International Islamic University Chittagong

Department of Computer Science and Engineering

B. Sc. in CSE

Final Exam, Autumn 2023

Course Code: **CSE 3525** Course Title: **Data Communication**

Time: 2 hours 30 minutes Full Marks: 50

(i) The figures in the right-hand margin indicate full marks

(ii) Course Outcomes and Bloom's Levels are mentioned in additional Columns

Course Outcomes (COs) of the Questions	
CO1	**Understand** Data Communications Concepts and its components.
CO2	**Analyze** the different types of Transmission media and their functions within a Network.
CO3	**Apply** the knowledge of encoding, decoding, and how error correction and error detection in data communication.
CO4	**Understand** switching principles and basics of wireless communication.

Bloom's Levels of the Questions						
Letter Symbols	**R**	**U**	**App**	**An**	**E**	**C**
Meaning	Remember	Understand	Apply	Analyze	Evaluate	Create

Group A

[Answer the questions from the followings]

1.	a)	What do you mean by signal rate and data rate? Write the relationship between signal rate and data rate. An analog signal has a bit rate of 16000 bps and a baud rate of 1000 baud. How many data elements are carried by each signal element? How many signal elements do we need?	CO3	An	5
	b)	Create a constellation diagram for 8-QAM with 4 phases and two amplitudes. Also, provide the time-domain plot for the given digital information signal: 111000101101110001.	CO3	Ap	5
2	a)	A corporation has a 10 MHz satellite channel and aims to create 40 distinct, independent channels, each capable of transmitting at least 10 mbps. Design an appropriate multiplexing technique for this communication requirement.	CO3	Ap	5
	b)	Four sources, each with a bit rate of 1000 mbps, need to be combined using Time Division Multiplexing (TDM) with a byte interval and synchronizing bits. Answer the following questions regarding the multiplexing process: i. What is the size of a frame in bits? ii. What is the frame rate? iii. What is the duration of a frame? iv. What is the data rate?	CO3	Ap	5

OR,

2.	a)	Describe multiplexing with necessary example and figure. Five channels, each with a 100-kHz bandwidth, are to be multiplexed together. What is the minimum bandwidth of the link if there is a need for a guard band of 40kHz between the channels to prevent interference?	CO1	U	5
	b)	Distinguish between synchronous and statistical TDM. You need to use synchronous TDM and combine 20 digital sources, each of 100 Kbps. Each output slot carries 1 bit from each digital source, but one extra bit is added to each frame for synchronization. Answer the following questions: i. What is the size of an output frame in bits? ii. What is the output frame rate? iii. What is the duration of an output frame? iv. What is the output data rate?	CO4	U	5

Group B

[Answer the questions from the followings]

3.	a)	What is virtual circuit switching? Describe the virtual circuit setup, data transfer, and teardown phases with illustrations.	CO4	U	5
	b)	Compare the delay in Circuit-Switched and Packet-Switched Networks using appropriate examples.	CO4	U	5
4.	a)	A sender needs to send the four data items Ox3456, OxABCC, Ox02BC, and OxEEEE. Answer the following: i. Find the checksum at the receiver site if the second data item is changed to OxABCE. ii. Find the checksum at the receiver site if the second data item is changed to OxABCE and the third data item is changed to Ox02BA.	CO4	U	5
	b)	Discuss the concept of redundancy in error detection and correction. Given the dataword 1010011110 and the divisor 10111. i. Show the generation of the codeword at the sender site (using binary division). ii. Show the checking of the codeword at the receiver site (assume no error).	CO3	App	5
5.	a)	Compare and contrast the Stop-And-Wait ARQ with the Go-Back-N ARQ flow control protocol.	CO2	An	5
	b)	Explain, with appropriate diagrams, the consequences of not using an adequate window size for the Selective-Repeat ARQ flow control protocol.	CO2	An	5

OR,

5.	a)	What do you mean by SONET? Find the data rate of an STS-9 signal used in SONET.	CO3	App	5
	b)	How does the Ethernet address lA:2B:3CAD:5E:6F appear on the line in binary? Compare a piconet and a scatternet.	CO3	An	5