

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY GURAJADA VIZIANAGARAM
III B. Tech I Semester Regular/Supplementary Examinations, April/May -2025
DIGITAL COMMUNICATIONS

(ELECTRONICS AND COMMUNICATION ENGINEERING)

Time: 3 hours

Max. Marks: 70

Answer any **FIVE** Questions **ONE** Question from **Each unit**

All Questions Carry Equal Marks

| UNIT-I | | | |
|-----------------|----|--|------|
| 1. | a) | Describe the elements of a digital communication system, explain the advantages of digital communication systems over analog communication. | [7M] |
| | b) | How does quantization error affect PCM and how is companding used in PCM systems to minimize quantization noise? | [7M] |
| (OR) | | | |
| 2. | a) | Describe the Delta Modulation (DM) system with a block diagram, Discuss its drawbacks and explain how Adaptive Delta Modulation (ADM) overcomes these limitations. | [7M] |
| | b) | What is the working principle of Differential Pulse Code Modulation (DPCM), and how does DPCM reduce redundancy compared to standard PCM? | [7M] |
| UNIT-II | | | |
| 3. | a) | With necessary waveforms, explain Amplitude Shift Keying (ASK), Discuss its advantages and disadvantages. | [7M] |
| | b) | How does Phase Shift Keying (PSK) work, and how does Differential PSK (DPSK) differ from standard PSK in terms of encoding and detection? | [7M] |
| (OR) | | | |
| 4. | a) | Describe Frequency Shift Keying (FSK), Compare its performance with Amplitude Shift Keying (ASK) in terms of bandwidth, noise immunity, and complexity. | [7M] |
| | b) | Compare Binary Frequency Shift Keying (BFSK) and Binary Phase Shift Keying (BPSK), discuss their similarities and differences in terms of bit error rate, power efficiency and bandwidth requirements. | [7M] |
| UNIT-III | | | |
| 5. | a) | Define probability of error in digital communication and discuss the factors affecting the probability of error in a communication system. | [7M] |
| | b) | Explain the concept of a matched filter. How does a matched filter minimize the probability of error in a receiver? | [7M] |
| (OR) | | | |
| 6. | a) | How does an optimum filter function, and how is the expression for the probability of error derived in a digital communication system? | [7M] |
| | b) | Differentiate between coherent and non-coherent reception, explain the non-coherent detection of Frequency Shift Keying (FSK). | [7M] |
| UNIT-IV | | | |
| 7. | a) | How is entropy defined in information theory and what is its significance in measuring the uncertainty of a source? What are its key properties? | [7M] |
| | b) | Describe Shannon-Fano coding and Huffman coding techniques, Compare their efficiency in terms of code length and redundancy. | [7M] |

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| | | (OR) | |
| 8. | a) | What is mutual information? Derive the expression for mutual information and explain its importance in communication systems. | [7M] |
| | b) | Derive the expression for the capacity of a Gaussian channel, explain the bandwidth and signal-to-noise ratio (S/N) trade-off in Gaussian channels. | [7M] |
| | | <u>UNIT-V</u> | |
| 9. | a) | In what way do linear block codes function and how are they represented using matrices? How do they enable error detection and correction? | [7M] |
| | b) | Discuss the structure of binary cyclic codes and explain the encoding process and syndrome calculation for error detection and correction. | [7M] |
| | | (OR) | |
| 10. | a) | In what way does the Viterbi algorithm decode convolutional codes and how is it implemented using state, tree, and trellis diagrams? | [7M] |
| | b) | In what way do Hamming codes function, and what is their construction and encoding process? How do they detect and correct errors? | [7M] |
