Total No. of Questions : 8] *[Total No. of Printed Pages : 3*

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MEMT-203

M.E./M.Tech., II Semester

Examination, June 2017

Information Theory and Coding

Time : Three Hours

Maximum Marks : 70

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

1. a) A source produces symbols A, B, C with equal probabilities at a rate of 100/sec. Due to noise on the channel, the probabilities of correct repetition of the various symbols are as shown in table. Determine the rate at which information is being transmitted.

		y_j		
	P	A	B	C
x_i	A	3/4	1/4	0
	B	1/4	1/2	1/4
	C	0	1/4	3/4

b) For the entropy of a zero memory source, prove the extremal property.

2. a) The output of a DMS consist of letters x_1, x_2, x_3 with probabilities 0.45, 0.35, 0.20 respectively.
   i) Compute the Huffman code for this source and also find code efficiency and variance.
   ii) If pairs of letter are encoded, compute the Huffman code, code efficiency and variance

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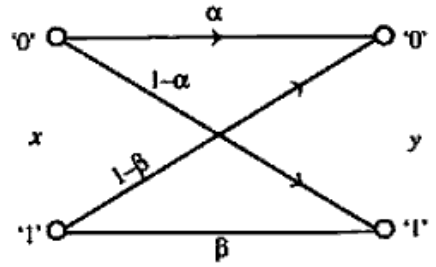
b) A non binary symmetric channel shown in figure has a symbol rate of 1000 symbols/sec.



i) Find H(x), H(y)
H(x, y), H(x/y), H(y/x) I(x, y).

Take $P(x=0)=\frac{1}{4}, P(x=1)=\frac{3}{4}, \alpha=0.75, \beta=0.9$

ii) Find the capacity of the binary symmetric channel α for the case (i).

3. a) Explain the steps in the Shannon's encoding algorithm for generating binary code.
   b) Discuss the error detection and correction capabilities of block codes.

4. a) Discuss the probability of undetected error for linear block code in BSC hamming code and their application.
   b) Discuss about the Galois field and its construction in GF (2m) and its properties.

5. a) Define cyclic code. Explain how cyclic codes are generated from the generating polynomials.
   b) Explain the coding and decoding of cyclic codes with the help of circuit diagram.

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6. a) In a (15, 5) cyclic code the generator polynomial is given by

$g(x) = 1 + x + x^2 + x^4 + x^5 + x^8 + x^{10}$

Draw the block diagram of an encoder and syndrome calculator for this code.

b) Determine the decoded data bits by applying Viterbi algorithm, if r = 1100000111 rest all '0'.

7. a) Consider a (2, 1, 2) convolution code with the impulse response $g^{(1)} = (1, 1, 1)$, and $g^{(2)} = (1, 0, 1)$ and the incoming message sequence is 10011

i) Draw the encoder block diagram.

ii) Find the generator matrix

b) Discuss about the Viterbi algorithm for maximum likelihood decoding.

8. Write short notes on any two :

a) Fading channels

b) Prefix coding

c) Lempel-Ziv coding

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