Roll No.

S. No. of Question Paper : **302**

Unique Paper Code : **237651**   E

Name of the Paper : **Sample Survey and Design of Experiments**

Name of the Course : **B.A. (Programme) Statistics–Discipline Course**

Semester : **VI**

Duration : **3 Hours**   Maximum Marks : **75**

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt *Five* questions in all, selecting *two* from Sections A and B each and *one* from Section C. Use of simple calculator is allowed.

Section A

1. (*a*) What are the advantages and disadvantages of sample surveys over complete enumeration ? Discuss the *three* basic principles of sample surveys.

   (*b*) The following table gives ten random numbers each of two digits :

43	69	16	58	94	87	05	20	27	13

   Obtain the serial numbers of 5 plots to be selected out of 40 plots without replacement.

(c) Define simple random sampling without replacement from a finite population. Derive the unbiased estimator of the population mean and find its sampling variance.   5,4,7

2. (a) Describe the methods of allocating a sample to different strata. Obtain the variance of the estimate of the population mean under each allocation and compare them. Also compare them with simple random sampling.

(b) In a finite population of size N, show that the systematic sampling will be more efficient than srswor if the intraclass correlation coefficient.

$$\rho = -1/(N - 1).$$ 8,8

3. (a) Explain ratio and regression methods of estimation. Which estimator is generally more efficient and why ? Derive the condition under which two estimators will have equal variances.

(b) Prove that if clusters are formed at random, cluster sampling is as efficient as simple random sampling without replacement.   8,8

Section B

4. (a) Describe the technique of analysis of variance, clearly mentioning the assumptions for its validity.

(b) The response time (in milliseconds) was determined for three different types of circuits in an electronic calculator. The results are recorded here :

Circuit Type	Response				
1	19	22	20	18	25
2	20	21,	33	27	40
3	16	15	18	26	17

Using $\alpha = 0.01$, test the hypothesis that the three circuits types have the same response time.

(c) In two-way classification with one observations per cell, show that the mean square error provides an unbiased estimate of error variance. 4,6,6

5. (a) Define LSD. Estimate a missing value in LSD.

(b) Derive the analysis of covariance for CRD with one concomitant variable. 7,9

6. (a) Describe, briefly, the basic principles of experimentation.

(b) What is Experimental error ? How does the use of local control help in minimizing experimental error in design of agricultural experiments ?

(c) The following table gives the results of the Latin Square Experiment on the effects of the four manurial treatments on the yield of the sugarcane. Test whether the treatments are equally effective. If not, compare A and B.

A	12	C	19	B	10	D	8
C	18	B	12	D	6	A	7
B	22	D	10	A	5	C	21
D	12	A	7	C	27	B	17

5,5,6

Section C

7. (a) Discuss "Price Statistics" in India with reference to its need and importance.

(b) How are Agricultural Statistics of area and yield collected in India ? Describe two common defects in Indian Agricultural Statistics. 5,6

8. (a) Discuss the nature, scope and limitation of the "Industrial Statistics" in India.

(b) Describe in brief the functions of the CSO and name any *five* of its publications. 6,5