Reg. No. : | | | | | | | | | | |

Question Paper Code: 31479

B.E. / B.Tech. DEGREE EXAMINATION, NOV 2016

Seventh Semester

Information Technology

01UEC953 - CODING AND INFORMATION THEORY

(Regulation 2013)

Duration: Three hours Maximum: 100 Marks

Answer ALL Questions

PART A - (10 x 2 = 20 Marks)

1. Define channel capacity of a discrete memoryless channel.
2. Define self-information.
3. Compare Huffman coding and LZW.
4. What are channel vocoders?
5. What is motion compensation?
6. What are the main steps in JPEG image compression?
7. What is a Hamming code?
8. What is CRC?
9. What is a state diagram?
10. What is the principle of turbo coding?

PART - B (5 x 16 = 80 Marks)

11. (a) Consider that two sources S_1 and S_2 emit messages x_1, x_2, x_3 and y_1, y_2, y_3 with joint probability $P(X, Y)$ as shown in the figure. Calculate $H(X)$, $H(Y)$, $H(X|Y)$, $H(Y|X)$ and $I(X:Y)$ given that $P(X,Y) = \begin{bmatrix} 3/40 & 1/40 & 1/40 \\ 1/20 & 3/20 & 1/20 \\ 1/8 & 1/8 & 3/8 \end{bmatrix}$ (16)

Or

(b) Apply Shannon–Fano encoding procedure to the following message ensemble

[X] = [x1, x2, x3, x4, x5, x6, x7, x8, x9]

[P] = [0.49, 0.14, 0.14, 0.07, 0.07, 0.04, 0.02, 0.02, 0.01]

Find the coding efficiency and coding redundancy. (16)

12. (a) Apply Arithmetic coding for the word 'WENT'. (16)

Symbol	*W*	*E*	*N*	*T*	.
Probability	0.1	0.3	0.3	0.2	0.1

Or

(b) Explain linear predictive coding and code excited LPC for speech compression. (16)

13. (a) Discuss in detail about the MPEG video coding standards. (16)

Or

(b) Discuss about H.261 standard in detail. (16)

14. (a) Find the generator matrix for a systematic (7, 4) cyclic code of $G(P) = P^3 + p + 1$. Also find the parity check matrix. (16)

Or

(b) Determine the encoded message for the following 8 bit data codes using the following CRC generating polynomial $P(x) = x^4 + x^3 + x^0$.

(i) 11001100 (ii) 01011111 (16)

15. (a) A 1/3 rate convolutional code has the following generators $G_1 = [1 \quad 0 \quad 0]$; $G_2 = [1 \quad 0 \quad 1]$; $G_3 = [1 \quad 1 \quad 1]$

(i) Draw the encoder circuit corresponding to this code

(ii) Draw the state transition diagram for this code

(iii) Draw the state diagram for this code

(iv) Draw the Trellis diagram for this code

(v) This code is used for transmission over an AWGN channel with hard decision decoding. The output of the demodulation detector is 101001011110111…….

Use Viterbi decoding algorithm to find the transmitted sequence. (16)

Or

(b) Draw the diagram of the ½ rate convolutional encoder with generator polynomials $g^{(1)}(D) = 1+D$ and $g^{(2)}(D) = 1+D+D^2$

Also compute the encoder output for input sequence 101101. Obtain the code tree, code trellis and state diagram. (16)