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Question Paper Code: U5404

B.E. / B.Tech. DEGREE EXAMINATION, NOV 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. An antenna has a field pattern E (θ) =cos θ. cos 2θ. The first null beam width of the antenna is_____ CO1- U

   (a) 45^0 (b) 90^0 (c) 180^0 (d) 120^0

2. In increased end- fire array the radiation is along CO1- U

   (a) X-direction (b)Y-direction (c) Both a and b. (d) None

3. In lens antenna, what kind of wave energy is transformed into plane waves? CO1- U

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

4. The radiation pattern of log periodic antenna is CO1- U

   (a) Bi directional (b) Uni directional (c) omni directional (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= 15 Marks)

6. Calculate the effective area of a half wave dipole operating at 1 GHz? CO1- U

7. What is the radiation resistance of a current element whose overall length is λ/50? CO1- U

8. Differentiate flat reflector and corner reflector antenna. CO1- U

9. Mention the safety precautions to be followed while designing RF antenna. CO1- U

10. Define maximum usable frequency in sky wave propagation. CO1- U

PART – C (5 x 16= 80 Marks)

11.	(a)	(i) A transmitting antenna having effective height of 61.4m takes a current of 50amp, at a wavelength of 625m. Find radiation resistance and power radiated by an antenna. (ii) In microwave communication link, two identical antennas operating at 10GHz are used with power gain of 40 dB. If the transmitter power is 1W, find the received power, if the range of the link is 30km.	CO2- App	(8+8)
		Or		
	(b)	(i) Calculate the gain of an antenna with a circular aperture of diameter 3m at a frequency of 5GHZ. (ii) Two spacecraft are separated by 100 mm. Each has an antenna with D = 1000 operating at 2.5 GHz. If craft A's receiver requires 20 dB over 1pW, what transmitter power is required on craft B to achieve this signal level?	CO2- App	(8+8)
12.	(a)	(i) A broadside array operating at 100 cm wavelength consists of four half wave dipole spaced 50cm. Each element carries radio frequency current in the same phase and of magnitude 50. Amperes. Calculate i) radiated power ii) half width of the major lobe (ii) A half wave dipole radiating in free space is driven width current of .5A at the terminals calculate E and H, 1km from the antenna at angles i) $\Theta=45^0$, i) $\Theta=90^0$	CO2- App	(8+8)
		Or		
	(b)	(i) Calculate the directivity of a given linear broadside, uniform linear array of 10 isotropic point elements with a separation of $\lambda/4$ between the elements. (ii) An antenna array with equal amplitude and opposite phase has a directive gain of $30^{0.}$ Find the array length and width of the major lobe. (i.e Beam width first nulls) What will be these values for a broadside array?	CO2- App	(8+8)
13.	(a)	Explain working principle of slot antenna and drive the expression for the impedances of the slot antenna.	CO1-U	(16)
		Or		
	(b)	Illustrate the principle operation of parabolic reflector antenna with a neat diagram and various types of feed used.	CO1- U	(16)

14. (a) Explain in detail about the working of helical antenna and derive its axial ratio. CO1- U (16)

Or

(b) Illustrate the techniques used for antenna gain measurement. CO1- U (16)

15. (a) Illustrate the mechanism of ionospheric propagation with neat diagram. CO1- U (16)

Or

(b) Explain about CO1- U (16)
(i) Critical Frequency (5)
(ii) Maximum Usable frequency (5)
(iii) Virtual Height.(6)