Seat No.: _____ Enrolment No._____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VII • EXAMINATION – WINTER • 2014

Subject Code: 173201 **Date: 25-11-2014**

Subject Name: Microwave and Satellite Communication

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)**	Enumerate the basic advantages of Microwaves and list the typical application of Microwaves.	**07**
	(b)	Define following terms with respect to waveguide: 1. Phase velocity 2. Group velocity. Derive expression for both of them.	**07**
Q.2	**(a)**	What are Kepler's three laws of planetary motion? Give the mathematical formulation of Kepler's third law of planetary motion.	**07**
	(b)	Derive wave equation for a *TE* wave and obtain all the field components in a rectangular waveguide.	**07**
		OR	
	(b)	Explain the operation of Multi hole directional coupler. Derive the scattering matrix for Multi hole directional coupler.	**07**
Q.3	**(a)**	Prove that it is impossible to construct a perfectly matched lossless, reciprocal 3-port junction.	**07**
	(b)	Calculate the maximum range of a radar system which operates at 3 cm with a peak pulse power of 600 kW if its antenna is 5 m^2, minimum detectable signal is 10^{-13} W and the radar cross sectional area of the target is 20 m^2.	**07**
		OR	
Q.3	**(a)**	When the dominant mode is propagated in an air filled rectangular waveguide, the guide wavelength for a frequency of 9000 MHz is 4 cm. Calculate breadth of waveguide.	**07**
	(b)	Briefly explain the limitations of conventional tubes at microwave frequencies.	**07**
Q.4	**(a)**	Using Applegate diagram explain working of reflex klystron. Differentiate between klystron and travelling wave tube.	**07**
	(b)	A satellite is in a 322 km high circular orbit. Determine: 1. The orbital velocity in meters per second, 2. The orbital period in minutes; 3. The orbital angular velocity in radians per second.	**07**
		OR	
Q.4	**(a)**	Discuss the application of PIN diode.	**07**
	(b)	Derive the radar range equation. Explain the factors that affect the maximum range of radar.	**07**
Q.5	**(a)**	Explain pulse radar with necessary block diagram.	**07**
	(b)	Explain TTC&M system of satellite.	**07**
		OR	
Q.5	**(a)**	Explain operation, features, applications and limitation of IMPATT diode.	**07**
	(b)	Explain basic transmission principle of satellite communication and derive link equation.	**07**

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