

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

- 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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