

FIRST SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2024
(Regular/Improvement/Supplementary)
STATISTICS
FMST1C04- SAMPLING THEORY

Time: 3 Hours**Maximum Weightage: 30****Part A: Answer any *four* questions. Each carries *two* weightage.**

1. Explain probability sampling and non-probability sampling. Give examples.
2. What are the two regression estimators used in stratified sampling? Discuss.
3. Define two-stage sampling. Find an unbiased estimator of population mean in this method.
4. What is meant by proportional allocation? Derive $V(\bar{y}_{st})$ under this allocation.
5. Distinguish between ordered estimator and unordered estimator.
6. Explain pps sampling. How it is different from SRS?
7. Write a short note on non-sampling errors.

(4 × 2 = 8 weightage)

Part B: Answer any *four* questions. Each carries *three* weightage.

8. What is SRSWOR? Derive the variance of an unbiased estimator of population proportion under this method.
9. Derive the variance of the regression estimator of population mean. Also find situation where this variance is minimum.
10. If the population consists of linear trend, compare stratified sampling and systematic sampling.
11. What is optimum allocation? Suggest a method to find sample size in each stratum under this allocation method.
12. Derive Murthy's unordered estimator of population total. Show that it is unbiased.
13. Explain Lahiri's method of selection in probability proportional to size sampling.
14. Obtain 2 unbiased estimators of population mean in cluster sampling with unequal cluster sizes and find their variances.

(4 × 3 = 12 weightage)

Part C: Answer any *two* questions. Each carries *five* weightage.

15. a) In SRSWOR, prove that the probability of selecting a specified unit of the population at any given draw is same as the probability of it being selected at the first draw.
b) In a linear systematic sampling, find the variance of systematic sample mean and compare it with SRSWOR.
16. With usual notations, in stratified sampling, prove that $V_{opt} \leq V_{prop} \leq V_{srs}$.
17. Define Horvitz Thompson estimator for population total and derive the variance of it. Also derive the variance of Yeates-Grundy form of it.
18. Explain cluster sampling and find an unbiased estimator of population mean in this method. Also derive the variance of this estimator and compare it with SRS.

(2 × 5 = 10 weightage)