.

UNIT – IV

8 (a) In a linear array of 4 isotropic elements spaced $\lambda/2$ apart and with equal currents fed in phase, plot the radiation pattern in polar coordinates.

(b) Derive the expressions of null-null beam width of a uniform linear array.

OR

9 (a) What are the precautions to be taken to obtain an accurate pattern measurements.

(b) Explain the method of measurement of antenna directivity with the help of diagram.

UNIT – V

10 (a) Derive expression for the field strength, due to space wave propagation at a point away from the transmitter.

(b) Explain salient features of Sommerfeld's theory.

OR

11 (a) Explain the terms wave tilt, virtual height, MUF, skip distance and critical frequency.

(b) Derive an expression for the refractive index of the ionosphere in terms of 'N' and frequency.

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