Total No. of Questions : 8] [Total No. of Printed Pages : 3

Roll No. ...

MCSE–202

M. E./M. Tech. (Second Semester)
EXAMINATION, Oct., 2009
INFORMATION THEORY AND CODING
(MCSE–202)

Time : Three Hours

Maximum Marks : 100

Minimum Pass Marks : 40

Note : Attempt any *five* questions. All questions carry equal marks.

1. (a) Discuss the coding for Discrete Memoryless sources for variable length code words.

   (b) A DMS has an alphabet of eight letters $x_i, i = 1, 2 \ldots\ldots 8$ with probabilities 0·3, 0·15, 0·14, 0·13, 0·10, 0·08, 0·05 and 0·05.

   (i) Use the Huffman encoding procedure to determine a binary code for the source output.

   (ii) Determine the average number $\bar{R}$ of a binary digits per source letter.

   (iii) Determine the entropy of the source and compare it with $\bar{R}$.

2. (a) Discuss the JPEG standards for lossy compression.

   (b) Determine the lempel ziv code for the following bit stream :

   01101011010110001001

   Recover the original sequence from the encoded stream.

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3. (a) Determine the mutual information and channel capacity of Binary symmetric channel.

   (b) Elaborate on the trade off between bandwidth and signal to noise ratio.

4. (a) Find the channel capacity for the channel shown in fig. 1.

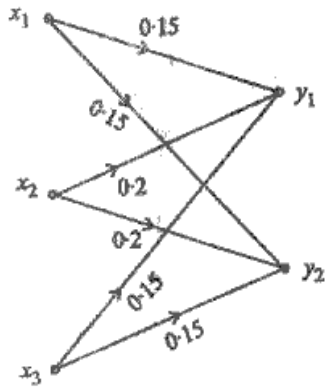

Fig. 1

   (b) For a (7, 4) Hamming code with number of parity bits $m = 3$, determine the hamming codes and also determine the decoding table for the same. The generator matrix is given here as under :

$$G = \left[\begin{array}{ccc:cccc} 1 & 1 & 0 & 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 & 1 & 0 & 0 \\ 1 & 1 & 1 & 0 & 0 & 1 & 0 \\ 1 & 0 & 1 & 0 & 0 & 0 & 1 \end{array}\right]$$

5. (a) Discuss the probability of undetected error for linear block code in BSC Hamming code and their application.

   (b) Design an encoder and a syndrome. Calculate circuit for the (7, 4) cyclic code generator by the polynomial :

$$g(x) = 1 + x^2 + x^3$$

6. (a) For a (5, 3) code over GF (4), the generator matrix is given by :

$$G = \begin{bmatrix} 1 & 0 & 0 & 1 & 1 \\ 0 & 1 & 0 & 1 & 2 \\ 0 & 0 & 1 & 1 & 3 \end{bmatrix}$$

   (i) Find the parity check matrix.
   (ii) How many errors can this code detect ?
   (iii) How many errors can this code correct ?
   (iv) How many erasures can this code correct ?

   (b) Construct GF (9) from GF (3) using an appropriate primitive polynomial.

7. (a) Consider the rate $r = \frac{1}{2}$, constraint length $k = 2$, convolutional encoder of fig. 2. The code is systematic. Find the encoder output produced by the message sequence 10111 ..... .

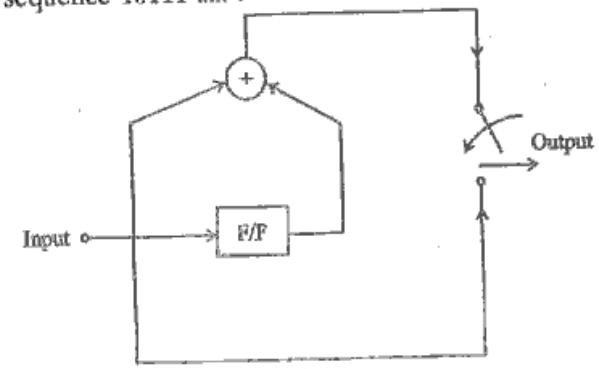

Fig. 2

   (b) Discuss briefly on Data Encryption Standards (DES).

8. Write short notes on any *two* of the following :
   (a) Asymmetric (Public-key) Algorithms
   (b) Decryption
   (c) Virterbi Algorithms