

Enrollment No./Seat No.:

GUJARAT TECHNOLOGICAL UNIVERSITY
Bachelor of Engineering - SEMESTER - VI EXAMINATION - WINTER 2025

Subject Code: 3161010

Date: 25-11-2025

Subject Name: Satellite Communication

Time: 02:30 PM TO 05:00 PM

Total Marks: 70

Instructions

- 1. Attempt all questions.**
- 2. Make suitable assumptions wherever necessary.**
- 3. Figures to the right indicate full marks.**
- 4. Simple and non-programmable scientific calculators are allowed.**

	Marks
Q.1 (a) Define satellite communication. What is its basic principle?	03
(b) Write a short note on the frequency bands (L, C, Ku, Ka) used in satellite systems and their significance.	04
(c) Compare the advantages and disadvantages of satellite communication with that of microwave terrestrial systems.	07
Q.2 (a) State Kepler's three laws of planetary motion and mention their significance in satellite motion.	03
(b) Derive the expression for orbital period using Kepler's third law.	04
(c) With a neat diagram, explain semi-major axis, right ascension of the ascending node (Ω), the argument of perigees (ω), inclination, eccentricity, and true anomaly in an elliptical orbit.	07
OR	
(c) Explain in detail the difference between solar day and sidereal day and how it affects satellite ground track patterns.	07
Q.3 (a) List the main subsystems of a typical communication satellite.	03
(b) Describe the energy generation, storage, and distribution process in the satellite power subsystem.	04
(c) Explain in detail the Telemetry, Tracking, Command, and Monitoring (TTC&M) subsystem with a neat block diagram and functions of each unit.	07
OR	
(a) Mention the major functions of a communication subsystem.	03
(b) Describe how thermal control is achieved in satellite subsystems.	04
(c) Discuss the Attitude and Orbit Control System (AOCS) in detail — describe sensors, actuators, and control mechanisms used for orientation and orbit correction.	07
Q.4 (a) What is a solar eclipse on a satellite? Explain with figure.	03
(b) Describe the sequence of events during a sun transit outage and its effect on signal quality.	04

- (c) Compare the impact of Doppler shift on GEO, MEO, and LEO satellite systems, and explain the compensation techniques used. 07

OR

- (a) Define flux density in the context of satellite communication. 03
- (b) Explain how system noise temperature of a receiver is calculated using individual component noise figures. 04
- (c) Explain in detail the steps for preparing a satellite link budget, highlighting uplink and downlink power calculations and link margins. 07

- Q.5** (a) Define C/N ratio and explain its importance in satellite link design. 03
- (b) Explain how rain attenuation affects the C/N ratio of a satellite link and how it is compensated. 04
- (c) A satellite transponder uses TDMA to serve multiple earth stations. Explain the timing, synchronization, and guard time concepts involved in the system design. 07

OR

- (a) Define multiple access and explain its necessity in satellite communication. 03
- (b) Compare Amplitude Shift Keying (ASK), Frequency Shift Keying (FSK), and Phase Shift Keying (PSK) in terms of bandwidth and power efficiency. 04
- (c) Compare TDMA, FDMA, and CDMA on the basis of channel allocation, synchronization, interference, and system capacity. 07
