[Time: - 3 Hours]   [Marks: 80]

N.B.:

1. Question No.1 is compulsory

2. Solve ANY THREE questions from Q2 to Q6

3. Assume suitable data wherever necessary and state it clearly.

Q.1.   Answer ANY FIVE
(a) An Analog Signal is band limited to 8 Hz sampled at Nyquist rate and Quantized
at 5 levels with probabilities 0·5, 0·125, 0·0625, 0·25 and 0·0625.
Calculate entropy and information.   **(4)**
(b)Explain with neat block diagram the Matched filter.   **(4)**
(c) What is optimum receiver? Explain in detail.   **(4)**
(d) Explain Lempel-Ziv Coding in detail   **(4)**
(e)What is EYE PATEERN? Explain its significance.   **(4)**
(f) Differentiate between Source Coding and Channel Coding.   **(4)**
(g) State and explain central limit theorem.   **(4)**
(h)State and explain Shannon's theorem.   **(4)**
(i)Why MSK is called shaped QPSK?   **(4)**

Q2. (a) A discrete memory less source has an alphabet of five symbols with the probabilities-

Symbol	S1	S2	S3	S4	S5
Probability	0.40	0.19	0.16	0.10	0.15

(I)Construct Huffman code

(II)Calculate code efficiency and the redundancy of the code.   **(10)**

(b) What is Pseudo-noise (PN) Sequence in spread spectrum technology? Why they are used in spread spectrum modulation system?   **(06)**

(c) State and explain Inter channel and Inter symbol interference   **(04)**

Q3.   (a) Show that for an input signal which is a sequence of rectangular positive and negative pulses, the integrator is the matched filter.   **(10)**

(b) Explain 4-ary PSK along with the following line:-   **(10)**

(I)Modulation and demodulation block diagram of offset QPSK.

(II) Plot the Power Spectral density with relevant frequencies and hence Bandwidth.

(III) Signal space representation hence Euclidian distance.

Q.4.   (a) Compare between slow frequency hopping and fast frequency hopping.Assume the data and PN sequence for the same.   **(10)**

(b) Define antijam characteristics of spread spectrum system. If the direct sequence spread spectrum system has the following parameters.   **(10)**

Data sequence bit duration Tb=6.125 ms

PN chip duration Tc=1.5 microseconds

The probability of error is less than 10^{-5} (Eb/No=10)

Turn Over

Then calculate processing gain and gain margin

Q.5. **(a) With the help of neat block diagram and waveform, explain how a message transmitted in BFSK? What type of receiver is used for BFSK reception?** **(10)**

(b) Prove that for the 16-ary QASK digital modulation technique, the Euclidean distance is given by:
d = 2 √ 0·4 Eb
Where Eb is normalized energy per bit also draw signal constellation diagram for 16-ary QPSK and Compare with 16-ary QASK. **(10)**

Q.6. **Answer ANY FOUR of the following**

(a) Explain significance of AWGN channel. **(5)**

(b)Explain Line codes and their desirable properties **(5)**
(c) Differentiate between BPSK, DPSK and DEPSK. **(5)**

(d)Define Hamming codes. Show that the Hamming Code corrects only single bit error. **(5)**

(e)Decoding of Convolutional codes using Viterbi algorithm **(5)**

(f) explain with suitable example the cyclic codes. **(5)**