T.E. Sem 5 (Rev.) Etrx & EXTC. Applied Maths 5 07/01/09

323/p3/ksl/upq/oct 012/2kl

Con. 5950-08. **(REVISED COURSE)** **RC- 6428**

(3 Hours) **[Total Marks : 100**

N. B. : (1) Question No. **1** is **compulsory**.
(2) Answer any **four** out of remaining **six** questions.
(3) Assume any **suitable** data whenever **required** and justify the **same**.
(4) Answers to the questions should be **grouped** and written **together**.

1. (a) Prove that $-1 \leq r \leq 1$ where r is Karl Pearsons coefficient of correlation. 5

(b) A continuous random variable x has p.d.f defined by $f(x) = A + Bx$, $0 \leq x \leq 1$. If the mean of the distribution $\frac{1}{3}$ find A and B. 5

(c) Let G be the set of all non-zero real numbers and let $a * b = \frac{ab}{2}$. Show that $(G, *)$ is an Abelian Group. 5

(d) A sample of 100 students is taken from a large population. The mean height of the students in this sample is 160 cm. Can it be reasonably regarded that, in the population, the mean height is 165 cm ? and s.d. is 10cm. 5

2. (a) Obtain Mean and Variance of Binomial distribution. 6

(b) The p.d.f f(x) for a random variable x is given by— 7

$$f(x) = 0 \quad ; \quad x < 0$$
$$= C(3x - x^2) \quad ; \quad 0 \leq x \leq 3$$
$$= 0 \quad ; \quad x > 3$$

Find (i) C (ii) Mean (iii) Variance

(c) Show that the set { 0, 1, 2, 3, 4 } is a ring w.r.t addition and multiplication of modulo 5. 7

3. (a) Calculate the correlation coefficient and rank correlation coefficient for the following height in inches of father (x) and their sons (y). 10

X	65	68	70	69	72	68	63	71	63	60	73	75
Y	28	30	32	31	27	33	32	35	32	29	26	34

(b) Using Warshall's algorithm find the transitive closure of the relation. 5
$R = \{ (a, a), (a, b), (b, c), (c, d), (c, e), (d, e) \}$ on $A = \{ a, b, c, d, e \}$

(c) In the normal distribution 30% items are under 45 and 8% are above 64. Find mean and s.d. of the normal distribution. 5

4. (a) In an experiment of immunisation of Cattle from Tuberculosis the following results were obtained. 7

	Affected	Not Affected
Inoculated	267	27
Not inoculated	757	155

use χ^2 test to determine the efficiency of vaccine in preventing tuberculosis ($\chi^2 = 3{\cdot}84$).

(b) Let R be the relation on the set A = { 2, 3, 4, 6, 8, 12, 36, 48 } defined by R = { (a, b) | a is advisor of b } then show the diagraph and Hasse diagram. 7

(c) Fit a Poisson distribution to the following 6

x	0	1	2	3	4	5	6	7
f (x)	15	30	28	14	8	4	0	1

and hence find β_1 and β_2.

5. (a) In a normally distributed group of 450 students with mean 42 and s.d. 8. Find the percentage and the number of students scoring (i) between 48 and 52 (ii) more than 60 (iii) Less than 40. 6

(b) The two lines of regression are given by $x + 2y = 5$ and $2x + 3y = 8$. Calculate 7

(i) the mean value of x and y

(ii) the coefficient of correlation

(iii) ratio of the regression coefficient.

(c) Let the functions f and g are defined as 7

$f : R \longrightarrow R ; f(x) = 4x - 3$

$g : R \longrightarrow R ; g(x) = x^2 + 1$

Find (i) fog (ii) gof (iii) fofog (iv) f^{-1}.

6. (a) Two independent samples of 8 and 7 items respectively had the following values. 6

Sample I	9	11	13	11	15	9	12	14
Sample II	10	12	10	14	9	8	10	

is the difference between the means of samples significant.

(b) First four moments about origin are 0·0375, 0·4546, 0·0609, 0·5074 respectively. Find (i) first four moments about mean (ii) β_1, β_2, γ_1 and γ_2 7

(c) If R is set of real numbers and o_1 and o_2 are two operations defined on R as a o_1 b = a + b – 5 and a o_2 b = 5 P.T (R, O_1, O_2) is commutative ring. Has it divisor of Zero ? 7

7. (a) Fit a second degree parabola to the following data taking x as the independent variable. 7

x	1	2	3	4	5	6	7	8
y	2	6	7	8	10	11	11	10

(b) Define (i) Lattice (ii) Distributive Lattice (iii) Complemented Lattice. Draw the Hasse diagram of D_{20}, the Lattice of divisiors of 20 ordered by divisibility. Is D_{20} complemented ? 7

(c) (i) The mean of binomial distribution is 6 and its s.d. is 4. Is it true or false with proper justification. 3

(ii) Define (i) Sampling
(ii) Type I and Type II errors. 3