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Daffodil International University

Faculty of Science & Information Technology

Department of Computer Science & Engineering

Final Examination, Spring 2026

Course Code: CSE 225, Course Title: Data Communication

Level: 2 Term: 2 Batch: 67

Time: 02:00 Hrs **Marks: 40**

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	Illustrate the constellation diagram for the following cases. Find the peak amplitude value for each case and define the type of modulation technique. The numbers in parentheses define the values of I and Q, respectively. A. Two points at (2, 0) and (3, 0) B. Two points at (3, 0) and (-3, 0) C. Four points at (2, 2), (-2, 2), (-2, -2) and (2, -2) D. Two points at (0, 5) and (0, -5)	4	CO3
	b	Suppose that a digital communication system is used to transmit binary data over a communication channel. The system sends a high-amplitude carrier signal when the bit is **1**, and a low (or zero) amplitude signal when the bit is **0**. The frequency and phase of the carrier signal remain constant throughout the transmission. Analyze the transmission technique with figures and discuss their advantages, disadvantages, and typical applications to support your justification.	4	
	c	Calculate the bandwidth for the following situations if we need to modulate a 10-KHz voice. a. AM b. PM (set $\beta = 5$)	2	
2	a	A data communication system uses hierarchical multiplexing techniques to combine multiple low data rate signals into high data rate signals. Analyze the digital hierarchy of telephone companies with a proper flow diagram. Besides, discuss how to find out the bandwidth and overhead for each level.	4	

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	b	We need to use synchronous TDM and Combine 10 digital sources, each of 200 Kbps. Each output slot carries 2 bits from each digital source, but one extra bit is added to each frame for synchronization. Solve the following question: A. What is the size of an output frame in bits? B. What is the output frame rate? C. What is the duration of an output frame? D. What is the output data rate?	4	
	c	Which modulation technique is used in optical fiber communication? Justify your opinion with proper figures and equations.	2	
3	a	Suppose the dividend = 111010111 and the divisor = 1101. Inspect the CRC. Also inspect that the CRC has no error.	4	CO4
	b	Given an 11-bit Hamming message bits: 10011100101 A. Determine the transmitted message (with redundant/extra/parity bits). B. If the 6th bit of the transmitted message becomes corrupted for some reasons during transmission, use the Hamming error-detection process to determine the error position detected by the code.	4	
	c	Calculate the hamming and error distance for each of the following code words: a. d(111111, 001001) b. d(000000, 111110) c. d(010101, 101010) d. d(110011, 000011)	2	
4	a	Which of the CSMA (CSMA/CD or CSMA/CA) is used in wireless networks? Explain that with proper figures.	4	
	b	Suppose you have 4 stations (A, B, C, and D). B and C are sending 0, D is silent, and A is sending 1. Demonstrate your calculation and discover the CDMA multiplexing values using the Walsh table.	4	
	c	Compare and contrast 'Polling' and 'Select' with necessary diagrams.	2	

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