

Time allowed: 3 Hours

Max. Marks: 65

NOTE: Attempt five questions in all, including Question No. 1 which is compulsory and selecting atleast two questions from each Section.

x-x-x

1. (i) Distinguish between convenience sampling and judgment sampling.
- (ii) Describe the method for computing sample size in SRSWOR.
- (iii) What is the difference between replication and repetition in design of experiment?
- (iv) How many degrees of freedom are there for error sum of square in two-way analysis of variance with one observation per cell. Justify your answer.
- (v) What do you mean by Experimental error? (2, 3, 3, 3, 2)

Section I

2. (a) Discuss sampling and non sampling errors. How will you optimize sampling and non sampling errors.
- (b) What are the advantages of sample survey over complete enumeration? Explain main steps involved in the planning and execution of large scale survey. (4,9)
3. How does simple random sampling without replacement differ from simple random sampling with replacement? Which of them gives a lower value of the standard deviation of the sample mean? Explain by considering samples of two from a population consisting of the five numbers 2, 3, 6, 8, 11. (4,9)
4. Explain Systematic sampling. Propose an estimate of population total under this scheme. Also prove that $V(\bar{y}_{sy}) = \frac{nk-1}{nk} \frac{S^2}{n} [1 + (n-1)\rho]$, where ρ is the intra class correlation between the units of the same systematic sampling. Derive the condition under which it is more efficient than simple random sampling. (13)
5. (a) Define stratified random sampling. Propose an unbiased estimator of population mean under stratified sampling scheme and derive the variance of this estimator.
- (b) Show that $\text{var}(\bar{y})_{SRSWR} > \text{var}(\bar{y}_{st})_{PA} > \text{var}(\bar{y}_{st})_{OA}$. (7,6)
 PA - Proportional Allocation
 OA - optimum Allocation

Section II

6. (a) Discuss one-way analysis of variance stating the underlying model used, analysis and its assumptions.
- (b) Distinguish between fixed effects model and random effects model in Analysis of variance. (8,5)
7. (a) What is the difference between 'variability within classes' and 'variability between classes'? Explain giving suitable example.
- (b) Explain in detail two-way analysis of variance with m observations per cell. State the underlying model used, hypothesis and assumptions. (5,8)
8. Explain the three basic principles of design of experiments. What is Randomized Block design? Write down its underlying model and analysis. Also find its efficiency over complete randomized design. (13)
9. (a) What is Latin square design? Give the skeleton analysis of variance table for the Latin square design.
- (b) Find the efficiency of Latin square design over randomized block design. (9,4)