GALGOTIAS UNIVERSITY

ADMISSION NUMBER

School of Engineering

B.TECH Electronics and Communication Engineering
Semester End Examination - Jun 2024

Duration : 180 Minutes
Max Marks : 100

Sem IV - G2UA405T - Antenna and Wave Propagation

General Instructions
Answer to the specific question asked
Draw neat, labelled diagrams wherever necessary
Approved data hand books are allowed subject to verification by the Invigilator

1)	Define the term "antenna impedance."	K1(2)
2)	Discuss the different modes of propagation in wireless communication, specifically focusing on the characteristics and applications of Ground Wave Propagation and Sky Wave Propagation. Provide examples of scenarios where each mode is effectively utilized.	K2(4)
3)	Compare and contrast the design considerations and applications of Microstrip Antennas and Horn Antennas. Provide detailed insights into their advantages, disadvantages, and the specific scenarios where each type of antenna is most suitable. Include discussions on their radiation characteristics, frequency ranges, and practical implementations.	K2(6)
4)	Describe the ionospheric effects on radio wave propagation, focusing on phenomena like absorption, refraction, and reflection. Discuss the impact of ionospheric irregularities on different frequency bands.	K3(9)
5)	Define obstruction loss in the context of wave propagation. Discuss how it is influenced by obstacles such as buildings, mountains, and vegetation. Explore strategies to mitigate obstruction loss in wireless communication systems.	K3(9)
6)	Demonstrate the structure of ionosphere, depicting all the different layers of ionosphere.	K5(10)
7)	A communication link operates with a transmitter at a height of 50 meters above the ground and a receiver at a distance of 30 km. Calculate the bending of radio waves due to tropospheric refraction, assuming standard atmospheric conditions.	K4(12)
8)	Consider a half-wavelength dipole antenna operating at a frequency of 300 MHz. The antenna is placed in free space, and its	K5(15)

length is precisely λ/2. The antenna is fed with a current of 1.5 amperes. i) Calculate the wavelength(λ) of the electromagnetic wave at the given frequency. ii) Determine the radiation resistance of the half-wavelength dipole antenna. iii) Compute the power radiated by the antenna. iv) If the antenna is connected to a transmission line with a characteristic impedance of 50 ohms, calculate the reflection coefficient (Γ) at the antenna's input. v) Discuss the significance of the radiation resistance and reflection coefficient in the context of antenna performance.

9) State and derive the RADAR Range equation. K5(15)

10) Consider the design of a Circular Array of Dipole Antennas for applications in wireless communication at a frequency of 2.4 GHz. The Circular Array is intended for achieving high directivity and coverage in a specific sector. i) Explain the concept of a Circular Array of Dipole Antennas, focusing on its design principles, radiation pattern, and advantages over a single dipole. ii) Calculate the physical dimensions of each dipole element in the Circular Array based on the specified frequency and desired beamwidth. iii) Discuss the trade-offs involved in choosing the number of elements in the Circular Array and their spacing. iv) Evaluate the impact of changing the operating frequency on the Circular Array's performance and propose adjustments to maintain optimal directivity. K6(18)