Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2023

Subject Code:3161003 Date:04-07-2023

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)**	Define the antenna term in different ways.	**03**
	(b)	Explain different layers of ionosphere with neat and clean figure.	**04**
	(c)	Define the following terms. (Draw necessary figures and write equations if any) i) Half Power Beamwidth ii) Radiation intensity iii) Antenna radiation efficiency iv) Effective length	**07**
Q.2	**(a)**	Draw and explain different parts of radiation pattern.	**03**
	(b)	Explain the principal of pattern multiplication for the antenna array.	**04**
	(c)	In a microwave link, two identical antennas operating at 10 GHz are used with power gain of 40 dB, If the transmitter power is 1W, find received power, if the range of link is 30 km.	**07**
		OR	
	(c)	Derive an expression for electric and magnetic components of a short dipole antenna if the spherical system is defined in r, θ and ϕ.	**07**
Q.3	**(a)**	The radiation resistance of an antenna is 80Ω and the loss resistance is 10Ω. What is the directivity in dB if the power gain is 16?	**03**
	(b)	Derive the relation between Directivity and Beam area.	**04**
	(c)	Explain various types of antennas with their applications.	**07**
		OR	
Q.3	**(a)**	Define pitch angle and axial ratio for helical antenna.	**03**
	(b)	Calculate the radiation resistance of a single turn small circular loop having a radius $\lambda/25$.	**04**
	(c)	Explain (i) Schelkunoff theorems for linear arrays (ii) Binomial arrays.	**07**
Q.4	**(a)**	What do you mean by isotropic radiator? Compare it with omnidirectional radiator.	**03**
	(b)	Discuss the different types of reflector antennas.	**04**
	(c)	Explain the different modes of radio wave propagation.	**07**

OR

Q.4	**(a)**	Explain construction of 3-element Yagi-Uda antenna with neat and clean figure.	**03**
	(b)	Draw field pattern of an array of 4 isotropic point source. Separated by half wave length.	**04**
	(c)	Describe the working principle, design and applications of rectangular microstrip patch antenna.	**07**
Q.5	**(a)**	What do you mean by array? Discuss its types in brief.	**03**
	(b)	Define the following terms with figure. i) Duct propagation ii) Linear polarization	**04**
	(c)	Explain Babinet's Principle. Discuss it for slot and complementary antenna	**07**

OR

Q.5	**(a)**	Explain in brief about antennas for satellite communication.	**03**
	(b)	Explain log-periodic antenna works as frequency independent antenna.	**04**
	(c)	Explain the experimental setup for the measurement of Gain of antenna under test.	**07**

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