Q. P. Code : 38834

(3 Hours) **(Total Marks : 80**

N.B. 1. Question No 1 is compulsory.
2. Attempt any three questions out of remaining five.
3. All questions carry equal marks
4. Assume Suitable data, if required and state it clearly.

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

1 With a relevant block diagram, explain duobinary signalling scheme. Why is it called correlative coding? Write the output for bitstream 001100.

2 Compare offset and non-offset QPSK.

3 Derive the condition for maximum entropy of the source.

4 What are the different parameters which need to be examined before choosing a PCM waveform for a particular application?

5 Define code rate, Hamming distance and Hamming Weight in the context of linear block code. Also explain the properties of generator polynomial in cyclic code.

2 **a** A discrete memory less source emits eight messages S_0-S_7 with probabilities 0.35, 0.3, 0.15, 0.08, 0.05, 0.03, 0.03 and 0.01 respectively. **[10]**

i. Create a Huffman Tree for Huffman source coding Technique using minimum variance method.
ii. Tabulate the codeword and length of codewords for each source symbol
iii. Determine the average code word length and entropy
iv. Comment on the results obtained
v. Find Information rate if source emits messages at the rate of 4000 messages per second.

b Consider (3,1,2) convolution code with $g^{(1)}$ =101, $g^{(2)}$ = 110 and $g^{(3)}$ = 011 [10]

i. Draw the encoder for this code
ii. Draw the state transition diagram
iii. Using state transition diagram, find the codeword for the sequence 1101.
iv. Derive the code transfer function.

3 **a** Explain 16-ary PSK w.r.t. the following:- [10]

1. Modulator and
2. Demodulator
3. Power spectral density
4. Bandwidth.
5. Euclidean distance.

b Consider a (7,4) cyclic code generated by $g(x)= 1 + x^2 + x^3$. [10]
Design an encoder for systematic cyclic code generation using shift registers
Using encoder implemented in (i) and not otherwise, find the code word for message (1001).
Suppose the received vector is R = (0 0 1 0 1 1 0), find the syndrome using syndrome circuit.
Find out the generator matrix for the above cyclic code.

TURN OVER

4 **a** Why MSK is called 'shaped QPSK'? For the bit sequence, 1011010, draw the MSK waveform (Consider m=5) [10]

b Explain Direct sequence spread spectrum (DS-SS) with neat diagram. Explain processing gain and Jamming Margin with necessary expressions. [10]

5 **a** Consider a Systematic block code whose Parity check equations are: [10]

P1= m1 + m2 + m3 P2= m1 + m2 + m4

P3= m1 + m3 + m4 P4 = m2 + m3 + m4

where mi are message bits and Pi are parity check bits. In a codeword parity bits appear before message bits.

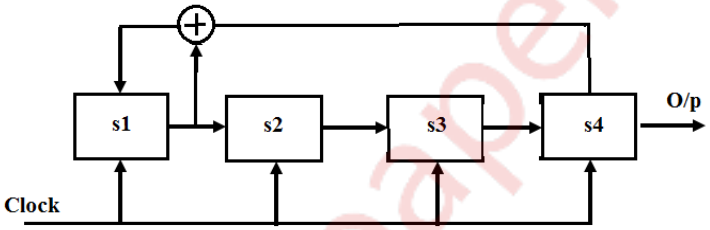
(i) Find Generator matrix (G) and Parity check matrix (H)

(ii) Find the codewords for the message vectors: 1001, 1101

(iii) How many errors can the code correct and detect?

(iv) If the received codeword is 10011101, decode the message.

b The following circuitary is used to generate PN sequence with initial content (Seed) as 1011. **[10]**



i. Write down the PN sequence.

ii. Verify the balance property of PN Sequence.

iii. Verify the Auto-correlation property of the PN sequence.

6 **a** a. What do you mean by eye diagram? What is its purpose? Draw the ideal eye pattern. Mention the various parameters observed from the eye pattern. Explain with help of suitable illustration. [10]

b What is matched Filter? State and explain maximum likelihood decision rule. Explain the function of correlator receiver. [10]