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Question Paper Code : 51761

B.E./B.Tech. DEGREE EXAMINATION, MAY/JUNE 2016

Fifth Semester

Information Technology

IT 2302/IT 52 – INFORMATION THEORY AND CODING

(Regulations 2008)

Time : Three Hours **Maximum : 100 Marks**

Answer ALL questions.

PART – A (10 × 2 = 20 Marks)

1. Calculate the amount of information if probability of occurrence = 5/8.

2. List the properties of mutual information.

3. What is perceptual coding ?

4. What is Dolby AC-3 ?

5. State the main difference between MPEG video compression algorithms and H.261.

6. What is TIFF ?

7. How is a burst error of length k can be represented ?

8. Suppose H is a parity check matrix of an (n,k) code, then for any vector $v \varepsilon GF(q)^n$, give the syndrome of v.

9. What are the difference between block and convolutional codes ?

10. What is interleaver in a turbo code ?

PART – B (5 × 16 = 80 Marks)

11. (a) A discrete memory less source has 5 symbols x_1, x_2, x_3, x_4 and x_5 with probabilities $p(x_1) = 0.4$, $p(x_2) = 0.19$, $p(x_3) = 0.16$, $p(x_4) = 0.15$ and $p(x_5) = 0.1$. Construct a Shannon-FANO code for the source and calculate entropy, efficiency and code variance. **(16)**

OR

(b) (i) Explain Channel capacity and derive the channel capacity for binary symmetric channel. **(8)**

(ii) Discuss about Mutual information and its properties. **(8)**

12. (a) Write a detailed note on :

(i) Arithmetic code

(ii) LZW algorithm.

OR

(b) Explain Linear Predictive Coding in detail.

13. (a) Explain in detail about the various types of MPEG standards. **(16)**

OR

(b) Explain in detail about the standard H.261. **(16)**

14. (a) (i) Consider a (7, 4) cyclic code whose generator polynomial is $g(x) = 1 + x^2 + x^3$. **(12)**

(1) Encode the message (1001) using encoder and algorithm.

(2) Decode the received word if error has occurred at middle bit using both syndrome calculator circuit and algorithm.

(ii) Let $c_1 = \{1101001\}$ and $c_2 = \{1100100\}$. Calculate $w(c_1)$, $w(c_2)$ and $w(c_1 + c_2)$ for two arbitrary binary vectors c_1 and c_2 of same length. $w(c_1 + c_2) = w(c_1) + w(c_2)$? **(4)**

OR

(b) (i) Consider a (7, 4) linear block code with parity check matrix given by, **(12)**

$$H = \begin{bmatrix} 1 & 0 & 1 & 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 1 & 0 & 1 & 0 \\ 0 & 1 & 1 & 1 & 0 & 0 & 1 \end{bmatrix}$$

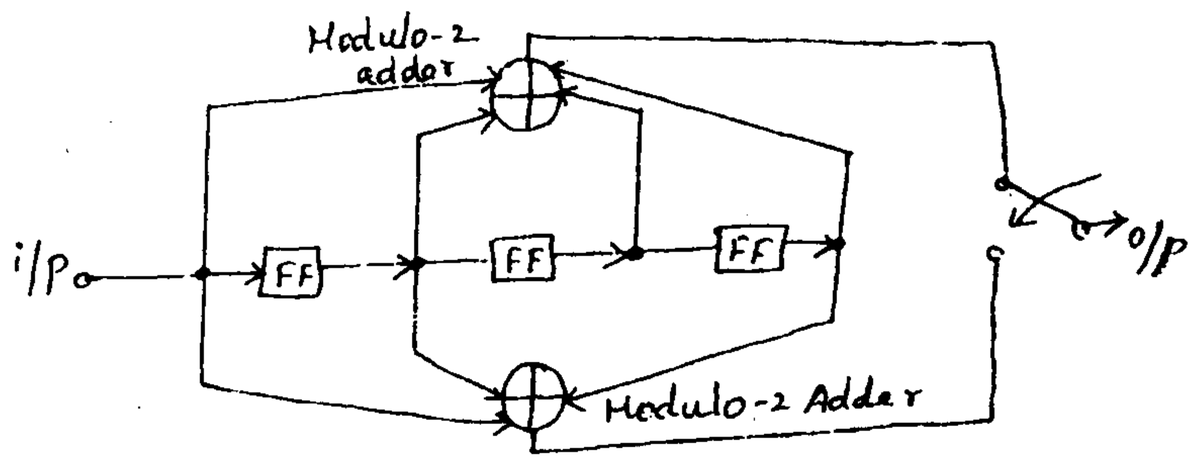
(1) Generate the codebook.

(2) Show that this code is a Hamming code.

(3) Illustrate the relation between the minimum distance and structure of the parity check matrix by considering the codeword 0101100.

(ii) Show that the minimum hamming distance d_{min} between two code words of a binary linear block code is equal to the hamming weight of the codeword with the smallest number of 1s. excluding all-0 codeword for the codebook C = {0000, 1010, 0101,1111). **(4)**

15. (a) (i) The convolution encoder for a rate r = ½, constraint length K = 4, determine the output codeword for the message (1011 1). **(10)**



(ii) Draw the code tree for the above convolutional encoder. **(6)**

OR

(b) Explain Viterbi algorithm in detail. **(16)**
