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Question Paper Code : 70441

B.E./B.Tech. DEGREE EXAMINATIONS, NOVEMBER/DECEMBER 2021.

Sixth Semester

Electronics and Communication Engineering

EC 6602 – ANTENNA AND WAVE PROPAGATION

(Regulations 2013)

(Common to : PTEC 6602 – Antenna and Wave Propagation for B.E. (Part - Time) –
Electronics and Communication Engineering - Fifth Semester (Regulations - 2014)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. Determine the electric field intensity at a distance of 10 km from a dipole antenna of directive gain of 6 dB and radiating power of 20 kW.
2. Define gain of an antenna. Mention the relationship between gain and aperture of an antenna.
3. The impedance of the half wave dipole antenna is $Z_d = 73 + j43$. Find the impedance of half wave slot antenna.
4. What are the types of feed used for reflector antenna?
5. What is binomial array? What are the disadvantages of binomial array?
6. What is meant by uniform linear array?
7. State Rumsey's principle.
8. Compare and contrast wedges and pyramids.
9. What is meant by fading?
10. Determine the maximum range of a Tropospheric transmission for which the transmitting antenna height is 100m and receiving antenna height is 10 m.

PART B — (5 × 13 = 65 marks)

11. (a) (i) Derive the expression for radiated fields and power of an half wave dipole antenna. (9)
- (ii) A dipole having 3 cm length is operated at 1 GHz. Calculate its radiation resistance. (4)

Or

- (b) (i) Explain the different types of antenna polarization. (5)
- (ii) Calculate the maximum effective aperture and directivity of a short dipole antenna. (8)
12. (a) (i) Find the dimensions and terminal resistance of a complementary slot for a cylindrical dipole with length to diameter ratio of 28 and length of 0.925λ having terminal impedance of $710 + j0$ ohms. (5)
- (ii) Explain in detail about radiation mechanism of slot antenna and derive the impedance of a Infinitesimally thin $\lambda/2$ slot antenna. What are the differences between slot and its complementary antenna. (8)

Or

- (b) (i) Write short notes on microstrip antenna. List the advantages and disadvantages of microstrip antenna. Discuss the ways to improve the bandwidth of microstrip antenna. (10)
- (ii) Explain the different feeding techniques for microstrip antenna. (3)
13. (a) Derive and draw the radiation pattern of 4 isotropic sources of equal amplitude and same phase. (13)

Or

- (b) (i) Describe the principle of phased arrays and explain how it is used in beam forming. (8)
- (ii) Write short notes on binomial arrays. (5)
14. (a) (i) Explain the operation and design of a helical Antenna. (9)
- (ii) Explain the procedures involved in the measurement of gain in antennas. (4)

Or

- (b) Explain in detail about log periodic antennas. What is the need for feeding from end with shorter dipoles and the need for transposing the lines? Also discuss the effects of decreasing α . (13)

15. (a) (i) Derive an expression for the refractive index of the ionosphere in terms of electron number density and frequency. (8)
- (ii) Explain the terms : Duct propagation and multi hop propagation. (5)

Or

- (b) (i) Describe the significant features of ground wave propagation. (4)
- (ii) Explain with the help of suitable sketch, the concept of skip distance and its relation to maximum usable frequency. (9)

PART C — (1 × 15 = 15 marks)

16. (a) (i) What is Log periodic antenna ? Explain the design principle of Log periodic antenna. (9)
- (ii) Design a 50 – 200 MHz Log-periodic antenna to obtain a gain corresponds to scale factor 0.8 and space factor 0.15. (6)

Or

- (b) Explain with the aid of a diagram, how multi-path transmission can arise of a long distance high frequency point to point service. What steps can be taken to minimize the effects of multi-path transmission? Explain how the D-layer and sporadic E layer affect long distance radio communication. (15)
