

**M.Tech 1st Semester (ECE) CBCS Scheme
Examination, December-2017**

INFORMATION & COMMUNICATION THEORY

Paper-MTECE 21C3

Time allowed : 3 hours]

[Maximum marks : 100

Note : Attempt any five questions in total. All questions carry equal marks.

1. (a) How entropy is calculated ? Explain various properties of entropy. 10
- (b) A channel is described by the following channel matrix : 10

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

- (i) Draw the channel diagram.
 - (ii) Find the channel capacity
2. (a) Explain the measurement of mutual information and also derive the expression for channel capacity. 10
 - (b) A discrete source emits one of the eight symbols once every millisecond with probabilities $1/8, 2/8, 3/8, 3/8, 5/8, 6/8, 7/8$ and $7/8$ respectively. Determine the source entropy and information rate. 10

3. (a) Examine source encoding in detail along with the basic properties of codes. 10
- (b) Apply the Shannon-Fano encoding procedure to the following DMS X: 10
- $$[X] = [x_1, x_2, x_3, x_4, x_5, x_6, x_7]$$
- $$[P] = [1/3, 1/6, 1/5, 1/12, 1/12, 1/12, 1/12]$$
4. (a) What is the purpose of the Hamming code ? How can we use the Hamming code to correct a burst error ? 10
- (b) Find checksum for the following bit sequence. Assume a 16 bit sequence size : 10
- (i) 1001001110010011
- (ii) 1001100001001101
5. (a) Draw the encoder circuit for an (n,k) linear systematic block code. 10
- (b) For the (7,4) linear block code, consider $r = 1011010$ be the received vector at the receiver. Calculate the syndrome and then determine the error vector r. 10
6. (a) Explain Burst error correcting block codes with suitable diagram. 10

- (b) For the (6,3) block code with generator matrix : 10

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

Find the corresponding code words for all possible data words.

7. Explain encoding and decoding procedure of BCH codes. How syndrome computation can be utilized for the BCH codes ? Explain with suitable example. 20
8. Write short notes on : 10×2=20
- (a) Performance of convolutional codes.
- (b) Error probability Upper and Lower bounds.