

- (b) A discrete memory less source has an alphabet of seven symbols with probabilities [0.4, 0.14, 0.16, 0.15, 0.05, 0.1]. Compute the Huffman code for this source symbols. Also determine average codeword length and efficiency.
12. (a) Explain DPCM system transmitter and receiver. Derive the expression for signal to noise ratio the system.

Or

- (b) (i) Explain the operating principle of Delta modulation. Also list its advantages. (7)
- (ii) Discuss the advantages of adaptive delta modulation. (6)
13. (a) State and Prove Nyquist criterion for distortion less base band binary transmission.

Or

- (b) Explain the principle of obtaining eye pattern and mark important observations made from the eye pattern.
14. (a) Explain the principle of operation of QAM transmitter and receiver with neat diagrams and mention its advantages.

Or

- (b) Construct and explain the generation and detection of coherent QPSK scheme with neat diagrams.
15. (a) Find the (7,4) systematic and non-systematic cyclic code words of the message word 1101. Assume the generator polynomial as $1 + x^2 + x^3$.

Or

- (b) (i) Consider the generator polynomial of the Convolutional encoder $g_1(x) = 1 + x^2$; and $g_2(x) = 1 + x$; $g_3(x) = 1 + x + x^2$. (5)
- (ii) Draw the structure of the convolutional encoder. (4)
- (iii) Determine the convolution code for the data sequence 10110. (4)

PART C — (1 × 15 = 15 marks)

16. (a) Consider a (6,3) systematic linear block code in which the three parity check digits are given as $c_4 = d_1 + d_2 + d_3$; $c_5 = d_1 + d_2$; $c_6 = d_1 + d_3$.
- (i) Construct the appropriate generator matrix for this code. (3)
- (ii) Construct all possible code Words generated by this matrix. (4)
- (iii) Determine the error correcting capability of this code. (4)
- (iv) Prepare a suitable decoding table and decode the following received codes 101100, 100110. (4)

Or

- (b) The input source to a noisy communication channel is a random variable X over the four symbols a, b, c, d . The output from this channel is a random variable Y over these same four symbols. The joint distribution of these two random variables $p(X, Y)$ is as follows:

$$p(X, Y) = \begin{bmatrix} 0.125 & 0.0625 & 0.0625 & 0.25 \\ 0.0625 & 0.125 & 0.0625 & 0 \\ 0.03125 & 0.03125 & 0.0625 & 0 \\ 0.03125 & 0.03125 & 0.0625 & 0 \end{bmatrix}$$

Find the Entropy $H(X)$, $H(Y)$, $H(Y/X)$ and $H(X/Y)$.

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