C **Reg. No. :** | | | | | | | | | | | | |

Question Paper Code: U4404

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2025

Professional Elective

Electronics and Communication Engineering

21ECV404-SATELLITE COMMUNICATION AND SERVICES

(Regulations 2021)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (5 x 1 = 5 Marks)

1. For an elliptical orbit, the eccentricity is CO1-U

   (a) 0 (b) 0 <e<1 (c) 1 (d)>1

2. Batteries are used to power all satellite subsystems CO1-U

   (a) at all times (b) only during emergencies

   (c) during eclipse periods (d) to give the solar arrays a rest

3. The satellite subsystem that monitors and controls the satellite is the CO1-U

   (a) Propulsion Subsystem (b) Power Subsystem

   (c) Communication Subsystem (d) TT&C

4. The modulation technique used in INTELSAT SCPC scheme is CO1-U

   (a) PSK (b) QPSK (c) FSK (d) BPSK

5. Which frequency band does the direct broadcast satellite system use? CO1-U

   (a) C band (b) X band (c) Ku band (d) MF band

PART – B (5 x 3= 15Marks)

6. Differentiate Apogee and Perigee. CO1-U

7. For a satellite circuit, the individual link carrier to noise spectral density ratios is: uplink 100dB, downlink 87dB. Calculate the combined C/N_0 ratio. CO3-App

8. Write the equation of link budget. CO1-U

9. What is the difference between active and passive satellites? CO1-U

10. How do satellites support internet connectivity in remote areas? Provide one example. CO4-App

PART – C (5 x 16= 80 Marks)

11.	(a)	(i) What are the orbital Perturbation? and explain them in detail	CO1-U	(08)
		(ii) Write a note on Limits of Visibility	CO1-U	(08)
		Or		
	(b)	(i) State Kepler's three laws of planetary motion. Illustrate in each case their relevance to artificial satellites orbiting the Earth.	CO1-U	(08)
		(ii) Write a note on atmospheric drag and station keeping.	CO1-U	(08)
12.	(a)	Explain Spade systems with suitable diagram	CO1-U	(16)
		Or		
	(b)	With a neat diagram, explain in detail about the function Code-Division Multiple Access.	CO1-U	(16)
13.	(a)	(i) A multiple carrier satellite circuit operates in the 6 GHz band with the following characteristics: DOWNLINK- Satellite saturation EIRP 26.6.dBW, output BO 6dB, free-space loss 196.7dB, earth station G/T 40.7dBK-1. Calculate the Carrier to Noise density ratio at the earth station. Other losses may be ignored.	CO3-App	(08)
		ii) An uplink 14Ghz requires a flux density of -91.4 dB watt/m^2 and input BO of 11 dB. The satellite [G\T] is -6.7dB/K and receiver feeder losses amount top 6 dB calculate the C/N density ratio.	CO3-App	(08)
		Or		
	(b)	Apply the concept of Carrier-to-Noise Ratio (C/N_0) to evaluate satellite uplink performance. Using a link budget at 12 GHz with EIRP = 48 dBW, Free Space Loss = 206 dB, Antenna Pointing Loss = 1 dB, Atmospheric Absorption = 2 dB, Receiver G/T = 19.5 dB/K, and Receiver Feeder Loss = 1 dB, calculate the Carrier-to-Noise Spectral Density Ratio (C/N_0). Then, apply the same method to analyze the impact of reducing FSL to 100 dB on link performance."	CO3-App	(16)
14.	(a)	Design a cost-effective GPS tracker for various applications	CO5-Ana	(16)
		Or		
	(b)	Analyze the remote sensing data from satellites for weather forecasting	CO5-Ana	(16)

15. (a) Describe the evolution of the INTELSAT series and its contribution to global satellite communication. Evaluate its importance in facilitating international broadcasting, telecommunication, and data relay services. CO5-Ana (16)

Or

(b) Analyze how satellite platforms have evolved to support advanced applications in both civilian and defense sectors. Discuss the technological advancements and their impact on global communication. CO5-Ana (16)