BANAGA BANDHU SHEIKH MUJIBUR RAHMAN SCIENCE AND TECHNOLOGY UNIVERSITY
DEPT. OF COPMUTER SCIENCE AND ENGINEERING

MARKS: 70 STA206: THEORY OF STATISTICS TIME: 3 Hr

Answer any three from each section on separate script marked A and B.

Section-A

A1. a) What do you understand by orthogonal transformation and linear orthogonal transformation? Find the ~~management~~ moment generating function of chi square (χ^2) distribution. 6

b) State and prove Fisher's lemma. $5\frac{2}{3}$

A2. a) Write the form of χ^2 distribution. 2

b) Derive the χ^2 distribution. Also find its mean. $4\frac{2}{3}$

c) What are the characteristics of χ^2 distribution. 3

A3. a) Write the form of 't' distribution. Find mean and variance of 't' distribution. 7

b) Write down application and characteristics of 't' distribution. $4\frac{2}{3}$

A4. a) Define F-variate. Mention some useful application of F-distribution. 5

b) Find the mean and variance of F-distribution. $6\frac{2}{3}$

Section B

B1 a) What do you mean by un-biasness and efficiency? 3

b) Suppose $x_1, x_2, x_3 \ldots\ldots x_n$ be random sample is drawn from a normal population with mean μ and variance σ^2. Find the MLE of μ and σ^2 $5\frac{2}{3}$

c) Find the maximum likelihood estimate for the parameter λ of a Poisson distribution on the basis of a sample size n. 3

B2. a) For 2x2 contingency table prove that chi-square test of independence gives $\chi^2 = \frac{N(ad-bc)^2}{(a+c)(b+d)(a+b)(c+d)}$; N=a+b+c+d . $5\frac{2}{3}$

b) To find whether a certain vaccination prevents a certain disease or not, an experiment was conducted and following figure in various classes were obtained, A showing vaccination and B attacked by the disease. 3

	A	α	Total
B	69	10	79
β	91	30	121
Total	160	40	200

Using χ^2 test, analyze the result of the experiment for independence between A and B.

c) How can you test the significance of an observed sample correlation coefficient? 3

B3. a) Describe the procedure of test for testing the significance of the difference between the two sample mean. $4\frac{2}{3}$

b) Sample of two type Electric light bulbs were tested for length of life and following data were obtained: 3.5

	Type I	Type II
Sample No	n_1=8	n_2=7
Sample Mean	$\overline{x1}$=1234 hrs	$\overline{x2}$=1036 hrs
Sample S.D.'s	s_1=36 hrs	s_2=40 hrs

Is the difference in the means sufficient to warrant that type I is superior to type II regarding length of life?

c) A sample of 15 students are selected from a group of 100 students and their grade in H.S.C examination is recorded as follows: 3.5

Students	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Grade	B	C	A	D	B	C	D	A	B	C	D	B	C	C	D

Do you think 10% student get grade A?

B4. a) What is nonparametric test? Distinguish between parametric and nonparametric test. 5

b) Describe the procedures of run for testing randomness. $3\frac{2}{3}$

c) The appearance transit for 11 patients with significantly occluded right coronary arteries are as follows: 3

Patients No:	1	2	3	4	5	6
Transit Time(sec)	1.80	3.30	5.65	2.25	2.50	3.50
Patients No:	7	8	9	10	11	
Transit Time:	2.75	3.25	3.10	2.70	3.00	

Can we conclude that at 5% level of significance, median appearance transit time in the population from which the sample was drawn is 3.50 seconds?