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Daffodil International University
Department of Computer Science and Engineering
Faculty of Science & Information Technology
Final Examination, Fall 2025

Course Code: CSE 225, Course Title: Data Communication
Level:2 Term:2 Batch: 66

Time: 2 Hours **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 (3, 0) and (2, 0) B. Two points at (2, 0) and (−2, 0) C. Four points at (4, 4), (−4, 4), (−4, −4), and (4, −4) D. Two points at (0, 4) and (0, −4)	4	CO3
	b)	Among ASK, FSK, and PSK modulation techniques, which one provides the best overall performance? **Analyze** each technique with figures and discuss their advantages, disadvantages, and typical applications to support your justification.	4	
	c)	**Illustrate** the constellation diagram for 16-QAM for the following cases: A. 2 amplitude levels and 8 phase angles, and B. 4 amplitude levels and 4 phase angles.	2	
2	a)	**Analyze** FDM (MUX and DEMUX) with a diagram, considering a system with three voice channels, each occupying 4 kHz of bandwidth and including a 1 kHz guard band.	4	CO3
	b)	We need to use synchronous TDM and combine 20 digital sources, each of 100 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 questions: 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, and what is the reason for using it?	2	

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3	a)	Given an 8-bit Hamming codeword: 10101011, A. **Determine** the original transmitted message (i.e., extract the data bits after identifying the parity bits). B. If the 5th bit of the transmitted message becomes corrupted during transmission, use the Hamming error-detection process to **determine** the error position detected by the code.	4	CO4
	b)	Suppose a sender transmits the following data words (in decimal): 5, 2, 8, 11, and 7. **Apply** the checksum at the sender side and verify it at the receiver side.	4	
	c)	**Apply** the concept of even parity to the following message bits: 1110010 1010101 1010001 determine your transmitted bits if you use 2-D (even) parity.	2	
4	a)	**Compare** between Poll and Select with appropriate figures.	4	CO4
	b)	Which of the CSMA (CSMA/CD or CSMA/CA) is used in traditional ethernet? **Analyze** that with proper figures.	4	
	c)	**Compare** persistent and non-persistent CSMA. Which technique is better, and what is the reason for its improved performance?	2	