Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII • EXAMINATION – WINTER 2013

Subject Code: 173201 **Date: 26-11-2013**

Subject Name: Microwave and Satellite Communication

Time: 10:30 TO 01:00 **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)**	(i) Why TEM mode does not exist in a waveguide? Explain. (ii)Define the following terms. (1) Phase velocity (2) Group velocity (3) Guide wavelength (4) Dominant mode.	**07**
	(b)	A rectangular wave guide has dimensions 2.5 x 5 cm. Determine the guide wavelength, phase constant β and phase velocity V_p at a wavelength of 4.5 cm for the dominant mode.	**07**
Q.2	**(a)**	Explain the operation of E-plane Tee junction. Derive the scattering matrix for E-plane Tee.	**07**
	(b)	How are waveguides different from normal two wire transmission lines? Discuss the similarities and dissimilarities. **OR**	**07**
	(b)	Determine the scattering parameters for a 10 dB direction coupler. The Directivity D= 30 dB. Assume that it is lossless and the VSWR at each port is 1.0 under matched conditions. Designate the ports in the main guide as 1 or 2 and the ports in the auxiliary guide as 3 and 4.	**07**
Q.3	**(a)**	Explain the working of TWT.	**07**
	(b)	Explain the need of microwave tubes as compare to conventional tubes at microwave frequencies.	**07**
		OR	
Q.3	**(a)**	Discuss the application of PIN diode.	**07**
	(b)	Explain the operation of Reflex klystron with necessary diagram.	**07**
Q.4	**(a)**	Explain the basic principles of a RADAR system. Give the applications and limitations of RADARs.	**07**
	(b)	Military RADAR operates at 5 GHz with 2.5 MW power output. If the antenna diameter is 5 m, the receiver bandwidth is 1.6 MHz and has a 12 dB noise figure, what is the maximum detection range for 1 m^2 target.	**07**
		OR	
Q.4	**(a)**	Derive the RADAR range equation. Explain the factors that affect the maximum range of RADAR.	**07**
	(b)	Explain three laws of Kepler's for planetary motion in detail.	**07**
Q.5	**(a)**	Define the following terms: (1)Apogee (2)Perigee (3)side real day (4)Mean anomaly	**07**
	(b)	The earth rotates once per sidereal day of 23h 56 min 4.09s. Calculate the radius of GEO satellite in Km.	**07**
		OR	
Q.5	**(a)**	Explain need of Telemetry, Tracking, command and monitoring system in satellite communication.	**07**
	(b)	An earth station situated in the Docklands of London, England, needs to calculate the look angle to a geostationary satellite in the Indian ocean operated by Intelsat. The details of the earth station site and the satellite are as follows: Earth station latitude and longitude are 52.0^o N and 0° Satellite longitude (sub satellite point) is 66.0^o E. Calculate the central angle γ, Elevation angle El, intermediate angle α, azimuth angle A_z.	**07**

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