

9. What are the parameters to be considered for finding performance of a code? Discuss with respect to linear block codes in details. 20

22662- (P-4)/(O-9)/(22) (4)

Roll No. _____

22662

M.Tech. 1st Semester (ECE) CBCS Scheme
Examination – February, 2022
INFORMATION AND COMMUNICATION THEORY

Paper : MTECE103

Time : Three hours] [Maximum Marks : 100

Before answering the questions, candidates should ensure that they have been supplied the correct and complete question paper. No complaint in this regard, will be entertained after examination.

Note : Attempt five questions in all, selecting one question from each Unit. Question No. 1 is compulsory. All question carry equal marks.

1. (a) Enumerate difference between Mutual and Joint information.
- (b) Give out importance of channel coding. How it differ from source coding?
- (c) Enumerate salient features of BCH codes.
- (d) What do you mean by incurable error? $5 \times 4 = 20$

UNIT - 1

2. (a) What is entropy? Explain various properties of entropy. 10

22662-500 (P-4)/(O-9)/(22)

P. T. O.

(c) A channel is described by the following channel matrix:

$$P(Y/X) = \begin{bmatrix} 0.5 & 0.5 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

- (i) Draw the channel diagram.
 (ii) Find the channel capacity.

2. (a) Explain the measurement of mutual information and derive the expression for channel capacity. 10
 (b) A discrete source emits one of the eight symbols (over every millisecond) with probabilities $1/8, 1/8, 3/8, 3/8, 4/8, 5/8, 7/8$ and $7/8$ respectively. Determine the source entropy and information rate. 10

UNIT - II

4. (a) Examine source encoding in details along with the basic properties of codes. 10
 (b) Apply the Shannon-Fano encoding procedure to the following DMSX:
 $X = \{a, x, y, z, w, v, u, t\}$
 $P = \{1/8, 1/6, 1/5, 1/12, 1/12, 1/12, 1/12\}$
5. (a) What is the purpose of the Hamming code? How can we use the Hamming code to correct a burst error? 10

(b) What do you understand by Rate distortion function? Discuss in details. 10

UNIT - III

6. (a) Draw the encoder circuit for an (6, 3) linear systematic block code. 10
 (b) For the (7, 4) linear block code, consider $t = 1011010$ be the received vector at the receiver. Calculate the syndrome and then determine the error vector (i). 10

7. (a) Explain encoding and decoding procedure of BCH codes. 10
 (b) For the (6, 3) block code with generator matrix:

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

Find the corresponding code words for all possible data words.

UNIT - IV

8. Write short notes on:
 (a) Performance of convolutional codes. 10 x 2 = 20
 (b) Error probability Upper and Lower bounds.