Code No: 115DQ

R13

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B. Tech III Year I Semester Examinations, March - 2017
ANTENNAS AND WAVE PROPAGATION
(Common to ECE, ETM)

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 the terms antenna efficiency and radiation efficiency. [2]

b) If the power density due to a point source in a free space at a distance of 25 Km is 100 micro watt/m^2 then what is the power density if the distance is (i) doubled (ii) halved. [3]

c) What is optimum horn? Explain its important features. [2]

d) Explain how unidirectional pattern is formed in Yag Uda antenna from the bi directional pattern of folded dipole. [3]

e) Why is zoning done in lens antenna? [2]

f) Discuss various methods available for analysis of microstrip antenna. [3]

g) Explain how beam steering is achieved in uniform linear array? [2]

h) Calculate directivity of a given linear uniform BSA of 10 element with separation of $\lambda/4$ between the elements. [3]

i) What is skip distance? [2]

j) What is wave tilt? List all the factors that affect wave tilt. [3]

PART - B

(50 Marks)

2.a) Derive the expression for radiation fields of a centre fed half wavelength dipole antenna. Sketch the radiation pattern.

b) Prove the reciprocity theorem as applicable to antennas and hence show the equality of directional pattern for transmission and reception by same antenna. [5+5]

OR

3.a) Compare far fields of small loop antenna and short dipole antenna.

b) What is the radiation resistance of antenna? Derive the expression for radiation resistance of half wave length dipole antenna. [5+5]

4.a) Derive the construction and basic principles of operation of a helical antenna under (i) normal mode of operation (ii) axial mode of operation

b) Explain the working of folded dipole antenna. [5+5]

OR

5.a) Draw the sketch of Yagi Uda array antenna. Prove how the longer antenna behind the main antenna behaves as a reflector and the shorter antenna in front of main antenna acts as a director.

b) What is electromagnetic horn antenna? What are the various types of horn? What are their practical applications? [5+5]

6.a)   Discuss the principle of operation and the consideration which have to be gone into the design and construction of parabolic reflector antenna.

   b)   Explain the various feeding mechanisms used in parabolic reflector antennas.   [5+5]

OR

7.a)   Show that the contour of a nonmetallic dielectric lens antenna is a hyperbola.

   b)   Explain the principle of working of lens antenna.   [5+5]

8.a)   What is binomial array antenna. What its basic principle of working? Mention the advantages and disadvantages.

   b)   What is the principle of pattern multiplication explain with an example.   [5+5]

OR

9.a)   What is near field and far field region? Why is the condition $2D^2/\lambda$ chosen for far field region.

   b)   With a neat sketch explain the procedure of radiation pattern measurement.   [5+5]

10.a)   Derive the relation for dielectric constant of ionosphere layer in terms of plasma frequency.

   b)   Explain the phenomenon of ducting? What are the conditions required for manifestation of this phenomenon.   [5+5]

OR

11.a)   Briefly explain the tropospheric propagation and multi-hop propagation.

   b)   Explain the following terms with diagram (i) Duct propagation (ii) Skip zone   [5+5]

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