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333612(33)

B. E. (Sixth Semester) Examination,
April - May 2021

(Old Scheme)

(IT Branch)

INFORMATION THEORY & CODING

Time Allowed : Three hours

Maximum Marks : 80

Minimum Pass Marks : 28

Note : *(i)* *Part (a) of each question is compulsory.*
Attempt any two parts from (b), (c) and (d).

(ii) *The figures in right-hand margin indicate marks.*

Unit-I

1. (a) Define Uncertainty and Information with example.   2

   (b) A code is composed of dots & dashes. Assume that

the dash is 3 times as long as the dot and has one third the probability of occurence :

(i) Calculate the information in dot and that in dash.

(ii) Calculate the average information in a dot-dash code.

(iii) Assume that a dot lasts for 10 m sec and that this some interval is allowed between symbols. Calculate the average rate of information transmission.   7

(c) For the given channel matrix, find out the mutual information. Given that $P(x_1) = 0.6$, $P(x_2) = 0.3$ and $P(x_3) = 0.1$ 7

$$P\left(\frac{y}{x}\right) = \begin{matrix} & y_1 & y_2 & y_3 \\ x_1 & \begin{bmatrix} 1/2 & 1/2 & 0 \\ 1/2 & 0 & 1/2 \\ 0 & 1/2 & 1/2 \end{bmatrix} \\ x_2 \\ x_3 \end{matrix}$$

(d) Show that the channel capacity of a ideal channel with infinite bandwidth is   7

$$C_\infty = 1 \cdot 44 \frac{S}{\eta} \text{ bit/sec}$$

Unit-II

2. (a) Define Code Rate.   2

(b) A discrete memoryless source has an alphabet of 7 symbols with their probability described in the table. Compute the Huffman coding for this source and calculate code efficiency.   7

S_1	S_2	S_3	S_4	S_5	S_6	S_7
0.25	0.25	0.125	0.125	0.125	0.0625	0.0625

Take M = 2

(c) Given a (7, 4) linear block code whose generator matrix is given by

$$G = \begin{bmatrix} 1 & 0 & 0 & 0 & 1 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 1 & 0 & 1 & 1 \end{bmatrix}$$ 7

(i) Find code words for message 0101.

(ii) Find parity check matrix.

(d) For (7, 4) block code whose generator matrix is given.   7

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

Find the corrected code words for if the received code word is 1000110

Unit-III

3. (a) Define run length coding.   2

(b) Explain lossless and lossy compression with example?   7

(c) Explain CC177 group 310 compression. Also explain the application of makeup code and terminating code.   7

(d) Explain CC177 group 320 compression with advantage and disadvantage? Also explain the function of vertical code, pass code & horizontal code.   7

Unit-IV

4. (a) What is CC177?   2

(b) Explain MPEG compression methodology with example.   7

(c) Write short note on Video Image Compression.   7

(d) Explain Audio (speech) compression in detail.   7

Unit-V

5. (a) What is digital signature?   2

(b) Explain Rivest - shamin Adelman (R-S-A) system for public key cryptography.   7

(c) Write short note on :   7

(i) Single Key cryptography.

(ii) Two key (public key) cryptography

(d) Explain DES Algorithm with diagram.   7