Daffodil International University

Department of Computer Science and Engineering
Faculty of Science & Information Technology
Midterm Examination, Fall-2023
Course Code: CSE225 Course Title: Data Communication
Level: 2 Term: 1 Batch: 62

Time: 1 Hour and 30 Minutes **Marks: 25**

Answer ALL Questions

[The figures in the right margin indicate the full marks and corresponding course outcomes. All portions of each question must be answered sequentially.]

1.	*a)*	Suppose, you are a network engineer of Daffodil Computers who hired you to design their network infrastructure. The company has four branches in different cities, each with about 50 employees. The company wants to ensure the network is reliable, secure, scalable, and fault tolerant with near about 99% uptime. Which network topology would you choose for the company? Besides, analyze the possible benefits and limitation of your topology and use the appropriate diagram if necessary.	[3]	CO1
	b)	A customer service representative is using a chat application to communicate with a client who has a problem with their product. The chat application allows the customer service representative to send text messages, images, and audio clips to the client, and vice versa. Examine the transmission mode (simplex, half-duplex or full-duplex) that is appropriate for this scenario.	[2]	
2.	*a)*	What are addresses used in OSI model? Compare and contrast among these addresses.	[3]	CO2
	b)	Relate the following to one or more layers of the OSI model i. Acknowledging received data. ii. Encryption of usernames and passwords. iii. Define ways to access the different types of media. iv. Decides how signals represent 0s and 1s.	[2]	
3.	*a)*	A periodic composite signal with a bandwidth of 500 Hz is composed of four sine waves. The first one has a frequency of 20 Hz with a maximum amplitude of 10 V, the second one has a frequency of 80 Hz with a maximum amplitude of 15 V, the third one has a frequency of 250 Hz with a maximum amplitude of 5V and the last one with a maximum amplitude of 20 V. Examine and draw the spectrum.	[2]	CO3
	b)	Suppose a communication channel has a bandwidth of 10 kHz and a signal-to-noise ratio of 20 dB. Inspect the maximum capacity that can be used to transmit data over this channel.	[3]	
4.	*a)*	Line coding is a method of transforming digital data into digital signals that can be transmitted over a communication channel. Suppose you want to send the hexadecimal data $(B7)_{16}$. Evaluate	[3]	CO3

		and encode this data using the following line coding schemes? i. Differential Manchester ii. NRZ (I) iii. MLT3		
	b)	Suppose you are a computer engineer who works for a company that makes printers and scanners. You need to design a cable that can connect these devices to a computer. You have two choices for the type of cable: serial or parallel. Discover and analyze the type of cable that is suitable for this task.	[2]	
5.	*a)*	Examine the Nyquist sampling rate for each of the following signals: i. A low-pass signal with bandwidth of 500 KHz? ii. A band-pass signal with bandwidth of 500 KHz if the lowest frequency is 200 KHz?	[2]	CO3
	b)	Pulse-code modulation (PCM) is a method used to digitally represent sampled analog signals. It is the standard form for digital audio in computers and various Blu-ray, Compact Disc and DVD formats, as well as other uses such as digital telephone systems. Moreover, a PCM stream is a digital representation of an analog signal, in which the magnitude of the analogue signal is sampled regularly at uniform intervals, with each sample being quantized to the nearest value within a range of digital steps. Therefore, briefly analyze the steps involved in Pulse Code Modulation.	[3]	