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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