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Question Paper Code: 46403

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2019

Sixth Semester

Electronics and Communication Engineering

14UEC603 - ANTENNA AND WAVE PROPAGATION

(Regulation 2014)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 1 = 10 Marks)

1. Effective aperture is always ---------- than Physical aperture.

   (a) higher (b) Θ (c) Elliptical (d) Circular

2. Consider a lossless antenna with a directive gain of +6 dB. If 1 mW of power is fed to it, the load power radiated by the antenna will be

   (a) 4mW (b) 1mW (c) 7mW (d) 1/4mW

3. A dipole antenna of λ/8 length has an equivalent total loss resistance of 1.5Ω. The efficiency of the antenna is

   (a) 0.89159% (b) 8.9159% (c) 89.159% (d) 891.59%

4. The array that does not produce side lobes excepting principal lobe is

   (a) Broad side array (b) End fire array

   (c) Yagi-Uda array (d) Binomial array

5. Corrugations in conical horn antenna is provided to improve

   (a) Directivity (b) Impedance matching

   (c) Beam symmetry (d) Bandwidth

6. The relation between slot and dipole impedances is

(a) $Z_S Z_d = Zi^2/4$ (b) $Z_S Z_d = Zi^2/2$

(c) $Z_S Z_d = Zd^2/4$ (d) $Z_S Z_d = Zd^2/2$

7. A 13 element Yagi-uda antenna array produces a maximum gain of _____ dB (approx.).

(a) 5 (b) 9 (c) 14 (d) 3

8. For a Hertz dipole antenna, the Half Pore Beam Width (HPBW) in the E-Plane is

(a) 360^o (b) 180^o (c) 90^o (d) 45^o

9. If the maximum electron density for F-layer in ionosphere is 4 x 106 electrons/cm3, then what will be the critical frequency of EM wave for F-layer?

(a) 4 MHz (b) 9 MHz (c) 18 MHz (d) 25 MHz

10. _____ is not a type of fading.

(a) Polarization (b) Skip (c) Interence (d) None of these

PART - B (5 x 2 = 10 Marks)

11. Distinguish far field and near field region of an antenna.

12. List out the advantages and disadvantages of loop antenna.

13. Define a Hertzian dipole.

14. Mention the relation between the length 'l' and spacing 'S' of adjacent elements of log periodic dipole array.

15. What are the factors that affect the propagation of radio waves?

PART - C (5 x 16 = 80 Marks)

16. (a) Discuss in detail on different apertures of an antenna and explain the relation between them (16)

Or

(b) (i) In a microwave link, two identical antennas operating at 10GHZ are used with power gain of 40db. If the transmitted power is 1 watt, find the received power if the range of the link is 30km. (8)

(ii) A thin dipole antenna is $\lambda/2$, if it's $R_{L=}$ 1.5Ω find R_r and its efficiency. (8)

17. (a) Derive the fields radiated from a half wave dipole antenna. Also find the power radiated from the same. (16)

Or

(b) Elucidate linear array of 4 isotropic elements spaced λ /2 apart and with equal currents fed out phase, plot the radiation pattern in polar coordinates. (16)

18. (a) Design a rectangular micro strip patch with dimensions W and L over a single substrate, whose center frequency is 10 GHz. The dielectric constant of the substrates is 10.2 and the height of the substrate is 0.127 cm. Determine the physical dimensions W and L of the patch taking into account fringing fields. (16)

Or

(b) Express the importance of Babinet's principle on complementary antennas in detail. (16)

19. (a) Explain the radiation mechanism of a 2 element Yagi-Uda Antenna. Derive its gain expression. (16)

Or

(b) (i) Design a log periodic dipole array with 7 db gain and a 4 to 1 bandwidth. Given from "Carrel" curve that 7 db gain corresponds to $\alpha=15^{\circ}$, K=1.2 and S/λ =0.15. (8)

(ii) Elaborate Gain and Directivity measurements in antenna. (8)

20. (a) At a 150 km height in the ionosphere, the electron density at night is about 2×10^{12} m^{-3} and the signal MUF is 1.5 times the critical frequency for a transmission distance of 600km. Compute the following: (i) Critical frequency (ii) Relative dielectric constant (iii) Phase constant (iv) Wave impedance (v) Wave velocity. (16)

Or

(b) Explain the various layers of Ionosphere (16)