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**UNIVERSITY**

(Karunya Institute of Technology & Sciences)

(Declared as Deemed-to-be University under Sec.3 of the UGC Act, 1956)

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

**End Semester Examination – Nov/Dec - 2016**

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|  |  | **Semester :** | **2016-17 ODD** |
| **Code :** | **EC290** | **Duration :** | **3 hrs** |
| **Sub. Name :** | **Information Theory and Coding** | **Max. marks :** | **100** |

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| **Q. No.** | **Questions** | **Marks** |
| **PART-A(10X1=10 MARKS)** | | |
| 1. | Prefix codes will always satisfy \_\_\_\_\_\_\_\_\_\_\_\_\_\_ inequality given by \_\_\_\_\_\_\_\_\_\_\_\_\_ | (1) |
| 2. | Obtain Huffman codes for the given set of symbols: {$ $ $ @ $ & @ & & $} | (1) |
| 3. | Define Nyquist rate. | (1) |
| 4. | What is your knowledge about adaptive coding? | (1) |
| 5. | Define a syndrome? | (1) |
| 6. | State the difference between block codes and convolution codes? | (1) |
| 7. | TIF stands for \_\_\_\_\_\_\_\_\_\_\_\_\_\_ | (1) |
| 8. | State the primary application of the format called GIF. | (1) |
| 9. | What is perceptual coding? | (1) |
| 10. | Define the term GOP with reference to video compression. | (1) |

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| **PART B(5 X 3= 15 MARKS)** | | |
| 11 | A binary memory less source transmits two independent messages with probabilities P0 and (1-P0) respectively. Prove that the entropy is maximum when both the messages are equally likely by plotting the variations of entropy with respect to probability. | (3) |
| 12 | Differentiate between delta modulation and adaptive delta modulation. | (3) |
| 13 | Let X= (1010101) and Y= (1010111) be two code vectors. Find;   1. Hamming distance between them. 2. Hamming weight of the vectors.   If X is transmitted and Y is the received code vector, estimate the error corrected received vector? | (3) |
| 14 | Paraphrase Makeup codes, Termination codes and MMR coding with respect to digitized documents. | (3) |
| 15 | What is the significance of D-frames in video coding? | (3) |

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| **PART C(5 X 15= 75 MARKS)** | | | |
| 16. | a. | Analysis of several text files that needs to be transmitted over a public network shows that it is comprised of six different symbols, the vowels with a relative frequency of occurrence 0.25, 0.125, 0.125, 0.25, 0.125 and the symbol ‘2’ with a frequency of occurrence 0.125 respectively.  Encode the symbols statistically using Huffman encoding algorithm for the transmission. | (8) |
| b. | Find the average number of bits per code word. | (3) |
| c. | Calculate the entropy of the source. | (2) |
| d. | Estimate the efficiency of the code. | (1) |
| e. | Obtain the redundancy of the code. | (1) |
| (OR) | | | |
| 17. | a. | Explain briefly about Source Coding Theorem . | (7) |
| b. | Consider the given transition probability diagram of a binary symmetric channel, the input binary symbols 0 and 1 are equi-probable. Find the mutual information between the channel input and channel output.    1-P  X0=0 Y0=0  P  P  X1=1 Y1=1  1-P | (8) |
| 18. |  | Explain briefly the Adaptive Differential Pulse Code Modulation technique, with necessary diagrams and supportive mathematical expressions. | (15) |
| (OR) | | | |
| 19. | a. | With neat sketches, explain the Adaptive Sub-band coding technique. | (7) |
| b. | Explain Delta Modulation with necessary diagrams. | (8) |
| 20. | a. | The generator matrix for a (7,4) linear block code is given;  1 1 0 1 0 0 0  G = 0 1 1 0 1 0 0  1 1 1 0 0 1 0  1 0 1 0 0 0 1  Find all the code vectors of this code. | (8) |
| b. | Find the parity check matrix. | (2) |
| c. | Find the minimum weight of this code. | (2) |
| d. | Find the syndrome for an error pattern (0 1 0 0 0 0 0) | (3) |
| (OR) | | | |
| 21. | a. | Given the generator polynomial g(D)=D3+D+1 for a (7,4) cyclic code; Construct the systematic cyclic codes. | (8) |
| b. | Construct the decoding table. | (3) |
| c. | If the received code is (1 1 0 1 1 0 0) find the transmitted code word. | (4) |
| 22. |  | For a source A={a1, a2,a3} with the probability of occurrence 0.8, 0.02, 0.18  Explain the simple Arithmetic coding algorithm for;   1. Generation of Tag. 2. Deciphering of Tag.   If the encoding sequence is {a1, a3,a2} | (7)  (8) |
| (OR) | | | |
| 23. |  | With neat sketches and necessary mathematical expressions, explain the JPEG standard. | (15) |
| 24. |  | What is MPEG? Draw and explain the MPEG audio encoder and decoder. Explain also its frame format with a neat diagram. | (15) |
| (OR) | | | |
| 25. |  | What is H.261 standard? Explain the standard with a neat diagram. Explain the macro block format with a neat sketch. | (15) |

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