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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.]***

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|---|---|---|---|---|
| 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.<br>A. Two points at (3, 0) and (2, 0)<br>B. Two points at (2, 0) and (−2, 0)<br>C. Four points at (4, 4), (−4, 4), (−4, −4), and (4, −4)<br>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:<br>A. 2 amplitude levels and 8 phase angles, and<br>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:<br>A. What is the size of an output frame in bits?<br>B. What is the output frame rate?<br>C. What is the duration of an output frame?<br>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,<br>A. **Determine** the original transmitted message (i.e., extract the data bits after identifying the parity bits).<br>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:<br>1110010 1010101 1010001<br>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 | |