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06EC64

Sixth Semester B.E. Degree Examination, June/July 2011
Antennas and Propagation

Time: 3 hrs. Max. Marks:100

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

PART – A

1 a. Define the term directivity and effective operator of an antenna. Derive the relation for D in terms of A_e. **(08 Marks)**

b. Define the following with respect to antenna
i) Effective height ii) Antenna field zones. **(04 Marks)**

c. Calculate the directivity of the source with the pattern $u = u_m \sin\theta \sin^3\phi$ using
i) Exact method ii) Approximate method. Take $0 \le \theta \le \Pi$ and $0 \le \phi \le \Pi$. **(08 Marks)**

2 a. The power received by the receiving antenna at a distance of 0.5 km over a free space at a frequency of 1 GHz is 10.8mW. Calculate the input to the transmitting antenna if gain of transmitting antenna and receiving antenna is 25dB and 20dB respectively. The gain is with respect to isotropic source. **(06 Marks)**

b. Explain the concept of principle of pattern multiplication with an example. **(06 Marks)**

c. Show that the width of the principle lobe of a uniform end-fire array is grater than that of a uniform broad-side array. **(08 Marks)**

3 a. Derive the field equation for a linear array of n isotropic point sources of equal amplitude and spacing. Explain its operation as i) Broad side array ii) End fire array. **(08 Marks)**

b. 4 isotropic point sources are placed $\lambda/6$ m apart. The power is applied with equal amplitude and a phase difference of $\Pi/3$ between adjacent element, determine FNBW. **(06 Marks)**

c. Using exact method, calculate the distance between elements of broadside array whose beam width between first null is found to be 45^0 at a frequency of 10MHz. There are 8 elements in the array. **(06 Marks)**

4 a. Starting from the concept of magnetic vector and electric scale potentials, derive the expressions for the field components of a short dipole for both general care and for field care. **(10 Marks)**

b. Write note on folded dipole antenna. **(04 Marks)**

c. A half wave dipole in free space is radiating with a current of 1A (rms) at the antenna terminals. Find the angle θ for maximum field strength and determine the field strength and power density at a point mile from the antenna at the corresponding angle. **(06 Marks)**

PART – B

5 a. Derive Far field expressions for small loop antenna. **(08 Marks)**

b. Explain the different types of rectangular and circular horn antenna. For rectangular horn write design equation for flare angle. **(06 Marks)**

c. Explain the slot and complementary antennas. **(06 Marks)**

6 a. Explain the axiat mode pattern and the phase velocity of wave propagation on Monofilar Helical antenna. **(10 Marks)**

b. Explain the working of log periodic antenna. **(05 Marks)**

c. Write a note on Embedded and Plasma antenna. **(05 Marks)**

7 a. Explain the propagation of wave by means of i) Surface wave ii) Diffraction. **(10 Marks)**

b. For Tropospheric wave propagation, show that the radius of curvature of path is a function of rate of change of refractive index with height and explain the duct propagation of wave. **(10 Marks)**

8 a. Explain the mechanism of wave reflection from ionosphere. **(06 Marks)**

b. For Ionospheric wave propagation show that attenuation factor is given by $\frac{60\Pi\sigma}{\sqrt{\epsilon_r}}$ **(06 Marks)**

c. A high frequency radio link is established for a range of 2000km. If the reflection region of the ionosphere is at a height of 300km and has a critical frequency of 8MHz. Calculate the maximum usable frequency. Derive the formula used. **(08 Marks)**

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