Duration: 3hrs **[Max Marks:80]**

N.B. : (1) Question No 1 is Compulsory.
(2) Attempt any three questions out of the remaining five.
(3) All questions carry equal marks.
(4) Assume suitable data, if required and state it clearly.

1 Attempt any **FOUR** **[20]**

a What is the digital modulation? What are the types of digital modulation techniques? **05**

b Define the following terms and give their significance (i) MEAN (ii) Central Moment (iii) Variance (iv) Standard deviation. **05**

c Compare BASK, BFSK and BPSK. **05**

d Explain need of source coding and significance of information theory. **05**

e What is digital communication? Explain with block diagram. **05**

2 a For a linear block code (7,4) whose generator matrix is **[10]**

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

Determine the Parity matrix, H matrix, generate the codeword for 1101, and draw the encoder.

b Using block diagram explain Non- offset QPSK transmitter and receiver with bandwidth, waveform, and its spectral efficiency. **[10]**

3 a A DMS has six messages with its probabilities as given below: **[10]**

Msg	M1	M2	M3	M4	M5	M6
Prob	0.5	0.25	0.125	0.0625	0.03125	0.03125

Construct the Shannon-Fano code and find entropy and average code word length of code; also calculate the code efficiency and redundancy of the code.

b Write a short note on **[10]**

a) Systematic and Nonsystematic codes b) code rate

c) Hamming Distance d) Hamming weight

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4 a For a convolutional encoder, having L=3 and rate as 1/3, $g_1=X+X^2$, $g_2=1+X$, $g_3=1+X+X^3$ **[10]**

i) Encoder diagram.

ii) State diagram.

iii) Tree diagram.

b Represent the following bit sequence, 1011101001, using i) Unipolar RZ, ii) Unipolar NRZ, iii) Bipolar NRZ, iv) AMI RZ, v) Manchester **[10]**

5 a What ISI? Explain with eye pattern diagram also compare between ISI and ICI. **[10]**

b Explain the term matched filter and write a note on integrator and dump receiver. **[10]**

6 a A (7,4) cyclic code is described by a generator polynomial $g(x)= 1+X+ X^3$, find **[10]**

i) Codeword for m=1010 using the polynomial division method.

ii) Design an encoder for systematic code generation using shift registers

b Explain MSK modulation with waveform and compare with QPSK technique. **[10]**

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