

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: **07**
1. Phase velocity 2. Group velocity. Derive expression for both of them.
- Q.2** (a) What are Kepler's three laws of planetary motion? **07**
Give the mathematical formulation of Kepler's third law of planetary motion.
- (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. **07**
Derive the scattering matrix for Multi hole directional coupler.
- 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 m², minimum detectable signal is 10⁻¹³ W and the radar cross sectional area of the target is 20 m². **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. **07**
Differentiate between klystron and travelling wave tube.
- (b) A satellite is in a 322 km high circular orbit. Determine: **07**
1. The orbital velocity in meters per second,
2. The orbital period in minutes;
3. The orbital angular velocity in radians per second.

OR

- Q.4** (a) Discuss the application of PIN diode. **07**
- (b) Derive the radar range equation. **07**
Explain the factors that affect the maximum range of radar.
- Q.5** (a) Explain pulse radar with necessary block diagram. **07**
- (b) Explain TTC&M system of satellite. **07**
- 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**
