Reg. No. | | | | | | | | | | |

MANIPAL INSTITUTE OF TECHNOLOGY

MANIPAL

A Constituent Institution of Manipal University

VI SEMESTER B.TECH. (INFORMATION TECHNOLOGY/COMPUTER AND COMMUNICATION ENGINEERING)

END SEMESTER EXAMINATIONS, APR/MAY 2017

SUBJECT: STATISTICAL ANALYSIS AND APPLICATIONS [ICT 322]

REVISED CREDIT SYSTEM
(27/04/2017)

Time: 3 Hours MAX. MARKS: 50

Instructions to Candidates:

- Answer **ANY FIVE FULL** questions.
- Missing data may be suitably assumed.

1A. Check whether the following random numbers are uniformly distributed over the interval [0, 1] using Kolmogorov-Smirnov test (Take: $D_{0.05} = 0.565$). 5

0.04, 0.14, 0.24, 0.34, 0.44, 0.54, 0.64, 0.74, 0.84, 0.94, 0.04, 0.14, 0.24, 0.34, 0.44, 0.54, 0.64, 0.74, 0.84, 0.94.

1B. An agriculture cooperative claims that 90% of the watermelons shipped out are ripe and ready to eat. Find the probabilities that among 20 watermelons shipped out 3

i) all 20 are ripe and ready to eat.

ii) at least 10 are ripe and ready to eat.

1C. Explain acceptance rejection technique for generating random variate X, which is uniformly distributed between 0.4 and 1. 2

2A. Generate 10 random numbers using multiplicative congruential generator with m=32, a = 13 and X_0 =3. Also check whether they are independent using autocorrelation test. Given that $Z_{0.025} = 1.96$. 5

2B. Service time at a cashier's window is normally distributed with mean 8.5 minutes and variance 10.5 minutes^2. Generate a service time using the random numbers given below, 3

0.1758	0.1489	0.2774	0.6033	0.9813	0.1052
0.1816	0.7484	0.1699	0.7350	0.6430	0.8803

2C. Find mean and variance of exponential distribution. 2

3A. A total calcium level below 6.5mg/dl is related to severe muscle spasms. Recently, the patients total calcium tests gave the following readings (in mg/dl). [Note: Assume that original distribution is normal] 5

9.3 8.8 10.1 8.9 9.4 9.8 10.0 9.9 11.2 12.1

(i) Find the sample mean and sample variance.

(ii) Find a 99.9% confidence interval for the population mean of total calcium in this patients blood. [Take $t_{0.999} = 4.781$]

(iii) Do you think the patient still has a calcium deficiency?

3B. A consulting firm in Goa rents bikes from three agencies, 20% from agency D, 20% from agency E and 60% from agency F. If 10% of the bikes from D, 12% of the bikes from E and 4% bikes from F have bad tires, what is the probability that the firm will get a bikes with bad tires? 3

3C. Write the following inequalities: 2

i. Chernoff Bound.

ii. Markov inequality.

iii. Chebyshev's inequality.

4A. A juice center in the MIT college campus near KC has been having average sales of 500 glasses per day. Due to the construction of new hostel block, increase in sales is expected. During the first 12 days after the start of the new hostel, the daily sales were as under: 5

550, 570, 490, 615, 505, 580, 570, 460, 600, 580, 530, 526

On the basis of this sample information, can one conclude that juice center sales have increased significantly due to the new hostel built? Use 5 per cent level of significance.

4B. Customers arrive at MIT cafeteria according to Poisson process with a mean of 4 customer per 30 minutes. Generate a random variate, N, which represents the number of arriving customers during 1 hour time slot. Select random numbers from the given sequence: 3

0.4377, 0.1806, 0.1508, 0.1502, 0.1202, 0.0955, 0.0146, 0.1567, 0.0089

4C. Is it possible to approximate binomial distribution using normal distribution. Justify your answer. 2

5A. Fit the data given below using simple linear regression. Predict the value of y when x = 200. 5

X :	10	15	40	25	60	110	12	43	30	50
Y :	25	35	85	55	125	225	29	91	65	105

5B. Develop a random variate generator for a random variable X with the pdf 3

$f(x) = 1/3 \quad 0 \le x \le 2$

$f(x) = 1/24 \quad 2 < x \le 10$

$f(x) = 0 \quad$ Otherwise

Also generate two random variates by taking $R_1 = 0.5$ and $R_2 = 0.8$.

5C. State central limit theorem. 2

6A. A Company insures homes in three cities, J, K, L. The losses occurring in these cities are independent. The moment-generating functions for the loss distributions of the cities are $M_J(t) = (1-2t)^{-3}$, $M_K(t) = (1-2t)^{-2.5}$, $M_L(t) = (1-2t)^{-4.5}$. Let X represent the combined losses from the three cities. Calculate E[X] and Var[X]. 5

6B. What is random walk? Suppose a drunkard do random walk (1D case) from the origin O, calculate the expected distance of the drunkard from the origin O after n steps. 3

6C. It is known that expected number of steps that a probabilistic algorithm A takes is *n*. By choosing appropriate value for δ prove that probability of algorithm A taking more than $(1+\delta)n$ steps is less than or equal to $1/n$. 2