Roll No. | | | | | | | | | | |

ANNA UNIVERSITY (UNIVERSITY DEPARTMENTS)

B.E. /B.Tech / B. Arch (Full Time) - END SEMESTER EXAMINATIONS, APRIL /MAY 2024

ELECTRONICS AND COMMUNICATION ENGINEERING
VI SEMESTER
EC 5007 & Satellite Communication
(Regulation 2019)

Time:3 hrs Max.Marks: 100

CO1	Ability to comprehend and appreciate the significance and role of this course in the present contemporary world
CO2	The student would be able to demonstrate an understanding of the basic principles of satellite orbits, placement and control, satellite link design and the communication system components.
CO3	The student would be able to demonstrate an understanding of the different communication, sensing and navigational applications of satellite and their implementation

BL – Bloom's Taxonomy Levels
(L1-Remembering, L2-Understanding, L3-Applying, L4-Analysing, L5-Evaluating, L6-Creating)

PART- A (10x2=20Marks)
(Answer all Questions)

Q. No.	Questions	Marks	CO	BL
1	List any two factors for selecting frequency for satellite communication	2	1	L2
2	Define argument of perigee west	2	1	L1
3	What are the two principal forms of attitude stabilization of satellites	2	1	L2
4	What is global beam and spot beam satellite antennas?	2	1	L2
5	A satellite transponder has a bandwidth of 36 MHz. Earth stations use ideal SRRC filters with $\alpha = 0.4$. What is the maximum bit rate that can be sent through this transponder using BPSK?	2	2	L3
6	What is the need for error control in satellite communication?	2	2	L2
7	A TDMA network has 5 earth stations. What is the data burst duration for each earth station of a TDMA system that uses a 125 μs, a 5μs preamble and a 2μs guard band?	2	2	L3
8	Which type of CDMA technique is used in satellite communication and why?	2	2	L2
9	Write a note on the role of satellite in military and defense.	2	3	L2
10	What are the two types of remote sensing that can be done using satellites?	2	3	L2

PART- B (5x 13=65Marks)
(Restrict to a maximum of 2 subdivisions)

Q. No.	Questions	Marks	CO	BL
11 (a)	(i). A geostationary satellite is located at 90°W. Calculate the azimuth angle for an earth station at latitude 35° north and longitude 100°W. Find the azimuth and antenna elevation angle for this system. (ii) What factors contribute to change in the orbit of a satellite?	8 5	2	L4
	OR			
11 (b)	(i) A satellite is in an orbit around the earth. The altitude of the satellite's orbit above the surface of the earth is 1400 Km.	7	2	L4

	What is the orbital period of the satellite in this orbit? Give your answer in hours, minutes and seconds (ii) List and describe the orbital elements of a satellite	6		
12 (a)	A 12 GHz receiving satellite system has an antenna with noise temperature 50K, a LNA with a noise temperature of 100 K and a gain of 40dB, and a mixer with a noise temperature of 1000K and 10dB loss. Find the system noise temperature.	13	2	L4
	OR			
12 (b)	The transponder saturated output power of a GEO satellite located at 36000 km away from an earth station is 20W. If its antenna gain is 20dB and its downlink frequency is 4 GHz what will be it C/N ratio in dB? Consider the receive antenna gain on axis is 49.7dB. Also consider that the loss due to clear air atmosphere and edge of beam loss is -0.2 dB and -3 dB respectively.	13	2	L4
13 (a)	Write a thorough note on the significance of channel synchronization in TDM systems and explain the Turbo codes used for error correction in these systems.	13	2	L3
	OR			
13 (b)	Determine the BER of a BPSK satellite link using clear representations of how modulation and demodulation of BPSK is done in satellite communication.	13	2	L3
14 (a)	Describe in detail the technical characteristics of TDMA and mention why a Unique Word Correlator is used. Also draw and explain the TDMA frame structure	13	2	L3
	OR			
14 (b)	Explain data recovery and spreading in CDMA satellite communication systems using clear illustrations.	13	2	L3
15 (a)	Explain the objectives, principles and applications of (i) GPS systems (ii) DTH/DBS systems	7 6	3	L2
	OR			
15 (b)	Describe the operation of typical VSAT system. State briefly where VSAT system find widest application	13	3	L2

PART- C (1x 15=15Marks)

(Q.No.16 is compulsory)

Q. No.	Questions	Marks	CO	BL
16.	(i) A C band earth station has an antenna with a transmit gain of 54dB. The transmitter output power is set to 100 W at a frequency of 6.1 GHz. The signal is received by the satellite at a distance of 37,500 km by an antenna with a gain of 26 dB. Calculate the path loss and the received power in dBm and dBW. (ii) Describe the tracking, telemetry and command facilities of a satellite communications system	7 8	2	L5