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10EC64

Sixth Semester B.E. Degree Examination, June/July 2017

Antenna and Propagation

Time: 3 hrs. Max. Marks:100

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

PART – A

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

b. Define the following parameters of antenna:
i) Beam area
ii) Radiation pattern **(08 Marks)**

c. An antenna has a field pattern given by $E(\theta) = \cos\theta\cos 2\theta$ for $0 \le \theta \le 90°$. Find:
i) The half-power beam width
ii) The beam width between first nulls. **(04 Marks)**

2 a. State and prove the power theorem and explain its application to an isotropic source. **(04 Marks)**

b. The radiation intensity of an antenna is given by $U = U_m \sin^2\theta$ for $0 \le \theta \le \pi/2$ and $0 \le \phi \le 2\pi$. Find the directivity. **(04 Marks)**

c. Explain field and phase pattern. **(05 Marks)**

d. Derive an expression for total field in case of two isotropic points with same amplitude and phase. Plot the relative field pattern when these two isotropic sources are spaced $\lambda/2$ apart. **(07 Marks)**

3 a. Derive the expression for the radiation resistance of short dipole. **(08 Marks)**

b. Show that the radiation resistance of a linear $\lambda/2$ antenna with sinusoidal current distribution is equal to 73Ω. **(08 Marks)**

c. For a short dipole $\lambda/15$ long, find the efficiency, radiation resistance if loss resistance is 1Ω. Find also the effective aperture. **(04 Marks)**

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

b. State and explain Babinet's principle. **(06 Marks)**

c. Write notes on patch antenna with applications. **(06 Marks)**

PART – B

5 a. Explain the Yagi-Uda array antenna. **(08 Marks)**

b. Explain the working of log periodic antenna. **(08 Marks)**

c. A 16-turn helical beam antenna has a circumference of λ and turn spacing of $\lambda/4$. What is (i) HPBW, (ii) Axial ratio, (iii) Gain? **(04 Marks)**

6 Write short notes on:

a. Sleeve antenna **(05 Marks)**

b. Antennas for ground penetrating radars (GPR) **(05 Marks)**

c. Ultra wide band antennas **(05 Marks)**

d. Plasma antenna **(05 Marks)**

7 a. Find the approximate formula for the filed strength in VHF propagation and explain how it varies sinusoidally. **(10 Marks)**

b. Explain about the diffraction with two basic models. **(06 Marks)**

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

8 a. Derive the expression for refractive index of an ionospheric layer. **(10 Marks)**

b. Explain the effects of earth's magnetic field. **(06 Marks)**

c. A HF radio link is established for a range of 2000 km. If the reflection region of the ionosphere is at a height of 200 km and has a critical frequency of 6 MHz. Calculate MUF. **(04 Marks)**

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