

GUJARAT TECHNOLOGICAL UNIVERSITY
ME - SEMESTER- I (OLD course) • EXAMINATION – SUMMER 2015

Subject Code: 710402**Date: 12/05/2015****Subject Name: Information Theory and Coding****Time: 10:30 am to 1:00 pm****Total Marks: 70****Instructions:**

1. Attempt all questions.
2. Make suitable assumptions wherever necessary.
3. Figures to the right indicate full marks.

- Q.1** (a) State and explain Kraft's inequality theorem and McMillan's theorem. **07**
 (b) A source emits seven messages with probability $1/2, 1/4, 1/8, 1/16, 1/32, 1/64, 1/64$ respectively. Find entropy of source. Obtain the compact binary code and find average length of code word. Determine the efficiency and redundancy of the source. **07**
- Q.2** (a) Explain Shannon-Fano encoding procedure for getting compact code with minimum redundancy with suitable example. **07**
 (b) Find channel capacity of binary symmetric channel with error probability P . **07**
- OR**
- (b) A binary channel matrix is given by $P(y_1/x_1)=2/3, P(y_2/x_1)=1/3, P(y_1/x_2)=1/10, P(y_2/x_2)=9/10$. It is also given $P_x(x_1)=1/3, P_x(x_2)=2/3$. Determine $H(x), H(x/y), H(y), H(y/x)$ and $I(X,Y)$. **07**
- Q.3** (a) Describe the DES scheme. **07**
 (b) Prove $0 \leq H(x) \leq \log_2 M$. Where M is the number of messages emitted by source. **07**
- OR**
- Q.3** (a) State and explain theorem of extension of source with proof. **07**
 (b) Difference between public key and private key encryption. Discuss knapsack problem. **07**
- Q.4** (a) Find generator polynomial $g(x)$ for (7,4) cyclic code and find code vector for following data vectors 1010, 11111, 0001, 10000 in non symmetrical form. **07**
 (b) Short note on RS code. **07**
- OR**
- Q.4** (a) Write short note on
 1) BCH code **07**
 2) Hamming bound
 (b) For a systematic (7,4) linear block code the parity matrix is **07**
- $$[P] = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 1 \end{bmatrix}$$
- Find code vectors for 1001, 1101.
 1) Draw the corresponding circuit
 2) Draw the syndrome calculation circuit
- Q.5** (a) Compare viterbi and sequential decoding algorithm for convolution code with merits and demerits. **07**
 (b) 1) Describe 2 out of 5 Code the sequence 037090 using this code is this encoding uniquely decodable? Justify. **03**
 2) Construct terminology instantaneous code for following source alphabet with prescribed length of code word. **04**

Symbol	S ₁	S ₂	S ₃	S ₄	S ₅	S ₆	S ₇	S ₈	S ₉
Length	1	3	3	3	3	2	2	2	2

OR

- Q.5** (a) Write brief note on arithmetic code with suitable example. **07**
(b) Explain JPEG standard for image compression. **07**
