Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI • EXAMINATION – SUMMER • 2014

Subject Code: 161003 **Date: 23-05-2014**

Subject Name: Antenna and Wave Propagation

Time: 10:30 am - 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.**

Q.1	**(a)**	Explain (i) Retarded Potential (ii) Circular polarization (iii) Effective length of antenna (iv) Skip Distance (v)Virtual Height (vi) Antenna Efficiency (vii) Resonant Antenna	**07**
	(b)	Explain (i) Binomial array (ii) Arrays with Parasitic elements	**07**
Q.2	**(a)**	Explain (i) Hertzian Dipole (ii) Folded Dipole	**07**
	(b)	(i) Design maximum E type rhombic antenna for an elevation angle of $\alpha=15^0$.Derive the equation used. (ii) Determine the gain ,beamwidth and capture area for a parabolic antenna with 10m diameter dish and dipole feed at 10 GHz.	**07**
		OR	
	(b)	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 equations.	**07**
Q.3	**(a)**	For uniform linear array of 'n ' isotropic sources,obtain the expression for relative electric field at a far point.Find nulls and maximas of an array pattern formed by four isotropic antenna fed in phase and spaced $\lambda/2$ apart .	**07**
	(b)	Discuss the use of Dolph-Tchebysheff distribution and polynomials in detail in antenna array design	**07**
		OR	
Q.3	**(a)**	Explain the construction and working principle ,advantages and disadvantages of following antennas: (i) Rhombic antenna (ii) Microstrip antenna	**07**
	(b)	State and explain Skelkunoff's theorems for antenna arrays.	**07**
Q.4	**(a)**	Derive interrelation between spacing ,circumference,turn length,diameter for T1 modefor helix treating it as an array. A helix operates at 2 GHz has dimensions: S=5cm, D=10cm,N=20.Find out 3dB beamwidth and directivity.	**07**
	(b)	Prove that the expressions for electric and magnetic fields for a small loop are same as these obtained by treating it as a short magnetic dipole.	**07**
		OR	
Q.4	**(a)**	What is the function of a horn antenna? Discuss various types of rectangular and circular horn antennas.Give the optimum horn dimensions?	**07**
	(b)	Derive the expression for Two isotropic point sources of the same amplitude and (i)same phase (ii) opposite phase of feed currents and sketch the radiation pattern for $\alpha = \pi$ with spacing between elements $d=\lambda/2$.	**07**
Q.5	**(a)**	Describe: (i) The structure and the Characteristics of Ionospheric layers. (ii) Nonmetallic dielectric lens antenna	**07**
	(b)	Discuss the methods for (i) measuring the Power gain of an antenna (ii) Feeding for parabolic reflectors.	**07**
		OR	
Q.5	**(a)**	Explain Spacewave Propagation .State the factors determining the range of propagation.For this mode of propagation obtain expression for electric field at the receiver neglecting earth curvature	**07**
	(b)	State Babinet's principle and illustrate its application to slot in an infinite metal and complementar metal strip Expalin the radiation patterns of a slot in an infinite sheet and of complementary dipole antenna.How is the field affected if the sheet is of finite extent?	**07**

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