

Total No. of Question : [4]

Registration No. :

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Programme Name : Bachelor of Electronics and Telecommunication Engineering
Regular T.Y.B.Tech. ESE (A.Y. 2023-24) Sem.V Nov.2023
V SEMESTER (2021 BATCH)
201ETL302-Information Theory & Coding

Duration : [11:00 AM - 01:00 PM]

Date : 22 Nov, 2023

Day : Wednesday

Marks : 50

Instructions :

(Q1) All questions are compulsory [20.0]

(1.1) What is Joint & Conditional entropy? Derive relation between them [6.0]

CO :- 302.1

Blooms Taxonomy :- Remember, Understand, Apply, Analyze

(1.2) Using Huffman's coding for the following message ensemble : [7.0]

$[X] = [X_1 X_2 X_3 X_4 X_5 X_6 X_7]$

$P[X] = [0.45 \ 0.15 \ 0.1 \ 0.1 \ 0.08 \ 0.08 \ 0.04]$

Determine entropy, average length of coded message and coding efficiency.

CO :- 302.2

Blooms Taxonomy :- Remember, Understand, Apply, Analyze, Evaluate

(1.3) An error control code has following parity check matrix [7.0]

$$H = \begin{bmatrix} 1 & 0 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

Determine:

- i) Find G matrix. ii) List of all code vector.
- iii) Min. distance & error correction capability
- iv) Decode the received codeword 110110.

CO :- 302.3

Blooms Taxonomy :- Remember, Understand, Apply, Analyze

(Q2) All Questions are compulsory [10.0]

(2.1) What is cyclic redundancy check code? [4.0]

CO :- 302.2

Blooms Taxonomy :- Remember, Understand, Apply, Analyze, Evaluate

(2.2) For (7, 4) cyclic code, the generator polynomial $g(x) = 1 + x^2 + x^3$. Determine the code [6.0]

vector for the message vector using systematic method.

CO :- 302.2, 302.3

Blooms Taxonomy :- Remember, Understand, Apply, Analyze, Evaluate

OR [2.2 / 2.3]

- (2.3) Design an encoder & syndrome calculator by (7, 4) cyclic code using $g(x)=x^3+x+1$. [6.0]
Verify its operation using the message vector (1101). Also prepare decoding table for 0000010. [3.0]

CO :- 302.3

Blooms Taxonomy :- Remember, Understand, Apply, Analyze

(Q3) All Questions are compulsory [10.0]

- (3.1) Write short on Characteristics of RS code. [3.0]

CO :- 302.4

Blooms Taxonomy :- Remember, Understand, Apply, Analyze, Evaluate, Create

- (3.2) Find the various primitive elements of GF(7) [7.0]

CO :- 302.3

Blooms Taxonomy :- Remember, Understand, Apply, Analyze

OR [3.2 / 3.3]

- (3.3) Determine the generator polynomial, code polynomial & code for (7, 3) RS double error correcting code for the message vector $(\alpha^2, \alpha^3, \alpha^4)$ using systematic method. [7.0]

CO :- 302.2, 302.3

Blooms Taxonomy :- Remember, Understand, Apply, Analyze, Evaluate

(Q4) Attempt any two out of three questions [10.0]

- (4.1) Write short note on Maximum likelihood decoding. [5.0]

CO :- 302.1

Blooms Taxonomy :- Remember, Understand, Apply, Analyze

- (4.2) State the difference between code tree & code trellis in convolution code. [5.0]

CO :- 302.3

Blooms Taxonomy :- Remember, Understand, Apply, Analyze

- (4.3) A convolution encoder using three shift register and $r=1/2$ has two generating vector as: [5.0]

$g_1=[1 \ 1 \ 1]$ and $g_2=[0 \ 1 \ 1]$

- i) Sketch the encoder configuration
- ii) Determine the generator matrix
- iii) If the message sequence is (1 0 1 1), determine the output sequence of the encoder.

CO :- 302.4
