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INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

Four Year B.Tech V Semester End Examinations(Regular) - November, 2019

Regulation: IARE – R16

ANTENNAS AND PROPOGATION

Time: 3 Hours

(ECE)

Max Marks: 70

Answer ONE Question from each Unit

All Questions Carry Equal Marks

All parts of the question must be answered in one place only

UNIT – I

- (a) Explain in detail about the concept of retarded vector potential. [7M]

(b) Discuss in detail about the power radiated by the current element and its radiation resistance. [7M]
- (a) Starting from linear current distribution discuss in detail about the linear antenna. [7M]

(b) Obtain expressions for the power radiated by a half wave dipole antenna and calculate the radiation resistance of the antenna. [7M]

UNIT – II

- (a) Find the total electric field of two point sources array with equal amplitude and out of phase at a far distant point. [7M]

(b) State three effects of non-uniform amplitude distribution on radiation pattern. Explain the Binomial array. [7M]
- (a) Design and explain Yagi-Uda antenna with 5 elements of appropriate length with a neat sketch. [7M]

(b) Explain with sketches a helical antenna and briefly describe its operation in the axial mode. [7M]

UNIT – III

- (a) Draw and explain the slot antenna with working principle. Draw its radiation pattern. [7M]

(b) What are the advantages of slot antennas. Determine the impedance of slot antenna. [7M]
- (a) Explain in detail about the construction of horn antenna and its operation. [7M]

(b) A pyramidal horn antenna having aperture dimensions of $a = 5.2$ cm and $b = 3.8$ cm is used at a frequency of 10GHz. Calculate its gain and HPBW. [7M]

UNIT – IV

7. (a) With a neat block diagram explain the measurement of gain of an antenna. [7M]
(b) Find the diameter of the reflector antenna that has a 0.5 deg HPBW at a frequency of 8.2 GHz. Assume an efficiency constant = 0.6. Calculate the antenna gain and effective aperture. [7M]
8. (a) Describe in detail the Cassegrain method of feeding of a paraboloid reflector with the help of the diagram. [7M]
(b) A parabolic reflector antenna with diameter 20 m, is designed to operate at frequency of 6GHz and illumination efficiency of 0.54. Calculate antenna gain. [7M]

UNIT – V

9. (a) Explain clearly about the structure of the atmosphere. Draw the structure of ionosphere. [7M]
(b) Calculate the critical frequency for the F1, F2 and E layers for which the maximum ionic densities are 2.3×10^6 , 3.5×10^6 and 1.7×10^6 electrons per c.c respectively? [7M]
10. (a) Explain the following terms with expressions.
i) Critical frequency
ii) MUF
iii) Virtual Height
iv) Skip distance [7M]
- (b) Show that $d = 3.57 [\sqrt{h_t} + \sqrt{h_r}]$ km is the distance in Line of sight propagation. [7M]