

QP CODE :587001

(3 hours)

Total marks : 100

- N.B. : 1) Question no. 1 is compulsory
 2) Attempt **any three** questions out of the remaining five questions
 3) Assume suitable data if required, stating them clearly.

Q.1 Answer the following questions:

- (a) What are the desirable properties of Line codes? explain.
 (b) Compare ISI with ICI.
 (c) Explain Shannon Hartley theorem on channel capacity
 (d) Distinguish between systematic and non-systematic codes

(20)

Q 2 (a) A discrete memory less source emits six messages with their probabilities as shown below:

(10)

Symbol	S1	S2	S3	S4	S5	S6
Probability	0.1	0.12	0.16	0.33	0.24	0.05

(i) Using Huffman Code , find the Entropy of the source. Obtain the compact binary code (ii) find the Average length of the Code, Code Efficiency and Code Redundancy

(10)

(b) Distinguish between Coherent and non coherent detection. Draw the block diagrams of coherent BFSK receiver and non coherent BFSK receiver. sketch its PSD

(10)

Q.3 (a) Compare the following: (any three)

(12)

- (i) OQPSK and MSK
 (ii) Duo-binary and Modified Duo binary encoding
 (iii) BFSK and BPSK
 (iv) Linear block code with Convolutional code

(b) Consider a (8,4) Systematic block code whose Parity check equations are:

$$C_5 = m_1 + m_2 + m_3$$

$$C_6 = m_2 + m_3 + m_4$$

$$C_7 = m_1 + m_3 + m_4$$

$$C_8 = m_1 + m_2 + m_4$$

(i) find 'G' and 'H' matrices

(ii) find the codewords for the msg vectors : 1011, 1101

(iii) construct the syndrome look-up table.

(iv) If the received codeword is 11011100, find the error vector from the look-up table and compute the corrected codeword.

(10)

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- Q.4 (a) With reference to Offset-QPSK, explain the following:
- transmitter and receiver with a neat block diagram along with mathematical expression for transmitted signal (12)
 - sketch its PSD indicating the bandwidth
 - draw its constellation diagram and find its Euclidian distance (8)
- (b) For a (7,4) cyclic code with generator Polynomial $g(x) = (1 + x^2 + x^3)$
- Find the systematic codeword for the message vectors: 1001, 1101 using long division method (8)
 - Find the syndrome, if the received codeword is 1101010 (8)
- Q.5 (a) Draw the signal constellation diagram for 16-ary QASK and determine the Euclidian distance for the same. (Take $d=2a$.) Compare it with that of 16-PSK. Which of them has better noise immunity? (8)
- (b) Explain the working of Duobinary encoder-decoder system with precoder. What are its drawbacks? How are they overcome? (8)
- Q.6 (a) Explain the need for Equalizer in digital transmission system. Explain tapped delay line Equalizer with a neat block diagram. (8)
- (b) For a convolutional encoder with code rate $1/3$ and constraint length 3 and generating Vectors $g_1 = (1\ 0\ 1)$, $g_2 = (1\ 1\ 0)$, $g_3 = (1\ 1\ 1)$ draw the encoder and Sketch its Trellis Diagram with minimum 4 stages. using this diagram, find the codeword for the input sequence 10101. Also Find its transfer function (12)
- Q.7 (a) Derive the expression for the Probability of error of Matched Filter (10)
- (b) write short notes on : (i) GMSK (ii) Eye pattern (10)