



M 23119

Reg. No. :

Name :

II Semester M.A./M.Sc./M.Com. Degree (Reg./Sup./Imp.)

Examination, March 2013

STATISTICS

Paper – 2.2 : Sampling Theory

Time: 3 Hours

Max. Marks: 70

- Instructions :** i) Answer **five** questions without omitting **any** Unit.
ii) **All** questions carry **equal** marks.

UNIT – 1

- I. a) Distinguish between probability sampling and non-probability sampling. Give an example in each case.
b) Show that in SRSWOR, the probability of drawing a specified population unit at the s^{th} draw is equal to the probability of drawing it at the first draw.
- II. a) What is an unbiased estimator of population total in
i) SRSWR
ii) SRSWOR ?

Derive an expression for variance of the estimator you suggested.

- b) If (X_i, Y_i) are pairs of values associated with i^{th} unit in the population of size N and \bar{x}, \bar{y} are their sample means based on a SRSWOR of size n , prove that

$$\text{Cov}(\bar{x}, \bar{y}) = \frac{N-n}{Nn} \frac{1}{N-1} \sum_{i=1}^N (x_i - \bar{X})(y_i - \bar{Y}).$$

UNIT – 2

- III. a) What is allocation problem in stratified random sampling ? Derive Neyman's optimum allocation.
b) Describe various considerations involved in construction of strata.

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- IV. a) What is systematic sampling? Describe an unbiased estimator of population mean under this sampling scheme. Derive the variance of your estimator.
- b) Derive the precision of systematic sampling over SRSWOR and stratified random sampling in estimating population mean.

UNIT – 3

- V. a) Describe PPS sampling by listing its advantages over equal probability sampling. Explain a method of selecting a PPS sample with and without replacement.
- b) Explain Sen-Midzuno scheme of sampling.
- VI. a) Define Horvitz-Thomson estimator. Derive its variance.
- b) Describe π ps sampling design. Suggest estimator of population total and derive its variance under this scheme of sampling.

UNIT – 4

- VII. a) Obtain the approximate variance of the ratio estimator and compare this estimator with mean per unit estimator.
- b) Describe ratio estimators in stratified random sampling. Make comparison between them.
- VIII. a) Define regression estimator. Obtain the bias of regression estimator and its approximate variance.
- b) Compare the efficiency of linear regression estimator with ratio estimator and the mean per unit estimator.

UNIT – 5

- IX. a) What is cluster sampling? In cluster sampling with equal clusters write down the estimator of population mean and derive its sampling variance.
- b) For cluster sampling with equal size clusters, derive its efficiency with respect to SRSWOR using intra-class correlation coefficient.
- X. a) In two-stage cluster sampling with clusters of equal size, propose an unbiased estimator of population mean. Derive the variance of the proposed estimator.
- b) Distinguish between multistage and multiphase sampling.
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