	Reg. No.:	
	Name :	

VIT CHENNAI
Vellore Institute of Technology
(Deemed to be University under section 3 of UGC Act, 1956)

Continuous Assessment Test – II – October 2024

Programme	:	**B.Tech (ECE)**	Semester	:	**Fall 2024-25**
Course	:	**Satellite Communication**	Code	:	**BECE310L**
			Slot	:	**B1+TB1**
Faculty	:	**Dr. Niraj Kumar** **Prof. J. Divya**	Class Nbr(s)	:	**CH2024250100027** **CH2024250100147**
Time	:	**90 Minutes**	Max. Marks	:	**50**

General Instructions:

- Write only your registration number on the question paper in the box provided and do not write other information.
- Use statistical tables supplied from the exam cell as necessary
- Use graph sheets supplied from the exam cell as necessary
- Only non-programmable calculator without storage is permitted

Answer ALL the questions

Q.No.	Sub. Sec.	Question Description	Marks	BT Level
1.		Six earth stations are operating in a TDMA mode. Speech signals are sampled at 8 kHz, using 8 bits/sample. The sampled signals are then multiplexed into 40 Mbps streams at each station, using QPSK. Assume that the TDMA system uses a 125 µs frame time. Find the number of channels that each earth station can send within the TDMA frame when: (i) No time is lost in overheads, preambles, and the like. (ii) A 5 µs preamble is added to the beginning of each earth station's transmission. (iii) A 5 µs preamble is added to each station's transmission and 2 µs guard band is allowed between every transmission.	**[7]**	**L3**
2.		Five earth stations share one transponder of a 6/4 GHz satellite. The satellite and earth station characteristics are given below: Find the earth station transmitter power and received (C/N) when the system is operated: (i) In TDMA with the transponder saturated by each earth station in turn. (ii) In FDMA with 3-dB input and output back-off.	**[8]**	**L3**

		Satellite		
		Transponder Bandwidth	36 MHz	
		Transponder gain	90 dB (max)	
		Input noise temperature	550 K	
		Saturated output power	20 W (max)	
		4 GHz antenna gain	20.0 dB	
		6 GHz antenna gain	22.0 dB	
		Earth station		
		4 GHz antenna gain	60.0 dB	
		6 GHz antenna gain	63.0 dB	
		Receive system temperature	100K	
		Path loss		
		At 4 GHz	196 dB	
		At 6 GHz	200 dB	
3.		Design a transmitting earth station to provide a clear air C/N of 26 dB in a C-band transponder at a frequency of 6.285 GHz. Use an uplink antenna with a diameter of 9 m and an aperture efficiency of 68%. The uplink station is located on the 2 dB contour of the satellite footprint and the transmitter/receiver gain of satellite antenna is 31 dB on its axis. Allow 0.5 dB for clear air atmospheric attenuation and other losses. (a) Calculate the gain of transmitting antenna. [4 Marks] (b) Calculate the free space path loss for a distance of 38,500 Km [4 Marks] (c) Calculate the noise power for 27 MHz FM-TV signal for noise temperature 500 K and Boltzman's constant 1.380649×10^{-23} J/K . [4 Marks] (d) Find the uplink transmitter power required to achieve the required C/N. [8 Marks]	**[20]**	**L5**
4.		Consider the data of Q.3 for the downlink communication. If satellite downlink frequency is 4.060 GHz, antenna noise temperature 130 K, LNA noise temperature is 40 K and transponder saturated output power is 80 W. (a) Calculate the received noise power at the earth station. [5 Marks] (b) Calculate the Gain of receiver antenna for a overall C/N of 13 dB. [5 Marks] (c) Calculate the required diameter of the receiver antenna for a overall C/N of 13 dB. [5 Marks]	**[15]**	**L4**
		Total Marks	**[50]**	

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