

Total No. of Questions : 8]

SEAT No. :

P 3283

[Total No. of Pages : 3

[5353] - 156

T.E. (Electronics and Telecommunication Engineering)
INFORMATION THEORY AND CODING TECHNIQUES
(2012 Pattern) (Semester - II)

Time : 2½ Hours]

[Max. Marks :70

Instructions to the candidates:

- 1) *Answer Q.1 or Q.2, Q.3 or Q.4, Q.5 or Q.6 and Q.7 or Q.8.*
- 2) *Figures to the right side indicate full marks.*
- 3) *Use of calculator is allowed.*
- 4) *Assume suitable data if necessary.*

- Q1)** a) For following terms in information theory, state and explain mathematical expression and two properties. [6]
- i) Entropy
 - ii) Mutual information.
- b) Explain JPEG image encoder and decoder [6]
- c) Explain with example, significance of d_{\min} for error detecting and correcting capability of LBC [6]

OR

- Q2)** a) Compute and compare average code word length, coding efficiency and variance for following symbols using Huffman and Shannon fano method of source coding [0.4, 0.35, 0.09, 0.16]. [7]
- b) For a (6, 3) systematic LBC, three parity bits given as, [7]
- $$C_4 = d_1 + d_2, C_5 = d_2 + d_3, C_6 = d_1 + d_3.$$
- i) Determine generator matrix
 - ii) Construct code generated by this matrix
 - iii) Determine error capacity of the code
 - iv) Prepare syndrome decoding table.
- c) Write Short Note on Golay code and single parity check code [4]

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- Q3)** a) What are properties of finite field, explain any three property in detail [6]
- b) For generating Polynomial $g(x) = 1 + x + x^3$. prepare generator matrix for (7,4) cyclic code. [6]
- c) Explain with suitable example, circuit implementation of cyclic code [6]

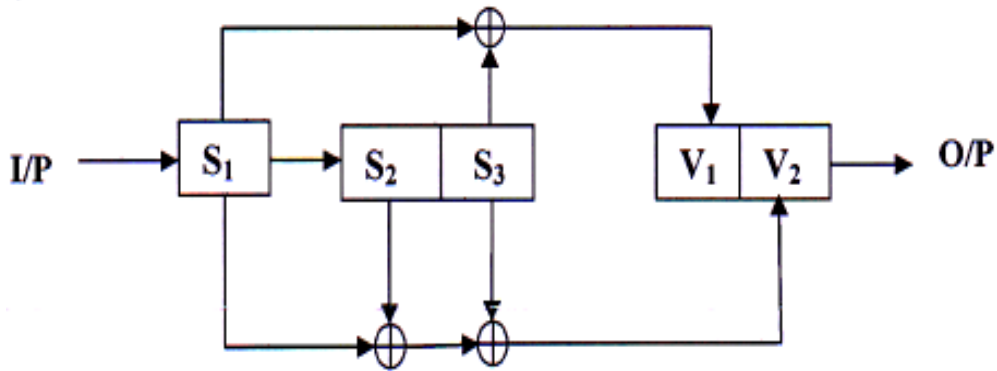
OR

- Q4)** a) Find All elements of GF(8) with primitive polynomial and hence compute minimal polynomial for $\alpha^2 + \alpha + 1$ [6]
- b) Explain Minimal Polynomial and Generating Polynomial [6]
- c) Explain in detail [6]
- i) FEC
- ii) ARQ

- Q5)** a) Explain with suitable example i) State Diagram ii) Code Tree iii) Trellis Diagram iv) d_{free} [8]
- b) With help of suitable convolution encoder diagram, state diagram and trellis diagram, explain Viterbi Decoding Algorithm in the Convolution Coding. [9]

OR

- Q6)** a) A convolution encoder has code rate $1/3$, constraint length $K=4$
 $g^1 = 1 + D + D^2 + D^3$, $g^2 = 1 + D^2 + D^3$, $g^3 = 1 + D + D^3$. [9]
- i) Obtain State Table
- ii) Draw the state diagram
- iii) Trellis diagram.
- b) For the convolution encoder shown in figure below. Sketch the state diagrams, Code Tree and trellis diagram. Find the output data sequence 10011. [8]



- Q7)** a) Write short notes on power and Bandwidth efficiency of TCM [6]
 b) Write short notes on Shannon Hartley Theorem [6]
 c) Explain with neat diagram, necessity of interleaver in turbo codes? [5]

OR

- Q8)** a) Explain the role of a Communication System Designer. What are the implications of Error Probability Plan and BW Efficiency Plan? [7]
 b) Explain Euclidean distance, Asymptotic coding gain of trellis coded Modulation [4]
 c) Explain with suitable example [6]
 i) TURBO codes,
 ii) LDPC

