Time: 3 Hours   **Max. Marks: 80**

N.B. 1. Question No. 1 is compulsory.
     2. Attempt any three questions out of five.
     3. All questions carry equal marks.
     4. Assume suitable data, if required and state it clearly.

Q-1   **Attempt Any Four**   **[20]**

     1   Explain the importance of line codes for data transmission and state different types of line codes.

     2   Justify that the probability of error in a matched filter does not depend on the shape of the input signal.

     3   Define the following terms and give their significance (i) Mean (ii) Central moment (iii) Variance (iv)Standard deviation

     4   State Shannon Hartley channel capacity theorem and explain the trade-off between bandwidth and signal to noise ratio.

     5   Draw a Signal space diagram of 16-ary PSK and 16-ary QASK and determine the Euclidean distances of both.

Q-2   **(a)**   The generator polynomial of (7, 4) cyclic code is $g(x) = 1 + x + x^3$.   **10**
                    I. Draw the block diagram of the encoder and syndrome calculator.
                    II. find the code polynomial for message vector 0101.

      (b)   What do you mean by inter-symbol interference? Explain the measures to be taken to avoid ISI? Explain eye diagram.   **10**

Q-3   **(a)**   Draw and explain a block diagram of BFSK transmitter and receiver. Calculate the bandwidth and Euclidean distance for the same.   **10**

      (b)   Describe in convolution code, time domain approach and transform domain approach to determine encoder output.   **10**

Q-4   **(a)**   A discrete memoryless source has an alphabet of six symbols with probabilities 0.30 ,0.25, 0.20, 0.12, 0.08, 0.05. Construct Huffman Code and Find code efficiency and redundancy.   **10**

      (b)   Draw the block diagram of MSK (Minimum Shift Keying) and justify why MSK is known as Shaped QPSK.   **10**

Q-5 **(a)** What is Optimum Filter? Derive an expression of probability of error of **10**
optimum filter.

(b) Compare the following modulation techniques. **10**
I. Coherent modulation technique and non-coherent modulation technique
II. BPSK and QPSK modulation technique

Q-6 **(a)** Explain Viterbi's decoding with an example. **10**

(b) Write a short note on the following. **10**
I. Random Processes
II. Central limit theorem

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