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10EC64

Sixth Semester B.E. Degree Examination, Aug./Sept.2020
Antennas and Propagation

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions, selecting atleast TWO questions from each part.***

PART - A

1 a. Explain the following terms with respect to an antenna :
i) Radiation intensity ii) Beam area iii) Polarization. **(06 Marks)**

b. Deduce the expression to depict the relation between effective aperture and directivity. **(07 Marks)**

c. Derive the expression for a field at a particular point in free space. **(07 Marks)**

2 a. Determine the actual directivity and approximate directivity for : i) $U = U_m \cos^3 \theta$
ii) $U = U_m \sin\theta \sin^2\phi$ iii) $U = U_m \sin\theta \sin^3\phi$ for $0 \le \theta, \phi \le \pi$. **(10 Marks)**

b. A linear array of 4 point sources has a distance of N_2 between adjacent elements of the array. The power is applied with equal amplitude and a phase difference of $-d_r$. Obtain the field pattern. **(10 Marks)**

3 a. Deduce the expression for the electric field component of a linear antenna of length N_2. **(12 Marks)**

b. Illustrate that the radiation resistance of a short dipole is 73Ω. **(08 Marks)**

4 a. Derive the expression for electric field component of a small circular loop antenna of radius 'a' carrying current I. **(08 Marks)**

b. State and illustrate Babinets principle. **(06 Marks)**

c. Deduce the expression for radiation resistance of a loop antenna. **(06 Marks)**

PART - B

5 a. Explain the Slot antenna and Complementary antenna. **(06 Marks)**

b. Explain the features and operation of helical antenna with its modes of operation. **(07 Marks)**

c. Explain the working of Yagi – Uda antenna. Mention its applications. **(07 Marks)**

6 a. Explain Rumsey's principle and the operation of log periodic antenna. **(10 Marks)**

b. Describe the operation of i) Antennas for ground penetrating radar ii) Embedded antenna. **(10 Marks)**

7 a. Deduce the resultant field strength due to direct and ground related rays at a distance 'd' from the transmitter , 'h_t' is the height of the transmitter and 'h_r' is the height of the receiver. **(10 Marks)**

b. Describe the factors affecting ground wave propagation. **(06 Marks)**

c. A VHF communication is to be established at 90MHz, with the transmitter power of 35W. Calculate the LOS communication distance, if the height of transmitter and receiver antenna are 40m and 25m respectively. **(04 Marks)**

8 a. Explain the different layers of the ionosphere. **(06 Marks)**

b. Calculate the critical frequency for F_1, F_2 and E layers for which the maximum ionic densities are 2.3×10^6 , 3.5×10^6 and 1.7×10^6 electrons/cm^3 respectively. **(06 Marks)**

c. Describe the significance of MUF and skip distance. Deduce the expression for MUF. **(08 Marks)**

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