7E4044

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B. Tech. VII Semester (Main/Back) Examination, Nov-Dec - 2011
Electronics & Communication Engineering
7EC1 Antenna & Wave Propagation

Time : 3 Hours

Maximum Marks : 80
Min. Passing Marks : 24

Instructions to Candidates:

*Attempt any **five questions** selecting **one question** from **each unit**. All questions carry **equal marks**. Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly. Units of quantities used/calculated must be stated clearly.*

Unit - I

1. a) Find the directivity, efficiency and effective area of an antenna if its $R_r = 85\Omega$, $R_l = 15\Omega$. The power gain is 12dB and antenna operates at a frequency of 200 MHz.   **(2×3=6)**

    b) Prove that the radiation resistance of Hertzian dipole is $R_r = 80\pi^2 \left(\dfrac{dl}{\lambda}\right)^2 \Omega$. **(10)**

OR

1. a) Find the current required to radiate power of 60 W at 50 MHz from a 0.15 λ Hertzian dipole.   **(6)**

    b) Prove that the radiated power of quarter-wave monopole, $P_T = 36.5 J^2 eff$ Watts and Radiation resistance, $R_r = 36.5\Omega$.   **(10)**

Unit - II

2. a) Define normal and axial mode of Helical antenna.   **(6)**

    b) Design a three-element Yagi-Uda antenna to operate at a frequency of 570 MHz.   **(10)**

OR

2. a) Draw the feed arrangements for microstrip patch antenna. (6)

   b) Calculate the design data of a Rhombic antenna to operate at 50 MHz if the angle of elevation is 30°. (10)

Unit - III

3. a) Define the principle of pattern multiplication and explain by considering an array of eight elements spaced at $\lambda/2$. (6)

   b) Find out Null-to-Null beam width of a broadside array when array length is 15λ and number of elements 30. (5)

   c) Find the null-to-null beam width of end-fire array when the array length is 15λ and number of element 30. (5)

OR

3. a) What are the effect of ground on antennas. (6)

   b) Find the relative excitation levels of a binomial array of 5 elements. (5)

   c) Obtain the pattern of a two-element array fed 180° out of phase (end-fire) and spaced at $d = \lambda/2$. (5)

Unit - IV

4. a) Discuss the different causes of attenuation and fading in tropospheric propagation. (6)

   b) A communication system is to be established at a frequency of 60 MHz with a transmitter power of 2 KW. The field strength of the directive antenna is 5 times that of a half-wave antenna, h_t=60m, h_r=6m. A field strength of $100 \mu V/m$ is required to give satisfactory reception. Find the range of the system. (10)

OR

4. a) Describe the Duct propagation. (6)

   b) A sky-wave is incident on D-layer at an angle of 35°. Find the angle of refraction if the frequency of the transmitted wave is 70 MHz. (10)

Unit - V

5. a) Describe the maximum usable frequency. (6)

    b) When the maximum electron density of the ionosphere layer corresponds to refractive index of 0.95 at the frequency of 20MHz, find the range if the frequency is MUF itself. The height of the ray reflection point on the ionospheric layer is 400 km. Assume flat earth and negligible effect of earth's magnetic field. (10)

OR

5. a) Describe the effect of earth's magnetic field. (6)

    b) Find the critical frequency if the maximum electron density is 1.3×10^6 electrone/cm^3. (5)

    c) What is the critical angle of propagation for D-layer if the transmitter and receiver are separated by 450 km? (5)

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