Total No. of Questions : 8]

SEAT No. :

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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

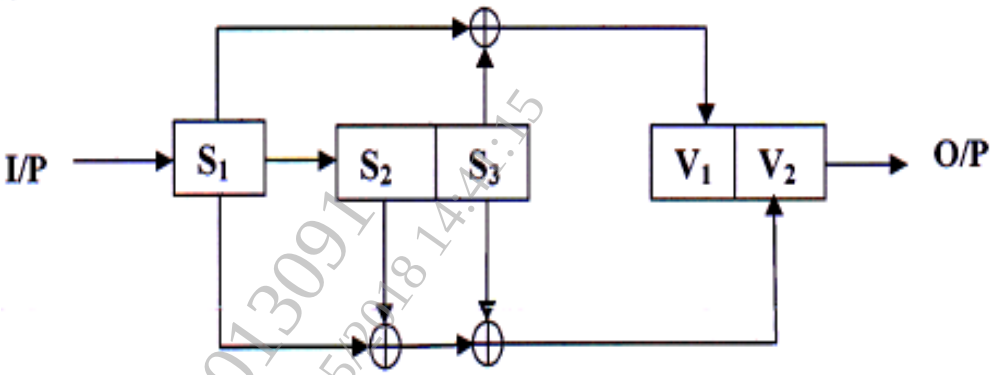
$g^1 = 1 + D + D^2 + D^3$, $g^2 = 1 + D^2 + D^3$, $g^3 = 1 + D + D^3$. **[9]**

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

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