VEER SURENDRA SAI UNIVERSITY OF TECHNOLOGY (VSSUT), ODISHA			
Even/Odd Mid Semester Examination for session 2023-24			
COURSE NAME: **B.Tech.**			SEMESTER: **4th**
BRANCH NAME: **Information Technology (IT)**			
SUBJECT NAME: **Data Communication and Computer Networks (DCCN)**			
FULL MARKS: **30**			TIME: **90 Minutes**
Answer **All** Questions.			
The figures in the right-hand margin indicate Marks. *Symbols carry usual meaning.*			
Q1.		Answer all Questions.	**[2 × 3]**
	a)	Mention four fundamental characteristics that are needed for making an effective data communication system.	- CO1
	b)	Define the following network performance metrics: Bandwidth, Throughput, Latency, Jitter, Packet loss, Round Trip Time (RTT).	- CO2
	c)	A noiseless 4-kHz channel is sampled every 1 msec. What is the maximum data rate? How does the maximum data rate change if the channel is noisy, with a signal-to-noise ratio of 30 dB? (Assume signals transmitted in binary form)	- CO3
Q2.			**[4+4]**
	a)	What do you mean by ISO OSI protocol stack? What is the basis for layering of protocols? Briefly outline the functions of each layer in ISO OSI model.	- CO1
		OR	
	b)	Calculate the total time (Latency) required to transfer a 1000-kB file in the following cases, assuming an RTT (Round trip time) of 100 msec, a packet size of 1 kB data, and an initial 2 × RTT of "handshaking" before data are sent. (i) The bandwidth is 1.5Mbps, and data packets can be sent continuously. (ii) The bandwidth is 1.5 Mbps, but after we finish sending each data packet, we must wait one RTT before sending the next. (iii) The bandwidth is "infinite," meaning that we take transmit time to be zero, and up to 20 packets can be sent per RTT. (iv) The bandwidth is infinite, and during the first RTT, we can send one packet (2^{1-1}), during the second RTT we can send two packets (2^{2-1}), during the third we can send four (2^{3-1}), and so on.	- CO1
Q3.			**[4+4]**
	a)	Draw & describe the connecting devices required for LAN for an organization using Tree topology.	- CO2
	b)	A group of 2^n-1 routers are interconnected in a centralized binary tree, with a router at each tree node. Router i communicates with router j by sending a message to the root of the tree. The root then sends the message back down to j. Derive an expression for the mean number of hops per message for large n, assuming that all router pairs are equally likely.	- CO2

		OR	
	c)	Define Guided & Unguided Transmission Medium. Describe the role of transmission medium in the process of data communication.	- CO2
	d)	Explain the use of Hamming code for error detection and correction with suitable example. If received Hamming code is 1110101 with even parity then detect and correct error.	- CO2
Q4			[4+4]
	a)	Given the data word 101001111 and the divisor 10111, show the generation of the CRC codeword at the sender site (using binary division) and received codeword is accepted at receiver site successfully.	- CO3
	b)	Why Multiplexing is necessary in networking? Compare and contrast between FDM, TDM and WDM.	- CO3
		OR	
	c)	Give a comparative study of switching techniques employed in computer networks.	- CO3
	d)	Explain checksum method for error detection. Suppose the following data: 01000001,01100010,01110011, and 01100100 are to transmitted. Find the transmitted Checksum codeword for the given data. Also shows the Receiver's identification for error detection.	- CO3