Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI EXAMINATION – SUMMER 2025

Subject Code: 3161003 Date:20-05-2025

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.**

			MARKS
Q.1	**(a)**	Define (1) Antenna, (2) Directivity, (3) Polarization	**03**
	(b)	(1) Draw the Radiation Pattern and give necessary indications. (2) Write an equation which shows the relation between directivity and gain.	**04**
	(c)	List down different types of antennas and explain any 2 with necessary figures.	**07**
Q.2	**(a)**	List down antenna radiating regions. What are near field and far field regions?	**03**
	(b)	An antenna has a field pattern $E(\theta) = \cos^2\theta, 0 \leq \theta \leq 90°$. Find HPBW and FNBW.	**04**
	(c)	Derive the expression of Friss Transmission formula. Explain radio communication link between transmitting antenna and receiving antenna.	**07**
		OR	
	(c)	Derive the expression of E_θ and $H_\emptyset$ of a small current element.	**07**
Q.3	**(a)**	Explain the principle of pattern multiplication with necessary example	**03**
	(b)	Derive an expression of 2 – isotropic point sources of same amplitude and same phase, placed equi – distance from center axis. Also draw its radiation pattern having distance between two elements as λ/2.	**04**
	(c)	Write a short note on Binomial array.	**07**
		OR	
Q.3	**(a)**	Explain helical geometry	**03**
	(b)	What is the function of horn antenna? List down various horn antennas. Give the optimum horn dimensions.	**04**
	(c)	Explain about loop antenna. . Explain the working principle of small loop antenna with necessary equations	**07**
Q.4	**(a)**	With suitable diagram discuss the construction features of Yagi-Uda antenna.	**03**
	(b)	State Babinet's principle. Explain slot antenna.	**04**
	(c)	What do you mean by frequency independent antennas? Draw log periodic wire antenna and explain the functioning and design concepts in detail.	**07**
		OR	
Q.4	**(a)**	What is lens antenna? Enlist its advantages and disadvantages.	**03**
	(b)	Explain in brief radiation mechanism for microstrip patch antenna. Enlist its advantages, disadvantages and applications of microstrip patch antenna.	**04**
	(c)	Write a short note on smart antenna.	**07**
Q.5	**(a)**	Define Virtual Height, Maximum Usable Frequency and critical frequency	**03**
	(b)	Explain the structure of ionosphere.	**04**
	(c)	Explain the Gain measurement methods	**07**

OR

Q.5	**(a)**	Explain Skip distance	**03**
	(b)	Enlist and draw with suitable indications of different modes of propagation.	**04**
	(c)	Write a short note on (1) Feed methods of Parabolic reflectors and (2) Feed methods of Microstrip Patch Antennas.	**07**

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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 Eθ and HΦ 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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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 λ/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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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2022

Subject Code:3161003 Date:01/06/2022

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.**

			MARKS
Q.1	**(a)**	Define the following terms: (i) Beam solid angle (ii) Directivity (iii)Antenna Aperture	**03**
	(b)	Derive the expression of Friss transmission formula	**04**
	(c)	Explain in the detail about Binomial array and pattern multiplication	**07**
Q.2	**(a)**	Explain the effect of ground on ungrounded antenna.	**03**
	(b)	Discuss Dolph–Tchebysheff distribution for linear arrays.	**04**
	(c)	Explain Non-metallic Dielectric lens and artificial dielectric lens antennas in detail.	**07**
		OR	
	(c)	Explain in detail about frequency scanning arrays.	**07**
Q.3	**(a)**	Calculate the percentage power reflected, if Antenna inputimpedance is (30+j40)Ω and characteristic impedance of transmission line is 50Ω.	**03**
	(b)	Explain the features of Yagi Uda antenna.	**04**
	(c)	State Babinet's principle and illustrate its application to slot antennas and complementary antennas.	**07**
		OR	
Q.3	**(a)**	Calculate the diameter of parabolic dish antenna, for given value of gain G = 40 dBand operating frequency 11 GHz.	**03**
	(b)	Explain the working principle of small loop antenna.	**04**
	(c)	Describe the properties of Endfire array.	**07**
Q.4	**(a)**	The maximum radiation intensity of a 90% efficiency antenna is 200mW/ unit solid angle. Find the directivity and gain (dimensionless andin dB) when theInput power is 125.66 mW.	**03**
	(b)	Along with necessary figure explain the principle of Folded dipole	**04**
	(c)	Explain Cassegrain feed with required figure.	**07**
		OR	
Q.4	**(a)**	Calculate the directivity of an antenna with circular aperture ofdiameter 3 meter at frequency 5 GHZ.	**03**
	(b)	Explain about log periodic antenna with necessary figures.	**04**
	(c)	Explain practical design consideration for the helical antenna.	**07**
Q.5	**(a)**	Describe various types of basic horns with figure.	**03**
	(b)	Explain the Different modes of Radio wave propagation.	**04**

	(c)	Obtain the ratio of E_θ and H_Φ field components of a current element at a distance point in free space with necessary derivations using Maxwell's equation	**07**

OR

Q.5	**(a)**	Explain multihop propagation briefly.	**03**
	(b)	With figure describe the ionization layers.	**04**
	(c)	With necessary figure and derivations explain N element array of equal amplitude and spacing. Write the equation for array Factor.	**07**

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