Total No. of Questions :8]

SEAT No. :

P1732

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[5058]-366

T.E. (Electronics and Telecommunication Engineering)
INFORMATION THEORY AND CODING TECHNIQUE
(2012 Course) (Semester - II) (304189)

Time : 2½ Hours] *[Max. Marks :70*

Instructions to the candidates:

1) ***Answer Q1 or Q2, Q3 or Q4, Q5 or Q6 and Q7 or Q8.***
2) ***Figures to the right side indicate full marks.***
3) ***Use of calculator is allowed.***
4) ***Assume suitable data if necessary.***

Q1) a) A discrete source emits messages X_1 & X_2 with probabilities $\frac{3}{4}$ & $\frac{1}{4}$ with BSC, Find H(X), H(Y), H(X,Y), H(X/Y), I(X;Y). **[7]**

b) Obtain the coding efficiency of a Shannon Fano and huffman code for a zero memory source that emits six messages (G, N, H, A, E, S) with probabilities of {0.19, 0.15, 0.02, 0.16, 0.4, 0.08} respectively. **[8]**

c) Determine Lempel-Ziv code for the following bit stream 0100 1111 1001 10000010101 0110 0110 000. **[5]**

OR

Q2) a) For a systematic Linear Block code, the three parity check digits C_4, C_5, C_6 are given $C_4 = d_1 + d_2 + d_3$ $C_5 = d_1 + d_2$ and $C_6 = d_1 + d_3$ **[6]**

i) Construct Generator matrix

ii) Determine error correcting capability

iii) Prepare a suitable decoding table

Decode the received words 101100 and 000110.

b) Construct a systematic (7, 4) cyclic code using generator polynomial $g(X) = X^3 + X + 1$. Construct the decoding table for the received code word 1 1 0 1 1 0 0, determine the transmitted data word. **[7]**

c) Explain any two properties of mutual information and show that Shannon's limit for AWGN Channel is -1.6dB. **[7]**

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Q3) a) Obtain generator polynomials and specifications for BCH code with block length n=15 & error correcting capability t_c = 1,2,3. **[8]**

b) Explain the following terms with the help of equations **[6]**

i) Primitive Polynomial

ii) Minimal Polynomial

iii) Generator Polynomial

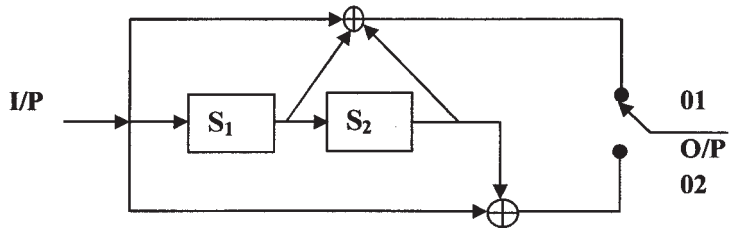
c) Differentiate between BCH and RS codes. **[4]**

OR

Q4) a) Consider the BCH (15,5) triple error correcting code has the following generator polynomial $g(x) = x^{10}+x^8+x^5+x^4+x^2+x+1$ Find the errors using Gorenstein-Zierler algorithm in received polynomial $x^9+x^6+x^5+x^4$. **[10]**

b) Explain the applications of RS codes and CRC code. **[8]**

Q5) a) A convolution encoder has code rate =½ constraint length K=3 as shown in Figure below. Draw the trellis diagram. By using Viterbi algorithm decode the sequence 010001000. **[8]**



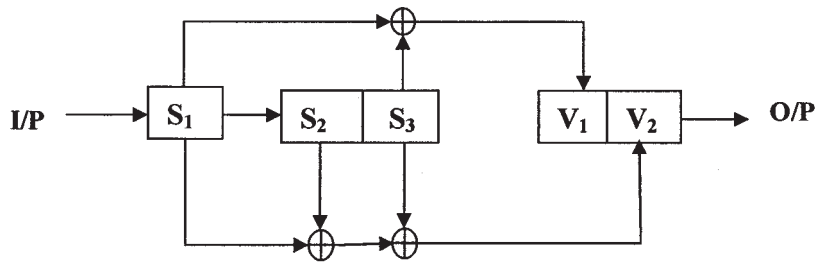
b) A convolutional encoder is rate 1/3, constraint length K =4 $g^1 = 1+D+D^2+D3$, $g^2 = 1+D2+D3$, $g^3 = 1+ D +D3$.

i) Obtain State Table.

ii) Draw the state diagram. **[8]**

OR

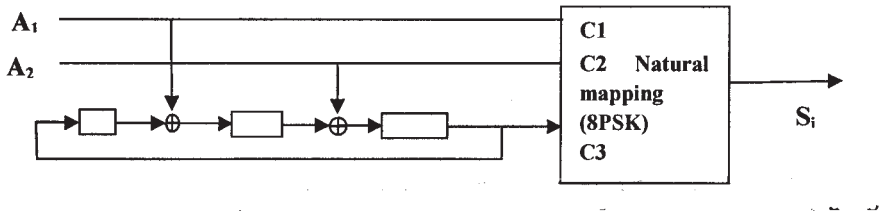
Q6) a) For the convolution encoder shown in figure below. Sketch the state diagrams, Code Tree and trellis diagram. Find the output data sequence 10011. **[10]**



b) Explain FEC and ARQ systems. **[6]**

Q7) a) What are the Ungerboek's TCM design rules. Explain asymptotic coding gain. **[6]**

b) Consider the 8 state, 8 PSK. TCM scheme as shown below. **[10]**



i) Draw trellis diagram

ii) Find d_{free} and Asymptotic coding gain and comment on it.

OR

Q8) a) What are turbo codes? Explain necessity of Inter-leaver in turbo codes? **[6]**

b) Explain Euclidean distance, Asymptotic coding gain of trellis coded Modulation. **[4]**

c) Discuss the importance of Trellis Coded Modulation with the block diagram of Communication System. **[6]**

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