

Duration: 3 Hours

Total Marks : 80

- N.B.: (1) Question No 1 is Compulsory.  
 (2) Attempt any three questions out of remaining five.  
 (3) All questions carry equal marks.  
 (4) Assume Suitable data, if required and state it clearly.

- QNo.1 Attempt any Four :- 20
- What is matched filter? Mention two properties of Matched filter.
  - State the significance of minimum distance block code.
  - Describe how channels can be classified briefly explain each.
  - How is spread spectrum signal different from normal signal?
  - Explain the following terms in digital modulation techniques: Probability of error, Power spectra, Bandwidth efficiency.
- Q No.2 a Explain the Huffman encoding procedure. A discrete memoryless source (DMS) has five symbols with probabilities for its output as described in Table. 10
- | Symbol      | $X_1$ | $X_2$ | $X_3$ | $X_4$ | $X_5$ |
|-------------|-------|-------|-------|-------|-------|
| Probability | 0.4   | 0.19  | 0.16  | 0.15  | 0.1   |
- Construct a Huffman code for X and calculate the efficiency of the code.
- Why do we need to use the line code formats? State the important properties of line codes. 10
- Q No.3 a Sketch PSK and QPSK signals for the input bit sequence 10011010. What are the similarities between them? How do they differ to each other? 10
- A polar NRZ waveform has to be received with the help of a matched filter. Here, binary 1 is represented by a rectangular positive pulse. Also, binary zero is represented by a rectangular negative pulse. Determine the impulse response of the matched filter. Also, sketch it. 10
- Q No.4 a Draw the block diagram of binary Frequency shift Keying (BFSK) generation. And also explain the Spectrum of BFSK signal. 10

- b The Parity check matrix of particular (7,4) linear block code is given by 10  
:

$$H = \begin{bmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

- Find the generator matrix (G)
- List all the codevectors
- What is the minimum distance between the code vectors?
- How many errors can be detected? How many errors can be corrected?

- Q No.5 a For the systematic (7, 4) cyclic code, determine the generator matrix and parity check matrix. Given generator  $g(x) = x^3 + x + 1$ . 10

- b Generator vectors for a rate 1/3 convolutional encoder are: 10  
 $g^1 = (1, 0, 1)$ ,  $g^2 = (1, 1, 0)$ ,  $g^3 = (1, 1, 1)$

- Draw encoder diagram.
- Draw trellis diagram.

Q No.6

- b Explain M-Ary FSK with the help of following. 10  
  - Block diagram
  - Spectrum of M-Ary FSK
  - Bandwidth of M-Ary FSK
- c Explain with block diagram, direct sequence spread spectrum technique. 10

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