

N. B. : Q.1 is compulsory and attempt any four questions from Q.2 to Q.7

1. (a) Derive the transfer function $H(f)$ for an optimum filter. Under which condition a optimum filter can be called as a matched filter? 10
 (b) Compare - 10
 (i) BPSK and QPSK
 (ii) Block codes and Convolution codes
2. (a) Draw and explain decision feedback equalizer. Show how it overcomes drawbacks of transversal equalizer. 10
 (b) Draw block diagram of BFSK Tx and Rx. The bit stream 001010011010 is to be transmitted using BFSK. Sketch transmitted waveform. 10
3. (a) How duobinary signaling technique introduces controlled ISI in data stream? 10
 (b) Define 'amount of information'. Discuss the different properties of information. Also define Entropy? 10
4. (a) For the binary bit stream 1101 1010 0010, draw the following waveforms
 (i) Unipolar NRZ (ii) Polar RZ (iii) Bipolar NRZ
 (iv) Polar quaternary NRZ (Gray coding) (v) Mary system ($M=8$) 10
 (b) Consider a $(7,4)$ code whose generator matrix is 10

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

- (i) Find all the codewords of the code.
 (ii) Find H , the parity-check matrix of the code.
 (iii) Compute the syndrome for the received vector 1101101. Is this a valid code vector?
 (iv) What is the error-correcting capability of the code?
 (v) What is the error-detecting capability of the code?
5. (a) Define the following : 10
 (i) Systematic and non-systematic code
 (ii) Hamming weight (iii) Hamming distance
 (iv) Rate of code (v) Properties of hamming code
 (b) Encode the message 101 in systematic form using polynomial division and the generator $g(X) = 1 + X + X^2 + X^4$. 10
6. (a) In relation to spread spectrum explain the following terms : 10
 (i) slow frequency hopping (ii) fast frequency hopping
 (b) Draw block diagram of a generator of DPSK. Also show how data is recovered from DPSK signal. 10
7. Write short note on any TWO. 20
 (a) Intersymbol interference and Interchannel interference
 (b) Eye Diagram
 (c) Viterbi decoding.