Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI • EXAMINATION – SUMMER 2013

Subject Code: 161003 Date: 28-05-2013

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 the following antenna parameters : (i) Radiation intensity (ii) Effective aperture (iii) Antenna efficiency (iv) Polarisation (v) FBR (vi) HPBW?	**06**
	(b)	Derive the expression for the far field pattern of an array of 2 ï isotropic point sources with equal amplitude and phase of feed currents.	**04**
	(c)	Calculate the effective length of a ə/2 antenna with R_{rad}=73q and Maximum effective aperture Amax=0.13 ə^2. Take ɖ=120´.	**04**
Q.2	**(a)**	Derive the expression for radiated power and radiation resistance of a small current element. Find the radiation resistance of a hertizian dipole of length ə/60.	**07**
	(b)	Derive the far field components and the radiation resistance of a small circular loop with radius ćaô and with a uniform phase current.	**07**
		OR	
	(b)	Explain (i) The principle of pattern multiplication. (ii) Binomial arrays.	**07**
Q.3	**(a)**	Describe the methods for measuring the gain and beam width of antenna.	**06**
	(b)	Derive Friss Transmission formula for a radio link.	**05**
	(c)	The radiation resistance of an antenna is 72 q and loss resistance is 8 q. Calculate antenna efficiency. What is the directive gain if the power gain is 16?	**03**
		OR	
Q.3	**(a)**	With a suitable diagram,discuss the construction features and operation of (i) Yagi antenna and (ii) Folded Dipole antenna	**06**
	(b)	For a helical antenna,discuss briefly (i) the different modes of operation (ii) design considerations.	**05**
	(c)	The field from an uniform linear array of n isotropic point sources will be maximum in any direction ű for which ɣ = 0 where ɣ is the total phase difference of fields from adjacent sources. Justify.	**03**
Q.4	**(a)**	Explain the working of an artificial dielectric lens antennas and derive the relation for effective index of refraction of such a lens formed by conducting spheres.	**07**
	(b)	Discuss Dolph-Tchebysheff distribution for linear arrays .	**04**
	(c)	Enumerate the steps for the design pyramidal horn.	**03**
		OR	

Q.4	**(a)**	Explain the properties of parabola and obtain the expression of the field-intensity ratio in the aperture plane of a cylindrical parabolic reflector.	**07**
	(b)	Calculate gain, null to null main beam width BWFN and HPBW of a paraboloid reflector of a 2 m diameter at 5 GHz.	**04**
	(c)	Expain the terms: i) Virtual height (ii) Skip distance (iii) Multi-hop propagation?	**03**
Q.5	**(a)**	Explain briefly (i)Sky Wave (ii Space Wave (iii) Troposphere Scatter Propagations	**07**
	(b)	Explain 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**

OR

Q.5	**(a)**	Deduce expression for (i) the critical frequency of an ionized region in terms of its maximum ionization density (ii) the refractive index of the ionosphere in terms of the electron number density and frequency ? If the critical frequency of an ionized layer is 1.5 MHz, find the electron density of layer.	**07**
	(b)	Write note on (i) Feed methods for parabolic reflectors and (ii) Microstrip antenna	**07**

****