

Duration:3 hours

Total marks:80

- N.S.: (1) Question No.1 is compulsory.
 (2) Solve any four from remaining six questions.
 (3) Figures to the right indicate full marks

1. Answer the following questions:

(20)

- (a) Why and how the bandwidth of a signal is spread using spread spectrum.
 (b) Define entropy of an information source and explain its significance.
 (c) Compare and contrast digital communication with analog communication
 (d) Explain the salient features of BFSK.
 (e) Discuss on linearity and cyclic property of linear codes.

2(a) Develop MSK waveform (with all intermediate waveforms) for 11000111 for $m=5$ & $n=1$ on the graph paper and justify the term "minimum shift keying". (10)

(b) A (7,4) cyclic code is generated using the polynomial $x^3 + x + 1$

i) Generate the systematic cyclic code for the data 1100.

ii) Draw the encoder & show how parity bits are generated for the data 1100. (10)

3(a) Compare BPSK and QPSK based on following parameters:- bandwidth requirement, noise immunity, transmission rate, efficiency & applications. (10)

(b) The generator matrix [G] of linear (7,4) block code is as follows:

$$G = \begin{matrix} 1111000 \\ 1010100 \\ 0110010 \\ 1100001 \end{matrix}$$

i) Find parity check matrix

ii) Determine the syndrome for the code word 1101101. State with reasons whether this a valid code word (10)

4(a) A three digit message is transmitted over a noisy channel having a probability of error

$$P(e) = (1/5) \text{ per digit.}$$

a. Determine Probability of occurrence of errorless message

b. Determine Probability of message having error in any two digits

Turn Over

- c. Determine Probability of message having error in all digits
 d. Plot the all possible probabilities of occurrence of error (10)

(b) Distinguish between direct sequence spread spectrum (DSSS) and frequency-hop spread spectrum (FHSS) with respect to principle and applications. (10)

5(a) Derive the probability of error of matched filter. Comment on your results. (10)

(b) Consider an alphabet of a discrete memory less source having five different symbols with probabilities as shown below:

| Symbol | S1 | S2 | S3 | S4 | S5 |
|-------------|-----|-----|-----|-----|-----|
| Probability | 0.1 | 0.2 | 0.4 | 0.1 | 0.2 |

Construct: (a) Huffman Code for each symbol.

(b) Determine average codeword length of the above source.

(c) Comment on your results. (10)

6(a) What is an eye diagram, explain the parameters observed from it with an illustration. (10)

(b) State Nyquist's Criterion for distortion less transmission. State its significance with duobinary encoding. (10)
