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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 $G = 10\text{dB}$. 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. (14 Marks)
 ii) Ultra – wide band antennas. (06 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/cm³. (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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