

Question Paper Code : 91565

B.E./B.Tech. DEGREE EXAMINATION, NOVEMBER/DECEMBER 2014.

Fifth Semester

Information Technology

IT 2302/TT 52 — INFORMATION THEORY AND CODING

(Regulation 2008)

Time : Three hours

Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1. List the properties of Mutual Information.
2. What is coding efficiency?
3. What is the need for adaptive Huffman coding?
4. State the LZW algorithm.
5. What are B & P frames?
6. What is the need for quantizer?
7. How many bit errors can be detected using a Hamming code of distance - 3?
8. Why cyclic codes are extremely well-suited for error detection?
9. What is the principle of Turbo coding?
10. Compare Convolutional and block codes.

PART B — (5 × 16 = 80 marks)

11. (a) (i) A discrete memory less source has an alphabet of five symbols whose probabilities of occurrence are as described here : (8)  
Symbols : X1 X2 X3 X4 X5  
Probability : 0.2 0.2 0.1 0.1 0.4  
Compute the Huffman code for this source and the efficiency of the source encoder.  
(ii) Show that the BSC capacity,  $C = 1 - H(P)$ . (8)

Or

(b) (i) Write the Shannon-Fano encoding algorithm. (4)

(ii) Apply the above procedure to the following message ensemble.

$$X = \{x_1, x_2, x_3, x_4, x_5, x_6, x_7, x_8, x_9\}$$

$$P = \{0.49, 0.14, 0.14, 0.07, 0.07, 0.04, 0.02, 0.02, 0.01\}$$

Find the entropy and efficiency of the source. (12)

12. (a) With the following symbols and their probability of occurrence, encode the message "went#" using arithmetic coding algorithms. Compare arithmetic coding with Huffman coding principles.

Symbols : e N t w #

Probability : 0.3 0.3 0.2 0.1 0.1

Or

(b) Explain

(i) MPEG Audio coders (8)

(ii) Dolby Audio coders. (8)

13. (a) Draw JPEG encoder block diagram and explain each block.

Or

(b) Explain in detail about the MPEG-1 standard.

14. (a) Explain about the Linear Block codes used in error detection and correction.

Or

(b) (i) Design an encoder for the (7, 4) binary cyclic code generated by  $g(x) = 1 + x + x^3$  and verify its operation using the message vector (0101). (10)

(ii) Explain Syndrome calculation in detail. (6)

15. (a) (i) Construct a convolution encoder for the following specifications: rate efficiency  $\frac{1}{2}$ , constraint length 3, the connections from the shift register to modulo-2 adder are described by the following equations,  $g_1(x) = 1 + x + x^2$ ,  $g_2(x) = 1 + x^2$ . (6)

(ii) Determine the output codeword for the message [10011]. (5)

(iii) Draw the code tree, state diagram. (5)

Or

(b) Explain Turbo decoding in detail.