

GUJARAT TECHNOLOGICAL UNIVERSITY
ME - SEMESTER-1 (NEW) EXAMINATION – WINTER 2018

Subject Code: 3710510**Date: 03/01/2019****Subject Name: Statistical Information Processing****Time: 02:30 PM To 05:00 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) Prove that Entropy will be maximum when all messages are equiprobable. **07**
 (b) Define the following terms **07**
 (1) Wide sense stationary process (2) Sample space (3) Random variable
 (4) Random process (5) Poisson distribution and (6) mutually exclusive events
 (7) Bay's Rule
- Q.2** (a) Define Cumulative Distribution Function. List and prove all the properties of CDF. **07**
 (b) Explain Arithmetic Code with Example. **07**
- OR**
- (b) Explain Central limit theorem. **07**
- Q.3** (a) Enlist Estimation Theories and Explain one of them. **07**
 (b) Let X be a continuous random variable with PDF **07**

$$F_x(X) = \begin{cases} kx & 0 < x < 1 \\ 0, & \text{otherwise} \end{cases}$$
 - a. Determine the value of k and sketch $f_x(x)$.
 - b. Find and sketch corresponding CDF $F_x(x)$.
 - c. Find $P(1/4 < X \leq 2)$
- OR**
- Q.3** (a) Give Classification of Random Processes. **07**
 (b) Two random processes $X(t)$ and $Y(t)$ are given by $X(t) = A \cos(\omega t + \theta)$ and $Y(t) = A \cos(\omega t + \theta)$, where A and ω are constants and θ is a uniform r.v. over $(0, 2\pi)$. Find the cross-correlation function of $X(t)$ and $Y(t)$ and verify $R_{x,y}(-\tau) = R_{x,y}(\tau)$ **07**
- Q.4** (a) Write down CDF and PDF of continuous random variable and discuss how they arise and how they interrelated. **07**
 (b) Find Shannon-Fano code for following messages whose efficiency is 96.7%. **07**

Message	A	B	C	D	E
Probability	0.2	0.2	0.2	0.2	0.2

OR

- Q.4** (a) State and prove Tchebycheff's Inequality theorem. **07**
(b) Find Huffman code, average length, entropy, code efficiency and redundancy for the following messages. **07**

Message	m ₁	m ₂	m ₃	m ₄	m ₅	m ₆
Probability	0.4	0.2	0.1	0.1	0.1	0.1

- Q.5** (a) Explain Baye's Criteria for binary hypothesis testing. **07**
(b) Write Short note on: Reed Solomon Code **07**

OR

- Q.5** (a) Write Short note on: BCH Code **07**
(b) Explain LZ-78 with example **07**

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