Reg. No.										

MANIPAL INSTITUTE OF TECHNOLOGY, MANIPAL 576104

(Constituent College of Manipal University)

SIXTH SEMESTER B.Tech. (IT & CCE) DEGREE MAKE UP EXAMINATION, JULY – 2016
SUBJECT: ELECTIVE – I: STATISTICAL ANALYSIS AND APPLICATIONS – ICT 322
(REVISED CREDIT SYSTEM)

TIME: 3 HOURS **04/ 07/2016** **MAX. MARKS: 50**

Instructions to candidates

Answer any **FIVE FULL** questions.
Missing data, if any, may be suitably assumed.

1A. Using Kolmogorov Smirnov test check whether the following random number are uniformly distributed. Given that $D_{0.05} = 0.410$

0.44 0.81 0.65 0.75 0.57 0.98 0.15 0.35 0.26 0.07

1B. Deduce Chebyshev's inequality using Markov inequality.

1C. A police department needs new tires for its patrol cars and probabilities with 0.35, 0.15, 0.3 and 0.2 that it will buy JK tires, Apollo tires, CEAT tires or MRF tires. Find the probabilities that it will buy

i) JK tires or Apollo tires

ii) CEAT tires or MRF tires

[5+3+2]

2A. Explain acceptance rejection technique for generating random variate X, which is uniformly distributed between ¼ and 1.

2B. It is known that expected number of steps that a probabilistic algorithm A takes is $\boldsymbol{n}$. By choosing appropriate value for $\boldsymbol{\delta}$ (using Chernoff bound) prove that probability of algorithm A taking more than $\boldsymbol{(1+\delta)n}$ steps is less than or equal to $\boldsymbol{1/n}$.

2C. State total probability theorem and Bayes' theorem

[5 + 3 + 2]

3A. Test whether the 3rd, 8th, 13th, and so on, numbers in the following sequence are auto correlated. Given that $Z_{0.025} = 1.96$.

0.12 0.01 0.23 0.28 0.89 0.31 0.64 0.28 0.83 0.93
0.99 0.15 0.33 0.35 0.91 0.41 0.60 0.27 0.75 0.88
0.68 0.49 0.05 0.43 0.95 0.58 0.19 0.36 0.69 0.87

3B. Find random variate generator for geometric distribution with pmf $p(x) = p(1-p)^x$, x=1, 2, …… Also find a geometric random variate when p = ½ and R = 0.932.

3C. Human error is given as the reason for 75% of all accidents in a plant. Find the probability that human error will be given as the reason for two of the next four accidents.

[5 + 3 + 2]

4A. Total calcium level below 6mg/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]

9.3 8.8 10.1 8.9 9.4 9.8 10.0 9.9 11.2 12.1

(a) Find the sample mean and sample variance.

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

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

4B. If 0.8% of the fuses delivered to an arsenal are defective, use the Poisson approximation to determine the probability that 4 fuses will be defective in a random sample of 400.

4C. Find the maximum period of linear congruential generator with m=8, a=5, $X_0 = 10$ and c=7

[5 + 3 + 2]

5A. The number of inches which a newly built structure is settling into the ground is given by

$\boldsymbol{y = \beta e^{-\alpha x}}$, where x is its age in months

x	2	4	6	12	18	24
y	1.07	1.88	2.26	2.78	2.97	2.99

Use the method of least squares to estimate α and β and predict the value of y when x = 30.

5B. If two random variables have the joint density

$f(x, y) = 6 (x + y^2) /5$ for $0 < x < 1, 0 < y < 1$; and

$f(x, y) = 0,$ Otherwise

i) Find the probability that $0.2 < X < 0.5$ and $0.4 < Y < 0.6$

ii) Find an expression for $f_1(x|y)$ for $0 < y < 1$

5C. Is it possible to approximate binomial distribution using normal distribution? Justify your answer.

[5 + 3 + 2]

6A. A statistical analysis and application exam has been given for several years with an average score of 80 and a standard deviation of 7. If 25 poor students taught with special emphasis on reading skill, obtain a mean grade of 83 on the examination. Is there reason to believe that the special emphasis changes the result on the test? Use 5 percent of significance level.

6B. Given the moment-generating function $M_X(t) = \exp \wedge (3t+8t^2)$ of a random variable X. Find the mean and variance of $Z = 1/4 (X – 3)$

6C. State the central limit theorem.

[5 + 3 + 2]