B. TECH. SEM -VI (E & TC ENGG.) (2014 COURSE) (CBCS) : SUMMER - 2018

SUBJECT : INFORMATION THEORY & CODING

Day : **Monday** | **S-2018-2461** | Time : **02.30 PM TO 05.30 PM**

Date : **11/06/2018** | Max. Marks : 60

N.B.:

1) All questions are **COMPULSORY**.
2) Figures to the right indicate **FULL** marks.
3) Use of non-programmable **CALCULATOR** is allowed.
4) Assume suitable data if necessary.

Q.1 Apply Shannon-fano coding for the following message. Find coding efficiency and determine the entropy of the source. **[10]**

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

OR

Apply Huffman's coding for the following message. **[10]**

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

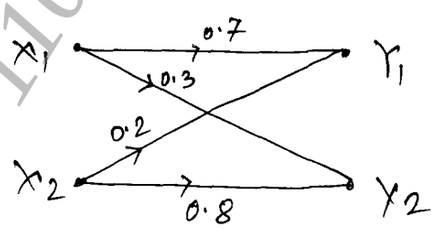
Determine the entropy of the source average length, find the coding efficiency.

Q.2 **a)** What do you mean by Joint and Conditional entropy? Derive relation between them. **[06]**

b) Properties of Mutual Information. **[04]**

OR

Find channel capacity and mutual information of the channel shown in figure. The source symbol probabilities are: **i)** $P(X_1) = 0.4$ **ii)** $P(X_2) = 0.6$. **[10]**



Q.3 **a)** Explain channel coding theorem. **[05]**

b) Write short note on : Gaussian Distribution. **[05]**

OR

P.T.O.

Derive an expression for channel capacity of binary erasure channel whose channel matrix is given by **[10]**

$$P(Y/X) = \begin{bmatrix} (1-p) & p & 0 \\ 0 & p & (1-p) \end{bmatrix}$$. Also draw channel diagram.

Q.4 Consider a (6, 3) linear block code whose generator matrix is given by **[10]**

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

a) Find all code vectors.
b) Find parity check matrix.
c) Error detecting and correcting capabilities of code.

OR

Consider a (7, 4) linear block code the generator matrix is given by: **[10]**

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

a) Find all code vectors.
b) Find parity check matrix.
c) Determine error detecting and correcting capabilities of code.

Q.5 Design an encoder and syndrome calculator for the (7, 4) cyclic code generated by $g(x) = x^3 + x + 1$. Verify its operation using the message vector (0 1 0 1). **[10]**

OR

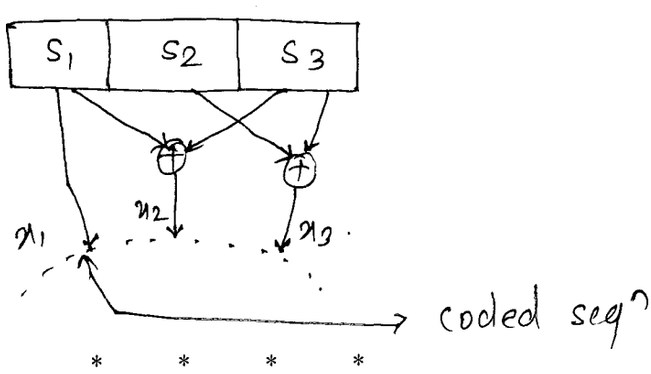
a) Explain BCH code and R.S. code. **[05]**

b) Explain R.S. code **[05]**

Q.6 Write short note on: **[10]**
a) Code tree
b) Trellis diagram

OR

For the convolutional encoder arrangement shown in figure. Draw the state and trellis diagram. Determine out digit sequence for the data digits [11010100]. **[10]**



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