Enrolment No./Seat No_____

GUJARAT TECHNOLOGICAL UNIVERSITY

BE - SEMESTER–VI (NEW) EXAMINATION – SUMMER 2024

Subject Code:3161010 Date:24-05-2024

Subject Name:Satellite Communication

Time:10:30 AM TO 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.**
4. **Simple and non-programmable scientific calculators are allowed.**

			MARKS
Q.1	**(a)**	Explain the principles and architecture of satellite communication. How do satellites function as key components in the communication system?	**03**
	(b)	Explore the different frequency bands used for satellite communication. Discuss the reasons behind using specific frequency bands.	**04**
	(c)	Explore the various applications of satellite communication across different sectors, including telecommunications, broadcasting, remote sensing, and navigation. Explain the impact of satellite technology on these domains and its significance in today's world.	**07**
Q.2	**(a)**	Define the terms apogee and perigee in the context of satellite orbits. How are they different for elliptical orbits, and what is their significance?	**03**
	(b)	Calculate the orbital period of a satellite in a given orbit. Explain the factors that influence the orbital period and its importance in satellite design and positioning.	**04**
	(c)	Provide a detailed explanation of Kepler's laws and their relevance to satellite orbits. How do these laws describe the motion of satellites and help in predicting their positions in space?	**07**
		OR	
	(c)	Compare and contrast the concepts of a solar day and a sidereal day. Explain how these different time measurements relate to satellite orbit determination and synchronization with ground stations.	**07**
Q.3	**(a)**	Describe the importance and functions of the Attitude and Orbit Control System (AOCS) in a satellite. How does AOCS ensure the satellite's proper orientation and positioning in space?	**03**
	(b)	Explain the significance of the Power sub-system in a satellite. How is power generated, stored, and distributed on a satellite, and what factors influence the choice of power sources and storage methods?	**04**
	(c)	Define and explain the roles of Telemetry, Tracking, Command, and Monitoring (TTC&M) subsystems in a satellite system. How do these subsystems contribute to the successful operation of a satellite?	**07**
		OR	
Q.3	**(a)**	What is station keeping?	**03**
	(b)	Write short note on Satellite Antennas.	**04**
	(c)	Draw the block diagram of the satellite Transponder. Explain frequency reuse in transponders.	**07**

Q.4	**(a)**	Describe the phenomenon of a solar eclipse on a satellite. How does a solar eclipse affect satellite communication, and what challenges does it pose?	**03**
	(b)	Explain the concept of sun transit outage phenomena in satellite communication. What are the effects of sun transit outages, and how can they be mitigated?	**04**
	(c)	Discuss the importance of Carrier-to-Noise (C/N) ratio calculations in both clean air and rainy conditions. Explain how variations in weather and atmospheric conditions can affect the C/N ratio and signal quality in satellite communication.	**07**

OR

Q.4	**(a)**	Explain the concept of flux density in satellite communication. How is received signal power calculated based on flux density and antenna characteristics?	**03**
	(b)	Describe the significance of system noise temperature in a satellite receiver. How is system noise temperature calculated, and how does it impact the overall performance of the receiver?	**04**
	(c)	Describe the process of drafting a satellite link budget in detail. Include all the major factors that need to be considered, such as transmit power, path loss, antenna gains, and noise temperature. How is the link budget used to ensure reliable communication in different weather conditions?	**07**
Q.5	**(a)**	What is EIRP? Show the relationship between Power flux density and EIRP.	**03**
	(b)	Define following terms: (1) Inclination (2) Semi-major axis (3) Prograde orbit (4) Footprint	**04**
	(c)	Explain the SPADE system.	**07**

OR

Q.5	**(a)**	Define multiple access in satellite communication. What does it mean, and why is it a critical aspect of satellite network design and operation?	**03**
	(b)	Explain briefly code division multiple access.	**04**
	(c)	Compare and contrast the Time Division Multiple Access (TDMA), Frequency Division Multiple Access (FDMA), and Code Division Multiple Access (CDMA) schemes used in satellite communication. How do these multiple access methods differ in their approach and suitability for various scenarios?	**07**

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