Total No. of Questions : 8] *[Total No. of Printed Pages : 2*

Roll No .....

MEDC-301(A)

M.E./M.Tech., III Semester

Examination, December 2016

Information Theory and Coding (Elective-I)

Time : Three Hours

Maximum Marks: 70

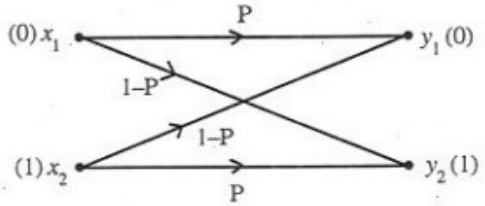
Note : i) Attempt any five questions.
ii) All questions carry equal marks.

1. a) What is entropy? Show that the entropy is maximum when all the symbols are equi-probable. 7
   b) Enlist and explain the important properties of entropy. 7

2. a) Apply Huffman coding for the following message ensemble and generate code words. 7

$[x] = [x_1 \quad x_2 \quad x_3 \quad x_4 \quad x_5 \quad x_6 \quad x_7]$
$[p] = [0.4 \quad 0.2 \quad .12 \quad .08 \quad .08 \quad .08 \quad .04]$

   b) What is Binary Symmetric Channel (BSC)? Find the channel capacity for
      i) P = 0.9 and
      ii) P = 0.6 in the following figure 7



3. a) Write and explain Shannon's theorem on channel capacity. 7
   b) What is mutual information? Write its properties. 7

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4. a) What are Block codes? Explain parity check code. 7
   b) What is Hamming distance? Explain how error detection and correction depends on Hamming distance. 7

5. a) What is linear block code? Explain systematic linear block code. 7
   b) The generator matrix for a (6, 3) block code is given below. Find all code vectors 7

$$G = \left[\begin{array}{ccc:ccc} 1 & 0 & 0 & 1 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 1 & 1 \end{array}\right]$$

6. a) What is cyclic code? How it differs from linear block codes. 7
   b) The generator polynomial of a (7, 4) cyclic code is $g(x) = 1 + x + x^3$. Find the 16 code words of this code. 7

7. a) Draw and explain encoder for convolution code. 7
   b) Write and explain viterbi algorithm for maximum likelihood decoding. 7

8. Write short notes (Any two) 14
   a) Lempel-Ziv coding
   b) Fading channel
   c) Galois field and its properties
   d) BCH codes

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