2055
B.A./B.Sc. (General) Fourth Semester
Statistics
Paper-203: Sample Surveys, Design and Analysis of Experiments

Time allowed: 3 Hours   Max. Marks: 65

NOTE: *Attempt five questions in all, including Question No. I which is compulsory and selecting two questions from each Unit. Use of simple non-programmable calculator is allowed. Statistical tables and log tables will be provided on request.*

x-x-x

1. Answer briefly the following:
    (a) Why is stratified sampling considered more efficient than simple random sampling?
    (b) What are the advantages of sampling over a census?
    (c) What is a mixed-effect model, and how does it differ from fixed and random effects?
    (d) What is the difference between one-way and two-way ANOVA?
    (e) Define Experimental Unit.

                                                                  (3, 3, 3, 2, 2)

UNIT - I

2. Explain simple random sampling (SRS) in detail. Explain the methods for selecting a random sample with and without replacement? Discuss the differences between these methods and derive the formulas for estimating the population mean in both cases.

                                                                         (13)

3. What are sampling errors and non-sampling errors? How do they impact the precision of survey outcomes? Describe their causes with examples and recommend measures to minimize such errors in a survey.   (13)

4. Explain stratified random sampling and why it is useful. Derive the formulas for proportional, equal, and optimum allocation. Compare their efficiency and explain which method is best in different situations.   (13)

5. (a) How does increasing the sample size improve the accuracy and precision of an estimate?
    (b) Define the three main principles of sample surveys.
    (c) What is systematic sampling? Explain how to select a sample using this method.
                                                                      (4, 5, 4)

UNIT - II

6. Write the ANOVA model for analyzing a one-way classification of data. Provide a complete analysis, derive the expectation of various sum of squares, and construct the ANOVA table. (13)

7. Explain two-way ANOVA for (i) one observation per cell and (ii) multiple but equal observations per cell. Describe the ANOVA model, construct the ANOVA table, and discuss the importance of interaction effects. (13)

8. Explain the need for the design of experiments. Discuss the three fundamental principles of experimental design with suitable examples. (13)

9. What is a Latin Square Design (LSD)? Explain its structure, model, and method of analysis. Compare LSD with RBD in terms of efficiency. (13)

x-x-x