(3 Hours) Marks: 80

N.B.

1) Question number ONE is compulsory.

2) Attempt any THREE questions from remaining questions.

3) All questions carry equal marks.

Q1

a) Show that the mean of the sum of random variables is the sum of the means of the random variables. 5

b) Compare QPSK and QASK 5

c) Explain Binary Symmetric Channel 5

d) Derive the condition for maximum entropy of a source. How does entropy vary with probability. 5

Q2 a) Draw the signal constellation for 16-QASK and hence find its Euclidean distance. Compare it with the Euclidean distance of 16-QPSK. 10

b) With reference to 8-PSK explain transmitter and receiver with neat block diagram along with mathematical expression for transmitted signal. Draw constellation diagram and find its Euclidian distance. 10

Q3 a) A discrete memory less source has an alphabet of five symbols with their probabilities a shown below:

Symbol	S1	S2	S3	S4	S5
Probability	0.4	0.19	0.15	0.15	0.11

i) Construct Huffman code for each symbol and determine the following parameters: Entropy, Average code word length, code efficiency and code redundancy.

ii) Determine the above parameters for Shannon-Fano code. 10

b) Explain FHSS giving appropriate diagrams. If the direct sequence spread spectrum system has the following parameters:
Data sequence bit duration, T_b=6.125ms, PN chip duration, Tc= 1.5μs, The probability of error is less than 10^{-5}; (E_b/N_0=10), then calculate the Processing gain and Jamming Margin. 10

Q4 a) Explain the necessity of line codes. State different types of line codes. Plot power spectral density of NRZ signal. 10

b) Explain Duo binary encoder-decoder with a neat sketch. What is significance of precoder in it? 10

Q5 a) Draw block diagram of BPSK transmitter and receiver and explain. Sketch signal space diagram and PSD of BPSK. 10

b) A (7, 4) cyclic code is generated using the polynomial $g(x)=(1+x+x^3)$. Find the code word if the data word is i) 0011, ii) 0100(MSB) by long division method. Draw the encoder and generate the code word for the same data tracing the path through the encoder. 10

Q6 Write short notes on following 20

a) AWGN Channel
b) Inter Symbol Interference
c) Eye Pattern
d) Matched Filter

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