Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2024

Subject Code:3161003 Date:15-05-2024

Subject Name:Antennas and Propagation

Time:10:30 AM TO 01:00 PM Total Marks:70

Instructions:

1. **Attempt all questions.**
2. **Make suitable assumptions wherever necessary.**
3. **Figures to the right indicate full marks.**
4. **Simple and non-programmable scientific calculators are allowed.**

Q.1	**(a)**	Explain different types of antenna apertures.	**03**
	(b)	Define the following terms. (Draw necessary figures and write equations if any) i) Beam solid angle ii) FNBW and HPBW	**04**
	(c)	Explain the different modes of radio wave propagation.	**07**
Q.2	**(a)**	Explain different antenna feeding methods.	**03**
	(b)	Enlist and discuss about various antenna field zones with figure.	**04**
	(c)	Derive the expression for the radiation resistance of half-wave dipole.	**07**
		OR	
	(c)	Derive the far field components of a small circular loop with radius ‘a’ and with a uniform phase current.	**07**
Q.3	**(a)**	Enumerate the steps for the design pyramidal horn.	**03**
	(b)	Define circular polarization and discuss its advantages.	**04**
	(c)	Obtain the ratio of $E\theta$ and $H\Phi$ field components of a current element at a distance point in free space with necessary derivations using Maxwell’s equation.	**07**
		OR	
Q.3	**(a)**	Define: i) Radiation intensity ii) Antenna Efficiency iii) MUF	**03**
	(b)	Explain the principle of Folded dipole with figure.	**04**
	(c)	Describe the principle of pattern multiplication in the working of array antennas. Explain Dolph-Tchebysheff distribution for linear arrays.	**07**
Q.4	**(a)**	Explain Cassegrain feed of parabolic reflector.	**03**
	(b)	Design 4-element Yagi-Uda antenna.	**04**
	(c)	Describe phase measurement method used in antenna system in detail.	**07**
		OR	

Q.4	**(a)**	Describe the working principle of Microstrip Patch antenna.	**03**
	(b)	Explain Schelkunoff theorems and its usefulness.	**04**
	(c)	Explain terms with reference to Wave propagation phenomenon with necessary figure. (i) Super refraction (ii) Multi hop Propagation (iii) Skip zone	**07**
Q.5	**(a)**	Describe Surface wave propagation briefly.	**03**
	(b)	Explain the normal mode of radiation of Helical antenna with neat and clean figure.	**04**
	(c)	How does the Friis transmission theory help to determine loss between the two antennas located in free space? Explain with necessary formula and theory.	**07**

OR

Q.5	**(a)**	Differentiate Gain and Directivity.	**03**
	(b)	Explain the Ultra-wideband antenna (UWB) antenna for Digital application.	**04**
	(c)	Explain the working of Artificial dielectric Lens antenna and derive the expression for Effective Refractive Index of such a lens formed by conducting sphere.	**07**

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