[4459] – 186

Seat No.	

T.E. (Electronics & Telecommunication) Examination, 2013
SIGNAL CODING & ESTIMATION THEORY (304187)
(2008 Pattern)

Time : 3 Hours] [Max. Marks : 100

Instructions: *1) Answer **three** questions from Section-I & **three** questions from Section-**II**.*
*2) Answers to the **two** sections should be written in separate answer books.*
*3) Neat diagrams must be drawn **wherever** necessary.*
4) Assume suitable data if necessary.
5) Use electronic pocket calculator is allowed.
*6) Figures to the **right** indicate **full** marks.*

SECTION – I

1. a) Why Huffman encoding process is not unique. Explain with suitable examples. [10]

   b) A zero memory source emits six messages X_1, X_2, X_3, X_4, X_5, X_6 with probabilities

   0.3, 0.1, 0.02, 0.15, 0.4, 0.03 respectively.

   i) Calculate entropy of source.

   ii) Determine Shannon fano code and calculate efficiency. [8]

   OR

2. a) Explain lossless deterministic and Binary symmetric channel with channel diagram and calculate capacity of each channel. [12]

   b) Find Mutual information for the channel matrix given below.

$$P(X,Y) = \begin{bmatrix} 0.3 & 0.05 & 0 \\ 0 & 0.25 & 0 \\ 0 & 0.15 & 0.05 \\ 0 & 0.05 & 0.15 \end{bmatrix}$$ [6]

P.T.O.

3. a) Explain Rate Distortion theory and rate distortion function [8]

b) The parity check matrix of a (7, 4) Hamming code is given as follows :

$$H = \begin{bmatrix} 1110100 \\ 0111010 \\ 1101001 \end{bmatrix}$$

1) Find generator Matrix.

2) Find out all possible codewords.

3) Determine error correcting cabability. [8]

OR

4. a) Construct a systematic (7,4) cyclic code using the generator polynomial $g(x)= x^3+x+1$.
What are the error correcting capabilities of this code? Construct the decoding table and for the received codeword 1101100,determine the transmitted data word. [10]

b) Explain sphere packing problem. [6]

5. a) A convolution encoder is rate 1/3 and constraint length K=4

$g^1= 1+D+D^2+D^3$

$g^2=1+D^2+D^3$

$g^3=1+D+D^3$

i) Draw Encoder diagram

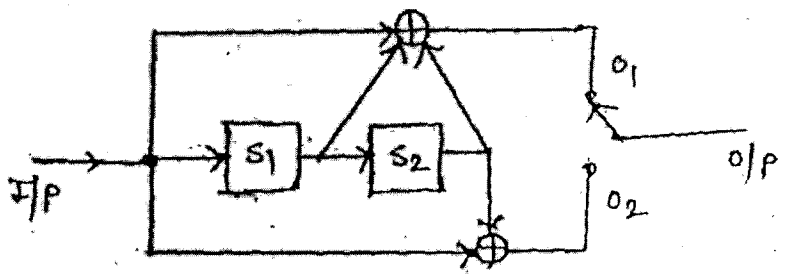
ii) Draw state diagram

iii) Find out the output for message input of 10011. [12]

b) Explain ARQ system [4]

OR

6. a) For the convolution encoder with constraint length of 3 and rate $\frac{1}{2}$ as shown in Fig. Draw the state diagram and trellis diagram. By using viterbi algorithm decode the sequence 010001000. [10]



b) Explain Euclidean distance, Asymptotic coding gain of Trellis coded Modulation [6]

SECTION – II

7. a) Consider the BCH (15,5) triple error correcting code with the generator polynomial $g(x)=x^{10}+x^8+x^5+x^4+x^2+x+1$. Find the error using Gorenstein Zierler algorithm in receiverd polynomial x^6+x^4. [10]

b) Explain Monoalphabetic and Polyalphabetic substitution Cipher. [8]

8. a) Design a (15,9) RS code. Find systematic code whose message polynomial is given as $\alpha^2 x^2+1$. [10]

b) Explain JPEG compression standards and its application. [8]

OR

9. a) Explain Recursive Least square estimation [8]

b) Suppose that three measurements of signal $S_k=\theta \exp(k/2)$, where θ is the parameter to be Estimated, are given by $y_1=1.5$, $y_2=3$ and $y_3=5$. Find the least square estimate of θ. [8]

OR

10. a) State and explain Cramer-Rao Inequality for a Random Parameter. [8]

b) Explain best linear unbiased Estimation. [8]

11. a) Derive the expression for minimax cost. [8]

b) What is Bayes criteria. Derive the expression for Bayes decision rule. Under what condition Bayes criteria reduces to LRT and MAP. [8]

OR

12. a) Explain how decision rule is framed in case of multiple hypothesis tests. [8]

b) For a binary decision problem the PDF s are given as $p(y/H_0)=1/2e^{-|y|}$ and $p(y/H_1)=e^{-|2y|}$. The costs associated with decision are $C_{00}=C_{11}=0$ and $C_{01}=1, C_{10}=2$ and $P(H_1)=0.75$.
Determine the Bayes decision rule. [8]
