**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 Define [05]

1.Entropy

2, Spectral efficiency

3. Code rate of block codes

b Explain the Concept of Inter symbol interference (ISI) and measures to reduce it. [05]

c State Shannon – Hartley channel capacity Theorem and discuss its Implications. [05]

d For the following bit sequence 110010 draw the waveforms for RZ unipolar, RZ Polar, NRZ polar, AMI, Manchester line coding techniques. [05]

e Compare block coding and convolutional coding technique [05]

2 a A (7,4) cyclic code with $g(x) = x^3 + x + 1$ [10]

i) Generate a systematic codeword for data 1100
ii) Verify result by encoder circuit and show how parity bits are generated for the data sequence 1100.
iii) Draw decoder for the same system

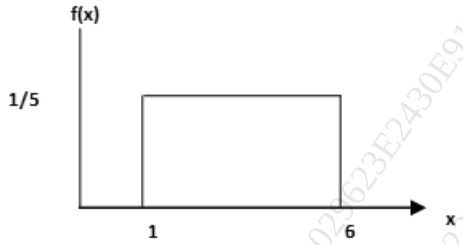
b Consider a DMS S= (S1, S2, S3, …., S7) with following message probability. [10]

| **Si** | **S1** | **S2** | **S3** | **S4** | **S5** | **S6** | **S7** |
|---|---|---|---|---|---|---|---|
| **P(Si)** | 0.40 | 0.25 | 0.15 | 0.10 | 0.05 | 0.03 | 0.02 |

Encode the source using Huffman algorithm. Find the average code length and efficiency.

3 a Explain working of duobinary encoder and decoder with proper diagram. What are the drawbacks of duobinary encoder. Generate coder output for binary data bit stream 00101. [10]

b [10]




A random variable is uniformly distributed over (1, 6).

1. Find and plot PDF and CDF.
2. Calculate mean, variance, standard deviation

a Mention needs of channel encoding [10]

Consider (6,3) linear Block code with generator matrix

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

i) Obtain all possible codewords
ii) Obtain dmin of above code
iii) Error detection and correction capability

b Describe MSK in detail with explaining how the drawbacks of QPSK have overcome using MSK ? [10]

5 a Derive the expression for the error probability for Integrator and Dump filter. [10]

b A (2,1,2) convolutional code is described by the generator sequence [10]
$g_1 = 1+D+D^2$ & $g_2 = 1+D^2$.
Obtain

i) State transition table
ii) State diagram
iii) Encode the message 10011

6 Write short note on any two [10]

1. QAM [10]
2. Matched filter and its probability of error.
3. M-ary PSK

**********