PVP 20

Code: 20EC3602

III B.Tech - II Semester – Regular Examinations – JUNE 2023

ANTENNAS AND PROPAGATION
(ELECTRONICS & COMMUNICATION ENGINEERING)

Duration: 3 hours Max. Marks: 70

Note: 1. This paper contains questions from 5 units of Syllabus. Each unit carries 14 marks and have an internal choice of Questions.
2. All parts of Question must be answered in one place.

BL – Blooms Level CO – Course Outcome

			BL	CO	Max. Marks
UNIT-I					
1	a)	Derive Friis Transmission equation the power received to the power transmitted between two antennas separated by a distance $R > 2D^2/\lambda$.	L2	CO1	7 M
	b)	Two X-band (8.2–12.4 GHz) rectangular horns, with aperture dimensions of 5.5 cm and 7.4 cm and each with a gain of 16.3 dB (over isotropic) at 10 GHz, are used as transmitting and receiving antennas. Assuming that the input power is 200 mW, the VSWR of each is 1.1, the conduction-dielectric efficiency is 100%, and the antennas are polarization-matched, find the maximum received power when the horns are separated in air by 50m.	L3	CO2	7 M
OR					

2	a)	Write a short notes on antenna efficiency and Polarization.	L2	CO1	7 M
	b)	A resonant half-wavelength dipole is made out of copper ($\sigma = 5.7 \times 10^7$ S/m) wire. Determine the conduction-dielectric (radiation) efficiency of the dipole antenna at f = 100 MHz if the radius of the wire b is 3×10^{-4} λ, and the radiation resistance of the $\lambda/2$ dipole is 73 ohms ($\mu_0 = 4\pi \times 10^{-7}$).	L3	CO2	7 M
		UNIT-II			
3	a)	Derive an expression for the radiation resistance of a Half wave dipole antenna.	L3	CO2	7 M
	b)	State reciprocity theorem for antennas. Prove that the self – impedance of an Antenna in transmitting and receiving antenna are same.	L3	CO2	7 M
		OR			
4	a)	Discuss the design considerations for the Monofilar axial-mode Helical antenna	L3	CO3	7 M
	b)	A lossless resonant half-wavelength dipole antenna, with input impedance of 73 ohms, is connected to a transmission line whose characteristic impedance is 50 ohms. Assuming that the pattern of the antenna is given approximately by $U = B_0 \, sin^3 \, \theta$. Find the maximum absolute gain of this antenna.	L3	CO2	7 M

UNIT-III					
5	a)	Discuss broadside array and end fire array with neat diagrams.	L2	CO2	7 M
	b)	Derive expression for antenna array factor.	L3	CO2	7 M
OR					
6	a)	Explain in detail about the Binomial array and differentiate it with a linear array.	L2	CO2	7 M
	b)	Derive an expression for the radiation pattern of a broadside uniform linear array of 4- elements with $\lambda/2$ spacing and obtain its radiation pattern.	L3	CO2	7 M
UNIT-IV					
7	a)	Design a rectangular microstrip patch with dimensions W and L, over a single substrate, whose center frequency is 10 GHz. The dielectric constant of the substrate is 10.2 and the height of the substrate is 0.127 cm (0.050 in.). Determine the physical dimensions W and L (in cm) of the patch, taking into account field fringing.	L3	CO3	7 M
	b)	Explain the various feeding mechanisms used in parabolic reflector antennas.	L3	CO3	7 M
OR					
8	a)	Explain the Half-Wavelength Folded Dipole.	L2	CO3	7 M
	b)	Analyze the rectangular microstrip antenna with a neat diagram.	L3	CO3	7 M

UNIT-V					
9	a)	Derive the relation between Maximum usable frequency (MUF) and skip distance.	L3	CO4	7 M
	b)	Write a brief note on (i) Wave tilt (ii) Effect of earth's curvature.	L2	CO4	7 M
OR					
10	a)	Explain the structural details of the Ionosphere.	L2	CO4	7 M
	b)	What is the radio horizon of a television antenna placed at a height of 276 meters? If the signal is to be received at a distance of 76 km. What should be the height of receiving antenna?	L3	CO4	7 M