Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE- SEMESTER–VI EXAMINATION – WINTER 2025

Subject Code:3161003 Date:02-12-2025

Subject Name:Antennas and Propagation

Time:02:30 PM TO 05:00 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)**	Derive the mathematical expression for the radiation intensity of an isotropic radiator.	**03**
	(b)	Enlist different types of antenna based on radiation pattern.	**04**
	(c)	Derive the mathematical expression between maximum effective aperture and directivity.	**07**
Q.2	**(a)**	Define: 1. Antenna Radiation Efficiency. 2. Radiation Resistance of Antenna. 3. HPBW of Antenna.	**03**
	(b)	Show that the directivity of an infinitesimal dipole is 1.76dB.	**04**
	(c)	Derive the far field components of a half-wave dipole antenna.	**07**
		OR	
	(c)	Derive the far field components of a monopole antenna.	**07**
Q.3	**(a)**	Explain antenna field zones with necessary figures.	**03**
	(b)	Explain the concept of pattern multiplication.	**04**
	(c)	Sketch the helical geometry with its associated dimensions showing relationship between circumference, spacing, turn length and pitch angle of helix. Explain the axial mode of helical antenna.	**07**
		OR	
Q.3	**(a)**	Differentiate broadside array and endfire array.	**03**
	(b)	Explain 3-element Yagi-Uda antenna.	**04**
	(c)	Derive the field components of a small loop antenna.	**07**
Q.4	**(a)**	Briefly explain folded dipole antenna.	**03**
	(b)	Explain Babinet’s principle.	**04**

	(c)	Write short note on log periodic antenna with necessary figure.	**07**

OR

Q.4	**(a)**	Explain any one antenna phase measurement method.	**03**
	(b)	Briefly explain UWB antenna.	**04**
	(c)	Enlist antenna gain methods and explain any two in detail.	**07**
Q.5	**(a)**	Enlist different modes of propagation.	**03**
	(b)	Briefly explain different types of lens antenna.	**04**
	(c)	Write short note on microstrip patch antenna.	**07**

OR

Q.5	**(a)**	In context of radio wave propagation define: 1. MUF. 2. Skip Distance. 3. Virtual Height.	**03**
	(b)	Explain multi-hop propagation.	**04**
	(c)	Write short note on parabolic reflector antenna.	**07**

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Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3161003 Date:20-11-2024

Subject Name:Antennas and Propagation

Time:02:30 PM TO 05:00 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)**	State and prove reciprocity theorem to antennas.	**03**
	(b)	Compare antenna with transmission line with necessary figure and equations.	**04**
	(c)	Define the following terms with necessary figures and equations if any. i) Antenna efficiency ii) Maximum Usable Frequency iii) Beam area iv) Resolution v) Circular Polarization	**07**
Q.2	**(a)**	Explain the term "Antenna" in different ways.	**03**
	(b)	Is it possible to design lossless antenna? Justify your answer.	**04**
	(c)	Derive the expression for the far field pattern of an array of 2 – isotropic point sources i) Equal amplitude and phase ii) Equal amplitude and opposite phase.	**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)**	What do you mean by retarded effect? Explain it with help of necessary figure and equations.	**03**
	(b)	Sketch the helical geometry with its associated dimensions showing relationship between circumference, spacing, turn length and pitch angle of helix.	**04**
	(c)	Explain the operation of Microstrip patch antenna with neat diagram.	**07**
		OR	
Q.3	**(a)**	When can an antenna be termed as Frequency independent?	**03**
	(b)	Explain Schelkunoff theorems and its usefulness.	**04**
	(c)	Explain the experimental setup for the measurement of radiation pattern of antenna under test.	**07**

Q.4	**(a)**	Derive Friis transmission formula to determine loss between the two antennas located in free space.	**03**
	(b)	Discuss significance of complementary antenna with the help of babinet's principal.	**04**
	(c)	Explain - Pattern Multiplication and show that it can be used to find the resultant pattern of a linear array	**07**

OR

Q.4	**(a)**	Explain the features of Yagi Uda antenna.	**03**
	(b)	Explain the working of Artificial dielectric Lens antenna.	**04**
	(c)	Give the geometry and discuss the performance of a Log periodic antenna. Derive the associated design equations	**07**

Q.5	**(a)**	Explain in brief about antenna for mobile communication.	**03**
	(b)	Define the following terms. (Draw necessary figures) (i) Super refraction (ii) Virtual height	**04**
	(c)	Enlist and explain the Different modes of Radio wave propagation.	**07**

OR

Q.5	**(a)**	Discuss the antenna field zone with neat and clean figure.	**03**
	(b)	Compare the far field equations of small loop with short dipole.	**04**
	(c)	Discuss the principle of working of Parabolic reflectors. Explain the various feed techniques, their relative merits and demerits	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3161003 Date:02-12-2023

