G 1311 (Pages : 3) Reg. No.....

Name.....

B.TECH. DEGREE EXAMINATION, MAY 2016

Seventh Semester

Branch : Electronics and Communication Engineering

EC 010 702—INFORMATION THEORY AND CODING (EC)

(New Scheme—2010 Admission onwards)

[Improvement/Supplementary]

Time : Three Hours Maximum : 100 Marks

Part A

Answer **all** *questions.*
Each question carries 3 *marks.*

1. Define marginal and conditional entropies.
2. State and explain Kraft's inequality.
3. State the two theorems on channel coding.
4. What is a group ? What are the axioms to be satisfied for a group ?
5. What is meant by constraint length and free distance of a convolution code ?

(5 × 3 = 15 marks)

Part B

Answer **all** *questions.*
Each question carries 5 *marks.*

6. Find the channel capacity of the channel with matrix

$$\begin{bmatrix} 1-p & p & o \\ o & 1-p & p \\ p & o & 1-p \end{bmatrix}.$$

7. Explain Huffman coding procedure.
8. Obtain the channel capacity of a binary symmetric channel with conditional probability of error p.
9. What is the minimum distance of a block code and how do you find it ?
10. What are Turbo codes ? With a neat block diagram, explain the working of a Turbo encoder.

(5 × 5 = 25 marks)

Turn over

Part C

Answer **all** *questions.*
Each full question carries **12** *marks.*

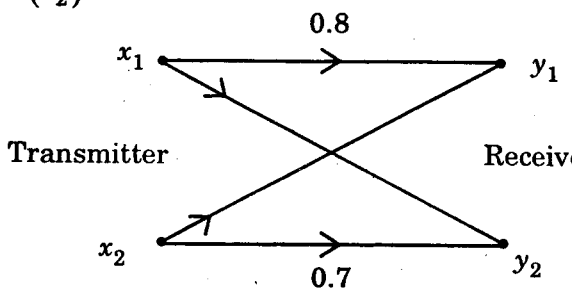
11. (a) A message source produces two independent symbols A and B with probabilities P(A) = 0.4 and P(B) = 0.6. Calculate the efficiency of the source and hence its redundancy. If the symbols are received in average with 4 in every 100 symbols in error, calculate the transmission rate of the system.

(7 marks)

(b) State and prove properties of mutual information. (5 marks)

Or

12. (a) Find the mutual information and channel capacity of the channel shown below if $P(x_1) = 0.6$ and $P(x_2) = 0.4$.



(7 marks)

(b) Explain the concept of amount of information associated with message. What is the reason for using logarithmic measure for measuring the amount of information ?

(5 marks)

13. Encode the following source symbols using Shannon-Fano code and Huffman code :

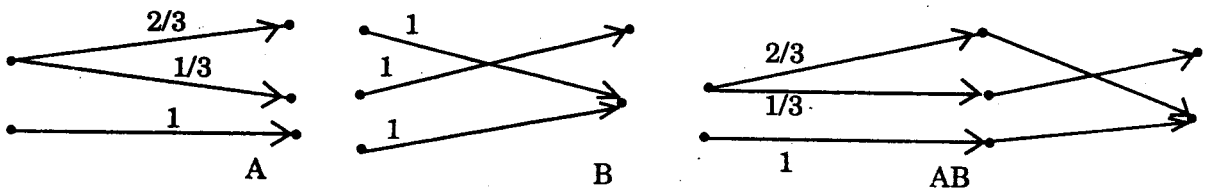
$X = \{x_1, x_2, x_3, x_4, x_5\}$
$P(x) = \{0.2, 0.1, 0.05, 0.05, 0.6\}$.

Find the efficiency of this code in both methods. Compare performance of the coding methods.

Or

14. Describe Shannon-Fano encoding algorithm. Given a source $S = \{S_1, S_2\}$ with probabilities 3/4 and 1/4 respectively. Obtain Shannon-Fano code of 2nd and 3rd extensions of the source. Calculate the efficiency in each case.

15. Consider the channels A, B and the cascaded channel AB shown below :



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$$\begin{bmatrix} 1-p & p & o \\ o & 1-p & p \\ p & o & 1-p \end{bmatrix}.$$

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