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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.

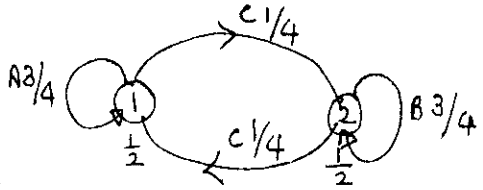
PART – A

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 : $\tau_{dot} = 0.2$ 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)**

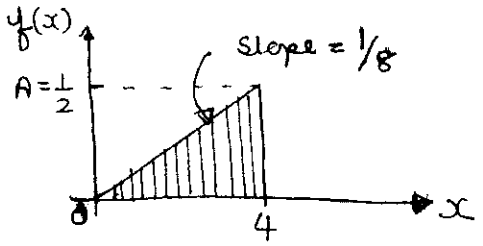
3 a. Explain with diagram a Binary erasure channel. Derive the expression for channel capacity of a Binary erasure channel. **(10 Marks)**

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)



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 :

a. RS codes.
b. Shortened cycle code.
c. Burst error correcting codes.
d. 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.
i) Time domain approach ii) Transform domain approach. **(16 Marks)**

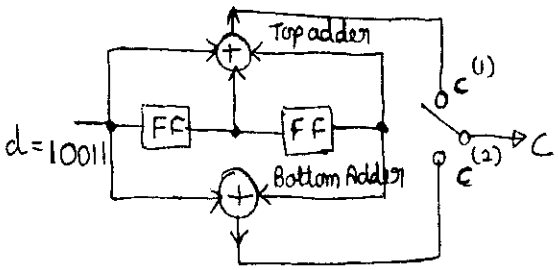


Fig.Q8(b)

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