

GUJARAT TECHNOLOGICAL UNIVERSITY
M. E. - SEMESTER – I • EXAMINATION – WINTER • 2013

Subject code: 710203N**Date: 03-01-2014****Subject Name: Information Theory and Coding****Time: 10.30 am – 01.00 pm****Total Marks: 70****Instructions:**

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

- Q.1** (a) Explain discrete time Markov chain and its applications. **07**
 (b) How to test for unique decodability of code? Test code1 = {0, 01, 11}, code2 = {0, 01, 10} for unique decodability and explain result. **07**

- Q.2** (a) Explain Huffman coding algorithm. Design Huffman code for source with alphabet $A = \{a_1, a_2, a_3, a_4, a_5\}$ with $p(a_1)=p(a_3)=0.2$, $p(a_2)=0.4$, $p(a_4)=p(a_5)=0.1$. **07**
 (b) Explain Arithmetic coding with example. **07**

OR

- (b) Discuss applications of Huffman coding in details. **07**
- Q.3** (a) Experiment consists of four successive tosses of a coin. Give sample space. Define a random variable X as the number of heads appearing in a trial. Determine probability density function and cumulative distribution function. **07**
 (b) Classify the random process and discuss each category in brief. **07**

OR

- Q.3** (a) Write algorithm to design Shannon-Fano code. Design Shannon-Fano code for following frequencies. **07**

| Symbols | Probability | counts |
|---------|-------------|--------|
| A | 0.38 | 15 |
| B | 0.18 | 7 |
| C | 0.15 | 6 |
| D | 0.15 | 6 |
| E | 0.13 | 5 |

- (b) Explain statistics of stochastic processes. Define autocorrelation and cross correlation. **07**
- Q.4** (a) What is convolution code? List out techniques for encoding and decoding convolution code. Explain any one in details. **07**
 (b) Define cyclic code and systematic cyclic code? Explain procedure to construct systematic cyclic code. **07**

OR

- Q.4** (a) Explain redundancy for error correction. Define Hamming distance and Hamming codes. **07**
 (b) Explain burst error detecting and correcting codes. **07**
- Q.5** (a) Define private key and public key cryptography. Explain any one modern private key algorithm. **07**
 (b) Define Poisson distribution. Determine mean and variance of Poisson distribution. **07**

OR

- Q.5** (a) Write short note on MPEG. **07**
 (b) Briefly explain approaches of image compression. **07**
