Duration: 3 Hrs Total Marks: 80

N.B: Question No 1 is compulsory.
Attempt any three questions out of remaining five**.**
All questions carry **equal** marks
Assume Suitable data, if required and state it clearly.

Q1) (20)

a) State and explain Shannon-Hartley theorem.
b) What is the cause of Inter Symbol Interference (ISI)
c) Explain the need of continuous wave modulation in detail.
d) Explain in brief with block diagram Integrate and Dump receiver.
e) List advantages and limitations of spread spectrum system.

Q2) a) Consider the seven symbols of Discrete Memoryless Source and their probabilities as shown in the table below. Follow the Huffman's algorithm to find the code words for each message. Also find the average code word length and the average information per message. (10)

Message	M_1	M_2	M_3	M_4	M_5	M_6	M_7
Probabilities	0.25	0.25	0.125	0.125	0.125	0.0625	0.0625

b) Derive the expression for minimum probability of error for matched filter. (10)

Q3) a) Explain the different line codes used for data transmission. (10)
b) Draw and explain the block diagram of OQPSK transmitter and receiver. Also draw the signal space representation. (10)

Q4) a) With relevant expressions and block diagram explain BFSK transmitter and receiver. Compare BPSK and BFSK. (10)

b) Consider a (7, 4) liner block code whose parity check matrix is (10)

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

Obtain Generator matrix and calculate the syndrome vector for single bit error.

Q5) a) Design feedback shift register encoder of (8, 5) cyclic code for the generator polynomial $g(x) = 1+X+X^2+X^3$.Use this encoder to find code word in systematic form for the message (11001). (10)

b) Define the following: (10)

i. Systematic and non-systematic codes.
ii. Hamming weight.
iii. Hamming distance.
iv. Rate of code.
v. Properties of Hamming code.

Q6) a) Draw and explain the block diagram of DSSS transmitter and receiver with coherent BPSK. Also draw relevant waveforms at various stages of the block diagram (10)

b) Draw the block diagram of MSK transmitter .Explain why MSK is called shaped QPSK. (10)
