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06EC65

Sixth Semester B.E. Degree Examination, Dec.2015/Jan.2016
Information Theory and Coding

Time: 3 hrs.

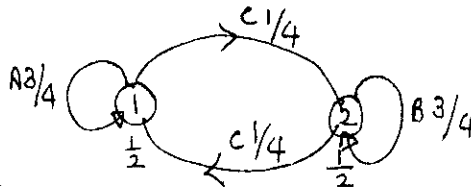
Max. Marks:100

- Note: 1. Answer any FIVE full questions, selecting atleast TWO questions from each part.**
2. Standard notations are used.
3. Missing data may be suitably assumed.

PART - A

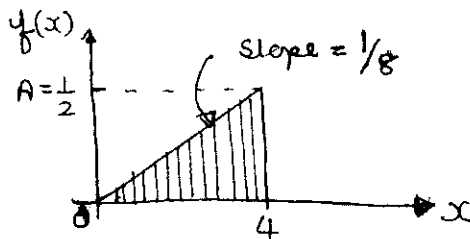
1. a. Derive the expression for entropy of a zero memory discrete source and define entropy rate, source efficiency and source redundancy. (10 Marks)
 b. Calculate the entropy rate and entropy of source of a conventional telegraph source with the dash twice as long as a dot and half as probable given : $\bar{T}_{dot} = 0.2$ sec. (10 Marks)
2. a. For the Markov source whose state diagram is shown below fig.Q2(a), find the source entropy H and the average information content per symbols in messages containing one, two and three symbols. That is calculating G_1 , G_2 and G_3 . (12 Marks)

Fig.Q2(a)



- b. What are the important properties of codes while encoding a source? Explain with examples. (08 Marks)
3. a. Explain with diagram a Binary erasure channel. Derive the expression for channel capacity of a Binary erasure channel. (10 Marks)
 b. Consider a zero memory source alphabet $S = \{S_1, S_2, S_3, S_4, S_5, S_6, S_7\}$ with probabilities $P = \{0.4, 0.2, 0.1, 0.1, 0.1, 0.05, 0.05\}$ construct a Binary Huffman code and compute the code efficiency and redundancy. (10 Marks)
4. a. State Shannon Hartley law and derive the expression for channel capacity with infinite Bandwidth. (10 Marks)
 b. A one dimensional variable has a pdf as shown in fig. Q4(b). Determine the entropy of the source producing the variation (ii). If the signal is passed through a linear amplifier of gain of determine the entropy of the output. (10 Marks)

Fig.Q4(b)



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PART – B

- 5 a. What is error control coding? Mention and explain the type of errors occurring in communication channels. (08 Marks)
- b. For a systematic (7, 4) linear block code the Parity matrix is given by :

$$P = \begin{bmatrix} 111 \\ 110 \\ 101 \\ 011 \end{bmatrix}$$

- i) Find all possible valid code vectors ii) Draw the corresponding encoder circuit.
- iii) Draw the syndrome calculation circuit. (12 Marks)
- 6 a. What is a binary cyclic code? Mention and explain the properties of cyclic codes. (08 Marks)
- b. For a (7, 4) cyclic code the received vector $Z(x)$ is 1110101 and the generator polynomial is $g(x) = 1 + x + x^3$. Draw the syndrome calculation circuit and correct the single error in the received vector. (12 Marks)
- 7 Write short notes on the following :
- RS codes.
 - Shortened cycle code.
 - Burst error correcting codes.
 - Golay codes.
- (20 Marks)
- 8 a. What are the main difference between block codes and convolutional codes? (04 Marks)
- b. For the convolution encoder the information sequence is $d = 10011$. Find the output sequence using the following two approaches.
- Time domain approach
 - Transform domain approach.
- (16 Marks)

Fig.Q8(b)

