III B. Tech I Semester Supplementary Examinations, August - 2021
DIGITAL COMMUNICATIONS
(Electronics and Communication Engineering)

Time: 3 hours   Max. Marks: 70

Note: 1. Question Paper consists of two parts (**Part-A** and **Part-B)**
2. Answer **ALL** the question in **Part-A**
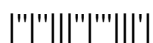3. Answer any **FOUR** Questions from **Part-B**
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PART –A   (14 Marks)

1. a) Discuss about the different noise effects in Pulse Code Modulation.   [2M]
   b) What are the drawbacks of BPSK?   [2M]
   c) Describe the condition of orthogonality of two BFSK systems.   [2M]
   d) If $I(x_1)$ is the information carried by message x_1 and $I(x_2)$ is the   [3M]
      information carried by message x_2, then prove that the amount of
      information carried compositely due to x_1 and x_2 is $I(x_1,x_2) = I(x_1)+I(x_2)$.
   e) Explain about binary symmetric channel.   [3M]
   f) What is the use of syndromes?   [2M]

PART –A   (56 Marks)

2. a) What is slope overload distortion and granular noise in Delta   [7M]
      Modulation? How it is removed in ADM?
   b) A speech signal of maximum frequency 3.4 kHz is applied to a delta   [7M]
      modulator whose bit rate is 20 Kbps. Determine minimum step size
      for the delta modulation so that there is no slope overload.

3. a) Explain the generation and recovery of BPSK with a neat block   [7M]
      diagram.
   b) What are power spectra? Explain power spectra of BPSK and BFSK   [7M]
      signals along with graphs.

4. a) Derive the probability of error of QPSK system and explain its   [7M]
      operation.
   b) What is correlator? Explain the optimum filter reception using   [7M]
      correlator.

5. a) Explain the mutual information and its properties.   [7M]
   b) A code is composed of dots and dashes. Assume the dash is three   [7M]
      times as long as the dot and has 1/3 the probability of occurrence.
         i) Calculate the information in a dot and that in a dash
         ii) Calculate the average information in the dot-dash code.
         iii) Assume that a dot lasts for 10 ms and that this same time
             interval is allowed between symbols. Calculate the average rate of
             information transmission.

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6. a) Explain the trade-off between bandwidth and signal to noise ratio.   [7M]
   b) A Discrete Memory less Symmetric channel X has five symbols x1, x2,   [7M]
      x3, x4 and x5 with respective probabilities 0.2, 0.15, 0.05, 0.1 and
      0.5. Construct Huffman code and calculate the code efficiency.

7. a) Explain the Viterbi algorithm for the decoding of convolutional codes.   [7M]
   b) The parity check bits of a (8, 4) block code are generated by: [7M]

$$c_5 = d_1 + d_2 + d_4$$
$$c_6 = d_1 + d_2 + d_3$$
$$c_7 = d_1 + d_3 + d_4$$
$$c_8 = d_2 + d_3 + d_4$$

   where d_1, d_2, d_3 and d_4 are the message digits.
      i) Find the generator matrix and parity check matrix for this code
      ii) Find the minimum weight of this code
      iii) Find the error detecting capabilities of this code.

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