**20EC507/PE**

**Hall Ticket Number:**

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| **III/IV B.Tech (Regular/Supplementary) DEGREE EXAMINATION** | | | |
| **January, 2024** | **Electronics and Communications Engineering** | | |
| **Fifth Semester** | **Information Theory & Coding** | | |
| **Time:** Three Hours | | **Maximum:** 70 Marks | |
| ***Answer question 1 compulsory.*** | | | **(14X1 = 14Marks)** |
| ***Answer one question from each unit.*** | | | **(4X14=56 Marks)** |
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|  |  |  | CO | BL | M |
| 1 | a) | Find the entropy of a source having 4 symbols with probabilities 1/2, 1/4, 1/8, 1/8? | CO 1 | L1 | 1M |
|  | b) | Define Mutual information? | CO 1 | L1 | 1M |
|  | c) | Write any two properties of entropy? | CO 1 | L2 | 1M |
|  | d) | Mention efficiency of source coding algorithm . | CO 1 | L2 | 1M |
|  | e) | In a (15,5) linear block code, calculate the number of check bits? | CO 2 | L2 | 1M |
|  | f) | Contrast error detection to correction capabilities of a (n, k) linear block codes? | CO 2 | L1 | 1M |
|  | g) | How cyclic codes are different from liner block codes? | CO 2 | L1 | 1M |
|  | h) | Find the hamming distance between the code words [1101010] and [1101001]? | CO 2 | L1 | 1M |
|  | i) | Mention advantage of BCH Codes? | CO 3 | L1 | 1M |
|  | j) | List the advantages of cyclic coded over linear block codes? | CO 3 | L1 | 1M |
|  | k) | What is a syndrome? | CO 3 | L1 | 1M |
|  | l) | Define constraint length? | CO 4 | L2 | 1M |
|  | m) | What are the main advantages of convolutional codes? | CO 4 | L1 | 1M |
|  | n) | Compare linear block codes and convolution codes? | CO 4 | L1 | 1M |
| **Unit-I** | | | | | |
| 2 | a) | Express information in terms of its symbol probabilities and list its properties. | CO 1 | L3 | 7M |
|  | b) | Apply the Huffman coding procedure for the following message ensemble  Find the coding efficiency of the code. | CO 1 | L3 | 7M |
| **(OR)** | | | | | |
| 3 | a) | A sample space of 5 messages with probabilities are given by  {0.25, 0.25, 0.25, 0.125, 0.125}. Find the entropy of the source. | CO 1 | L3 | 7M |
|  | b) | |  | | --- | | Contrast prefix to non-prefix codes with suitable examples. | | CO 1 | L4 | 7M |
| **Unit-II** | | | | | |
| 4 | a) | Enumerate the steps followed in error correcting procedure in case of linear block codes | CO 2 | L2 | 7M |
|  | b) | The generator matrix for a (6,3) linear block code is given below. Find all the code vectors of this code? | CO 2 | L4 | 7M |
| **(OR)** | | | | | |
| 5 | a) | Explain the matrix description of Linear block codes? | CO 2 | L2 | 7M |
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|  | b) | Consider a Linear block code with generator matrix  Determine the parity check matrix, the error detecting and correcting capability of the code, Calculate the syndrome matrix for the received vector R= [110101 | CO 2 | L4 | 7M |
| **Unit-III** | | | | | |
| 6 | a) | Describe BCH codes and about minimum distance and bound of BCH codes? | CO 3 | L2 | 7M |
|  | b) | A (15,5) Linear Cyclic codes has a generator polynomial  find the code vector for the message polynomial in systematic form? | CO 3 | L4 | 7M |
| **(OR)** | | | | | |
| 7 | a) | Explain the decoding procedure for BCH codes? | CO 3 | L2 | 7M |
|  | b) | The generator polynomial of a (7,4) cyclic code is  Find the code vector for the message block D= [1011] in systematic form | CO 3 | L4 | 7M |
| **Unit-IV** | | | | | |
| 8 |  | A convolution encoder has 3 shift registers with two stages, two modulo-2 adders and an output multiplexer. The generator sequences of the encoder are as follows.  g (1) = (1, 1, 1, 1) ; g (2) =(1, 1, 0,1).  Draw the block diagram of the encoder. Find the encoder output produced by the message sequence 1011101 using time domain approach and transform domain approach? | CO 4 | L4 | 14M |
| **(OR)** | | | | | |
| 9 |  | Design a (3, 1,, 2) convolution encoder for the impulse response  g (1) = [1, 0, 1) ; g (2) =[1, 1, 1]; g (3) = [0, 1, 1] .  Find the output for message 11010 in time domain and transform domain approach. | CO 4 | L4 | 14M |