Subject Name:Antennas and Propagation

Time:02:30 PM TO 05:00 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) FNBW (2) HPBW (3) Gain of antenna	**03**
	(b)	Describe briefly polarization and its types.	**04**
	(c)	Demonstrate the Radio communication link between transmitting and receiving antenna using Friss Transmission formula.	**07**
Q.2	**(a)**	Define antenna and list down various types of antennas.	**03**
	(b)	Show that directivity is inversely proportional to beam area.	**04**
	(c)	Derive the expression of E_θ and $H_\emptyset$ of a small current element.	**07**
		OR	
	(c)	Derive the expression of radiation resistance of a λ/2 dipole antenna	**07**
Q.3	**(a)**	Answer the following: (1) What is the value of directivity, if beam area is 2π/3? (2) Sketch the radiation pattern with necessary indications	**03**
	(b)	Explain the helical geometry of helical antenna with necessary diagram.	**04**
	(c)	Explain antenna field zones, antenna aperture and radiation resistance of an antenna.	**07**
		OR	
Q.3	**(a)**	Describe the constructional features of 3 - element Yagi - Uda antenna.	**03**
	(b)	Describe the principle of pattern multiplication in the working of Array antennas	**04**
	(c)	Explain Binomial Array in detail. Also give its advantages and disadvantages.	**07**
Q.4	**(a)**	Give the classification of lens antenna in brief.	**03**
	(b)	Explain Babinet's Principle for slot antenna.	**04**
	(c)	Explain in brief radiation mechanism for microstrip patch antenna. Give advantages, disadvantages and applications of microstrip patch antenna.	**07**
		OR	
Q.4	**(a)**	Define UWB. Explain it in brief	**03**
	(b)	Describe in brief the working principle of reflector antenna.	**04**
	(c)	Obtain the expression for the far field of circular loop antenna. And also show that directivity of loop antenna is same as dipole antenna	**07**
Q.5	**(a)**	Explain any one method of phase measurement.	**03**
	(b)	Describe in brief log periodic antenna.	**04**
	(c)	Which are the methods used to measure the gain of an antenna? Explain any one method.	**07**

OR

Q.5	**(a)**	Define MUF, virtual height and skip distance.	**03**
	(b)	Explain the structure of ionosphere with necessary diagram.	**04**
	(c)	Differentiate ground wave propagation, sky wave propagation and space wave propagation.	**07**

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Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

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

Subject Code:3161003 Date:13-12-2022

Subject Name:Antennas and Propagation

Time:02:30 PM TO 05:00 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)**	Enlist and define the different types of aperture of an antenna.	**03**
	(b)	Derive the condition, When an antenna is act as radiator. Also discuss its different cases.	**04**
	(c)	Write the statement of pattern multiplication theorem. Explain it in detail by using any example.	**07**
Q.2	**(a)**	Classify the antennas according to radiation pattern.	**03**
	(b)	The measured Half Power Beam widths of an antenna in the two orthogonal planes are 30° and 20°. Antenna efficiency is 100%. Calculate the approximate gain of the antenna.	**04**
	(c)	Draw and explain structure of Log periodic antenna. Derive its Mathematical equations for designing purpose.	**07**
		OR	
	(c)	Starting from retarded current, derive an expressions 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)**	What is meant by reciprocity Theorem?	**03**
	(b)	Compare the far field equations of small loop with short dipole.	**04**
	(c)	Describe the various forms of Horn antenna. Obtain the design equations of Horn antenna.	**07**
		OR	
Q.3	**(a)**	Calculate the maximum effective aperture of a microwave antenna which has a directivity of 800. Frequency of operation is 6GHz.	**03**
	(b)	Determine the distance from short dipole operating at 1MHz at which radiation filed is equal to the induction filed	**04**
	(c)	Describe the procedure for the measurement of gain of antenna under test.	**07**
Q.4	**(a)**	Draw and explain the working principle of slot antenna.	**03**
	(b)	What is the need for an antenna array? Distinguish: Broadside and End fire array	**04**
	(c)	Discuss the principle of working of Parabolic reflectors. Explain the various feed techniques, their relative merits and demerits. Discuss the role of f/d ratio in the parabolic reflectors.(f-focal length, D- diameter of reflector)	**07**
		OR	
Q.4	**(a)**	Enlist the different types of lens antenna and explain in brief.	**03**
	(b)	Define the following terms: i) Pitch angle of helical antenna ii) Isotropic point source iii) Skip zone	**04**

iv) Critical frequency

	(c)	Explain and design 4-element yagi-uda antenna	**07**
Q.5	**(a)**	Explain Super refraction briefly.	**03**
	(b)	Discuss Dolph–Tchebysheff distribution for linear arrays.	**04**
	(c)	Give the radiation mechanism of Microstrip antenna	**07**

OR

Q.5	**(a)**	What is meant by virtual height in radio wave propagation?	**03**
	(b)	Describe how helical antenna works in axial and normal mode.	**04**
	(c)	Draw the structure of atmosphere and ionosphere and explain in detail the various regions of ionosphere.	**07**

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