C   Reg. No. : [ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ][ ]

Question Paper Code: 95404

B.E. / B.Tech. DEGREE EXAMINATION, APRIL 2024

Fifth Semester

Electronics and Communication Engineering

21UEC504 - ANTENNA AND WAVE PROPAGATION

(Regulations 2021)

Duration: Three hours   Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. The beam width of the antenna pattern measured at half power points is   CO1-U
   called_____

   (a) Half power beam width   (b) Full null beam width

   (c) Beam width   (d) None of the above

2. In an electrically large loop, an overall length of the loop is equal to _____   CO1-U

   (a) $\lambda/2$ (b) λ (c) $\lambda/20$ (d) $\lambda/50$

3. In lens antenna, what kind of wave energy is transformed into plane
   waves?   CO2-U

   (a) Convergent   (b) Divergent   (c) Contingent   (d) Congruent

4. In Rhombic antenna maximum gain is along the   CO1-U

   (a) main axis   (b) minor axis   (c) back side of the hemisphere   (d) none of these

5. Relative Permittivity of the ionosphere at radio frequencies is   CO1-U

   (a) >1   (b) <1   (c) 1   (d) 0

PART – B (5 x 3= 15Marks)

6. Find the maximum effective aperture of a Microwave antenna with a directivity   CO1- U
   of 900?

7. Calculate the directivity of a given linear broadside uniform array of 10 isotropic   CO1 -U
   elements with a separation of $\lambda/4$ between the elements

8. Find the terminal impedance of a thin $\lambda/2$ slot antenna when the impedance of a   CO1- U
   thin $\lambda/2$ dipole antenna is 73+j42.5 ohms.

9. Distinguish Rectangular and tapered Chamber..   CO1 -U

10. What is the critical frequency for reflection at vertical incidence if the maximum   CO1 -U
    value of electron density is $1.24*10^6$ cm^{-3}?

<div align="center">PART – C (5 x 16= 80Marks)</div>

11. (a) (i) A transmitting antenna having effective height of 6.14m takes   CO2 -App   (8)
           a current of 50amp, at a wavelength of 625m. Find radiation
           resistance and power radiated by an antenna.

        (ii) Compute the effective area of an antenna if Rr=80 ohm   CO2 -App   (8)
           Rl=10ohm.The power gain is 30db and the antenna operates at
           100MHZ

<div align="center">Or</div>

    (b) (i) Two spacecraft are separated by 100 Mm. Each has an antenna   CO2 -App   (8)
           with D = 1000 operating at 3.5 GHz. If craft A's receiver requires
           20 dB over 1 pW, what transmitter power is required on craft B to
           achieve this signal level?

        (ii) What is the effective length of half wave dipole operating at   CO2- App   (8)
           50MHZ and 200MHZ.given A_e=.13λ^2,Rr=73 ohm, Z=377 ohm.

12. (a) Analyze the fields radiated from a $\lambda/2$ dipole antenna using   CO4- Ana   (16)
        Maxwell's equation.

<div align="center">Or</div>

    (b) Analyze the fields radiated from a quarter wave dipole antenna   CO4- Ana   (16)
        using Maxwell's equation

13. (a) (i) A parabolic reflector antenna with diameter 20m is designed to   CO2-App   (8)
           operate at a frequency of 6 GHz and illumination efficiency of
           0.54. Calculate the antenna gain in decibels.

        (ii) Estimate the diameter and the effective aperture of a   CO2-App   (8)
           paraboloidal reflector antenna required to produce a null beam
           width of 10° at 3 GHz.

<div align="center">Or</div>

    (b) (i) Design a Aperture antenna (pyramidal horn antenna) for which   CO2-App   (8)
           the mouth height h=10 λ. It is fed by rectangular waveguide with
           TE_{10}

        (ii) Design an antenna for satellite signal reception for the various   CO2-App   (8)
           aperture numbers (i) 25 (ii) 5 (iii) 6 Diameter of the mouth is
           10m. Calculate the position of the focal point with reference to
           the rector mouth in each case and analyze it.

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14. (a) Explain construction and working principle of Yagi-Uda antenna and its design.   CO1- U   (16)

Or

(b) Explain the techniques used for Anechoic chamber measurement.   CO1- U   (16)

15. (a) Discuss the structure of atmosphere with various layers. Specify the factors affecting the radio wave propagation.   CO1-U   (16)

Or

(b) Explain the principle of ionospheric propagation with a neat diagram.   CO1-U   (16)

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