

8. Discuss the following any four) :  $4 \times 5 = 20$
- (a) BCH code,
  - (b) Continuous error correction,
  - (c) MDS code,
  - (d) Redundancy,
  - (e) Code incurable error probability,
  - (f) Optimum code.

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**22144**

**M. E. 1st Sem. (Electronics & Communication Engg.)**

**Examination – January, 2016**

**INFORMATION & COMMUNICATION THEORY**

Paper : MEEC – 505

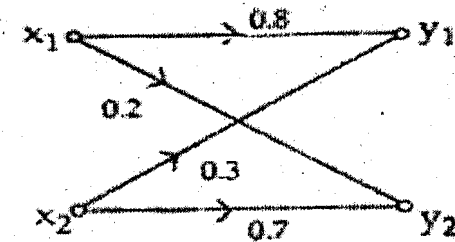
*Time : Three Hours ]*

*[ 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 : All questions carry equal marks. Attempt any five questions.*

1. Find the mutual information and channel capacity of the channel as shown in Figure. Give  $P(x_1) = 0.4$  &  $P(x_2) = 0.4$  : 20



2. (a) Show that {01, 01, 1110, 1111, 0011, 0001} cannot be a probability distribution. 10

(b) Prove that:  $I(X; YZ) = I(X; Z/Y) + I(X; W/ZY)$  10

3. A source has an alphabet {a1, a2, a3, a4} with probabilities (0.1, 0.2, 0.3, 0.4).

(a) Find the entropy of the source.

(b) What is the minimum word length to reconstruct this source for error-free reconstruction?

(c) Design a Huffman code for the source and compare the average length of the Huffman code with the entropy of the source. 20

4. A (15, 5) linear cyclic code has a generator polynomial,

$$G(p) = p^{10} + p^5 + p^4 + p^2 + p + 1.$$

(a) Draw the block diagram of an encoder and decoder for this code.

(b) Find the code polynomial for the message polynomial  $M(p) = p^2 + 1$  in systematic form. 20

5. (A) The parity check matrix of a (7, 4) Hamming code is given as follows:

$$H = \begin{bmatrix} 1 & 1 & 1 & 0 & 1 & 0 & 0 \\ 0 & 1 & 1 & 1 & 0 & 1 & 0 \\ 1 & 1 & 0 & 1 & 0 & 0 & 1 \end{bmatrix}_{3 \times 7}$$

Calculate the syndrome vector for single bit errors.

(B) Discuss the followings:

(a) Justen codes,

(b) Idempotent and Mattson Solomon polynomials. 8

6. Discuss the Vertical Redundancy Check (VRC) & Longitudinal Redundancy Check (LRC) used in parity coding. Also discuss the advantages of LRC over VRC. Discuss the drawback of LRC. 20

7. Explain the following terms: 20

(a) Hamming distance,

(b) Hamming bound,

(c) Code rate,

(d) Free distance,

(e) Coding gain,

(f) Code efficiency.