[This question paper contains 4 printed pages.]

Sr. No. of Question Paper : 192 **G** **Your Roll No.....**

Unique Paper Code : 237351

Name of the Paper : Statistical Methods – II

Name of the Course : **B.A. (Program) Statistics**

Semester : III

Duration : 3 Hours Maximum Marks : 75

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **Six** questions in all.
3. Q. No. **1** is compulsory.
4. Simple calculator can be used.
5. Attempt **Five** more questions.

1. (a) Fill in the blanks :

(i) χ^2-distribution reduces to negative exponential distribution for ... d.f..

(ii) If χ_1^2 and χ_2^2 are two independent Chi-square variates with n and m d.f., respectively then $\frac{\chi_1^2}{\left(\chi_1^2+\chi_2^2\right)} \sim \ldots$.

(iii) Variance of a t distribution with n d.f. is _____ .

(b) Examine the consistency of the following data :

$(A) = 450$, $(B) = 600$, $(AB) = 300$, $N = 1000$; the symbols having the usual meaning.

(c) If $X \sim F(n, m)$, then show that $(1/X) \sim F(m, n)$.

P.T.O.

(d) Let X, Y, Z, W be i.i.d. $N(0,\sigma^2)$ variates and define $T = \frac{k(X+Y)}{\sqrt{Z^2}} + W^2$.

For what values of k, $T \sim t_n$? Find n as well.

(e) Find the Mean of $X \sim \chi^2_{(n)}$. (3×5)

2. (a) Calculate the coefficient of association between extravagance in fathers and sons from the following data :

Extravagant fathers with Extravagant sons = 327

Extravagant fathers with Miserly sons = 545

Miserly fathers with Extravagant sons = 741

Miserly fathers with Miserly sons = 234

Also tabulate for comparison the frequencies that would have been observed had there been no heredity.

(b) Show that

$(AB)^2 + (\alpha\beta)^2 - (\alpha B)^2 - (A\beta)^2 = [(A) - (\alpha)][(B) - (\beta)] + 2N\delta$,

the symbols having the usual meaning. (6,6)

3. (a) Discuss the test of significance for difference of proportions of two independent samples, when the sample sizes are large.

(b) In a locality, 100 persons were randomly selected and asked about their education achievements. The results were given below :

	Middle	High school	College
Male	10	15	25
Female	25	10	15

Compute the statistics you would use to test whether the education pattern varies with sex. Also state how you would proceed further. (6,6)

4. (a) State and prove the sampling distribution of Student's t. Who discovered it ?

(b) For t-distribution with n *d.f.* show that :

$$\mu_{2r+1} = 0$$

and $$\mu_{2r} = n^r \frac{\Gamma\left(\frac{n}{2} - r\right)\Gamma\left(r + \frac{1}{2}\right)}{\Gamma\left(\frac{1}{2}\right)\Gamma\left(\frac{n}{2}\right)}; \; r = 0, 1, 2, \ldots.$$ (6,6)

5. (a) If X is chi-square variate with nd.f., then prove that for large n,

$$\sqrt{2X} \sim N\left(\sqrt{2n}, 1\right)$$

(b) The frequency distribution of the digits on a set of random numbers was observed to be :

Digits	0	1	2	3	4	5	6	7	8	9
Frequency	18	19	23	21	16	25	22	20	21	15

Is this result consistent with the hypothesis that the digits are uniformly distributed ? (6,6)

6. (a) Show that for a t-distribution with n d.f., mean deviation about mean is given by : $\sqrt{(n}\Gamma[(n-1)/2])/\sqrt{\pi}\Gamma(n/2)$.

(b) Two kinds of manure were applied to sixteen one-acre plots, other conditions remaining the same. The yields (in quintals) are set out below :

Manure I : 18, 20, 36, 50, 49, 36, 34, 49, 41

Manure II : 29, 28, 26, 35, 30, 44, 46

Examine the significance of the difference between the mean yields due to the application of different kinds of manures. (6,6)

7. (a) Find mean, variance and coefficient of variation of F distribution with n and m d.f..

P.T.O.

(b) The following random samples are measurements of the heat-producing capacity (in millions of calories per ton) of specimens of coal from two mines :

Mine 1 : 8,260 8,130 8,350 8,070 8,340

Mine 2 : 7,950 7,890 7,900 8,140 7,920 7,840

Is it reasonable to assume that the variances of the two populations sampled are equal ? (6,6)

8. Write short notes on **(any two)** :

(a) Yates correction for continuity.

(b) Applications of t – distribution.

(c) Relation between F and χ^2 distribution. (6,6)