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P.E.S. College of Engineering, Mandya - 571 401
(An Autonomous Institution affiliated to VTU, Belagavi)
Fifth Semester, B.E. - Electronics and Communication Engineering
Semester End Examination; Dec. - 2019
Information Theory and Coding

Time: 3 hrs   *Max. Marks: 100*

Note: Answer **FIVE** full questions, selecting **ONE** full question from each unit.

UNIT - I

1 a. With a neat diagram, explain the modeling process. | 8

  b. A card is drawn from a deck,

  i) You are told it is a spade, what is its probability?

  ii) What is the probability? If you are told that the card drawn is an ace. | 6

  iii) If you are told that the card drawn is an ace of spades, what is its probability?

  c. Explain briefly about Axioms of probability. | 6

2 a. With neat diagram, explain packet voice transmission system. | 6

  b. Explain the concept of independence of events. | 8

  c. Write a short note on:

  i) Deterministic models   ii) Probability models | 6

UNIT - II

3 a. Discuss the concept of Uncertainty and Information. | 6

  b. Define; i) Differential entropy   and   ii) Average conditional entropy. | 4

  c. Consider the source with 8 alphabets A to H with respective probabilities of 0.22, 0.20, 0.18, 0.15, 0.10, 0.08, 0.05, 0.02

  i) Construct a Huffman code | 10

  ii) Determine entropy of average length of a code

  iii) Determine code efficiency of redundancy

4 a. Explain briefly about Lempel-Ziv algorithm. | 5

  b. Explain briefly about bandwidth efficiency diagram. | 8

 c. Define channel capacity. Determine the channel capacity of binary symmetric channel. | 7

UNIT - III

5 a. With a neat block diagram, explain a digital communication system. | 5

  b. Explain briefly the steps for syndrome decoding. | 5

  c. For a systematic (6, 3) linear block code, the parity matrix P is given by,

$$P \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

| 10

  i) Find all code vectors of this code   ii) Draw encoder circuit for the above code

  iii) Find minimum hamming weight

6 a. State the division algorithm for polynomials. 4

  b. With an example, explain a method for generating cyclic codes. 6

  c. Let the polynomial $g(x) = x^{10} + x^8 + x^5 + x^4 + x^2 + x + 1$ by the generator polynomial of a cycle code over GF(2) with block length 15 10

    i) Find generator polynomial G

    ii) How many errors can this code detect?

    iii) How many errors can this code correct?

    iv) Write the generator matrix in the systematic form

UNIT - IV

7 a. Explain briefly the generator polynomials in terms of minimal polynomial of a t-error correcting BCH code. 10

  b. Explain Read Salomon codes with its applications. Explain the hardware implementation of RS Encoder. 10

8 a. Define; 10

    i) Constraint length   ii) Tree code   iii) Word length

    iv) Convolutional code   v) Sliding block code

  b. Consider the Convolutional encoder shown in Fig. 8(b). 10

fig: 8b
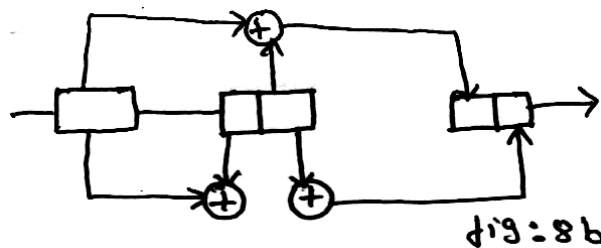
    i) Find the value of n_o, k_o, v

    ii) Construct the state diagram

    iii) Construct the trellis diagram

UNIT - V

9 a. Find the general structure of a TCM encoder that process *m* input bits. 8

  b. Explain briefly the Ungerboeck's TCM design rules . 6

  c. Explain the concept of coded modulation. 6

10 a. Write a note on; 10

    i) RC ciphers

    ii) Public-Key Algorithm

  b. Explain briefly the RSA algorithm with an example. 10

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