Reg. No. \_\_\_\_\_\_\_\_\_\_\_\_



**End Semester Examination – Nov / Dec – 2019**

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| **Code :** | **14EC2065** | **Duration :** | **3hrs** |
| **Sub. Name :** | **INFORMATION THEORY AND CODING** | **Max. Marks :** | **100** |

**ANSWER ALL QUESTIONS (5 x 20 = 100 Marks)**

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| **Q. No.** | **Sub Div.** | **Questions** | **Course**  **Outcome** | **Marks** |
| 1. | a. | A source contains 160 symbols. 128 symbols are probable with P=1/256 each and the remaining symbols are probable with P=1/64 each. Evaluate the average information rate of the source if it emits 10,000 symbols / sec. | CO1 | 15 |
|  | b. | Outline the properties of entropy. | CO1 | 5 |
| **(OR)** | | | | |
| 2. | a. | Analysis of several text files that needs to be transmitted over a public network shows that it is comprised of 7 different symbols, the vowels with a relative frequency of occurrence 0.25, 0.125, 0.125, 0.25, 0.125 and the symbol ‘2’ and ‘7’ with a frequency of occurrence 0.625 each respectively. Encode the symbols using minimum variance Huffman encoding algorithm. Calculate the entropy, average code word length, efficiency, redundancy and code variance of the source. | CO3 | 15 |
| b. | Construct minimum variance Huffman codes for the given set of symbols: S= {p, z, p, a, a, a, z, a, p, a}. | CO3 | 5 |
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| 3. |  | A (7,4) LBC consists of the parity check matrix H.  Untitled  Develop the generator matrix, the code vectors, Hamming weight, minimum distance and syndromes. If the decoded code is (1010110) construct the error corrected code for an error in bit position five of the decoded code. | CO3 | 20 |
| **(OR)** | | | | |
| 4. |  | 0.8 0.7  X1 Y1 Z1  0.2 0.2 0.3 0.3    X2 Y2 Z2  0.8 0.7  Consider the cascaded binary symmetric channel shown in the figure, estimate the resultant channel matrix and evaluate the probabilities of the outputs Z1 and Z2. | CO2 | 20 |
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| 5. |  | A convolutional encoder has single shift register with 3 flip flops, three modulo-2 adders and an output multiplexer. The generator sequences are; g1= (1,0,1); g2=(1,1,0) and g3= (1,1,1). Design the block diagram of the encoder. Construct the encoded sequences for the message (10101) in Time Domain Approach. | CO3 | 20 |
| **(OR)** | | | | |
| 6. |  | G(D)= D10+D8+D5+D4+D2+D+1 is the generator polynomial of a (15,5) algebraic code. Design the encoder and the syndrome calculator. Estimate the codeword for the message polynomial D4+D2+1 using the designed encoder. | CO3 | 20 |
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| 7. | a. | Outline the concepts of Space Time Codes in brief. | CO3 | 10 |
| b. | Summarize the concepts of Turbo Codes. | CO3 | 10 |
| **(OR)** | | | | |
| 8. | a. | Outline the concepts of LDPC Codes in brief. | CO3 | 10 |
| b. | Summarize the concepts of Product Codes. | CO3 | 10 |
|  | | **Compulsory**: |  |  |
| 9. | a. | Discuss on Orthogonal space time block codes in detail. | CO3 | 10 |
| b | Elaborate your perception on Spatial multiplexing. | CO3 | 10 |