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10EC64

Sixth Semester B.E. Degree Examination, June/July 2019
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. Define the following terms :
i) Beam area ii) Effective height iii) Directivity iv) Radiation pattern. **(12 Marks)**

b. What is Friis formula? How can it be used for the calculation of power at a receiving point. **(05 Marks)**

c. A radio link has 150W transmitter connected to an antenna of $2m^2$ aperture at 2GHz. The receiving antenna has a aperture of $1.5m^2$ and is located at 10km. Find the power delivered to the receiver. **(03 Marks)**

2 a. Define a point source. State the power theorem as applied to a point source. **(06 Marks)**

b. Calculate the directivity of a broad side array of two identical isotropic sources feed with currents of same magnitude and phase spaced $\lambda/4$ apart along the polar axis. The relative field pattern is give by $E = \text{Cos}(\pi/2 \cos\theta)$ where θ is the polar angle. **(06 Marks)**

c. Obtain the expression for the field due to a broad side array of n elements. **(08 Marks)**

3 a. Derive the radiation resistances in the case of
i) Thin linear dipole ii) $\lambda/2$ dipole. **(10 Marks)**

b. Given for an antenna $R_r = 73\Omega$, $R_L = 7\Omega$ and G = 10dB. Compute its efficiency and directivity. **(06 Marks)**

c. Write short note on V antennas. **(04 Marks)**

4 a. Derive the expression for the field strengths E_ϕ and H_θ in the case of a small loop. **(10 Marks)**

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

c. Explain microstrip antennas with neat sketches and mention its advantages. **(04 Marks)**

PART - B

5 a. Explain the practical design and operation for the monofilar axial mode helical antenna. **(07 Marks)**

b. Explain the working of log periodic antenna. **(07 Marks)**

c. Explain the theory behind Yagi – Uda array. **(06 Marks)**

6 a. Write short notes on :
i) Antennas for ground penetrating radar.
ii) Ultra – wide band antennas. **(14 Marks)**

b. Explain Turnstile antenna. **(06 Marks)**

7 a. Discuss the different forms of radio wave propagations. **(08 Marks)**

b. Derive an expression for space wave field intensity. **(08 Marks)**

c. A TV transmitter (T) uses an antenna of height 200m. The height of receiving antenna (R) for this transmitter is 20m. Obtain the maximum spacing between T and R through tropospheric propagation. Compute also the radio horizon in this case. **(04 Marks)**

8 a. For Ionospheric layer, derive the expression for conductivity and relative permittivity as a function of electron density and angular frequency. **(08 Marks)**

b. Calculate the value of the operating frequency of the ionospheric layer specified by a refractive index 0.85 and an electron density of 5×10^5 electrons/cm^3. **(04 Marks)**

c. Calculate the value of the skip distance given that the height of the ionospheric layer is 50km, MUF is 29MHz and its critical frequency is 4MHz. **(04 Marks)**

d. Write short note on Diffraction. **(04 Marks)**

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