

KL UNIVERSITY
M.Phil / PRE-Ph.D EXAMINATION
DEPARTMENT OF MATHEMATICS
SYLLABUS
PAPER-III SAMPLING THEORY

UNIT I- SIMPLE RANDOM SAMPLING

Simple Random Sampling, Selection of a Simple Random Sample, Definitions and Notations, Properties of the Estimates, Variances of the Estimates, Estimation of the Standard Error from A Sample, Confidence Limits, Random Sampling with Replacement, Estimation of a Ratio, Estimates of a Means over Sub Populations, Estimates of Totals Over Sub Populations, Comparison between domain Means, Validity of the Normal Approximation, Linear Estimators of the Population Mean.

UNIT II- STRATIFIED RANDOM SAMPLING

Description, notation, properties of the estimates, the estimated variance and confidence limits, optimum allocation, relative precision of stratified random and simple random sampling, stratification producing large gains in precision, allocation requiring more than 100 percent, estimation of sample size with continuous data, stratified sampling for proportions, estimation of sample size with proportions

UNIT III- RATIO ESTIMATORS: Methods of estimation, the ratio estimate, approximate variance of the ratio estimate, estimation of a variance from a sample, confidence limits, comparison of the ratio estimate is a best linear unbiased estimator, bias of the ratio estimate ,accuracy of the formulas for the variance and estimated variance, ratio estimates in stratified random sampling, the combined ratio estimate, comparison of the combined and separate estimates, short -cut computation of the estimated variance, optimum allocation with a ratio estimate, unbiased ratio type estimates, comparison of the methods, improved estimation of the variance, comparison of two ratios, multivariate ratio estimates, product estimators

UNIT IV- REGRESSION ESTIMATORS:The linear regression estimate , regression estimates with pre-assigned b, regression estimates when b is computed from the sample, sample estimate of variance. Large sample comparison with the ratio estimate and the mean per unit , bias of the linear regression estimate, the linear regression estimate under a linear regression model, regression estimates in stratified sampling, regression coefficients estimated from the sample, comparison of the two types of regression estimates

UNIT V- SYSTEMATIC SAMPLING :Description, relation to the cluster sampling, variance of the estimated mean, comparison of systematic with stratified random sampling, populations in "Random" order, populations with linear trend, methods for populations with linear trends, populations with periodic variation, auto-correlated populations, natural populations, estimation of the variance from a single sample, stratified systematic sampling, systematic sampling in two dimensions, summary

PRESCRIBED BOOK

SAMPLING TECHNIQUES by W.G. COCHRAN, Wiley, Third edition (CHAPTERS: 2,5,6,7,8)

Additional reading

Sampling theory by DES RAJ , McGraw Hill

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MODEL QUESTION PAPER
PAPER-III SAMPLING THEORY

1. a) Define Simple random sampling. Explain with illustrations the need for sampling in contrast to census.
b) Give an estimate of the population mean and its variance in the case of simple random sampling.
2. a) Describe the problems of optimum allocation in stratified sampling and discuss briefly merits and demerits of stratified sampling.
b) Obtain an unbiased estimate of the population mean and compare its efficiency with that of a simple random sampling.
3. a) Explain stratified sampling with continuous data and sampling for its proportions.
b) Explain gain in precision in stratified sampling for proportions.
4. a) What is meant by ratio estimator? State the assumptions of ratio estimator.
b) Derive approximate expressions for bias and MSE of the ratio estimators of the population total assuming SRSWOR for the units.
5. a) Show that under certain conditions to be stated, separate ratio estimator is better than combined ratio estimator.
b) Discuss the relative efficiency of ratio and regression estimates.
6. a) Define regression estimators and give an example of its application. Obtain an estimate of the bias of regression estimator for the population total.
b) What are the conditions under which the regression estimator is as BLUE?
7. a) Explain systematic sampling procedure with the help of an example.
b) Find the variance of the sample mean in terms of correlation coefficient between pairs of units that are in the same systematic sample.
8. a) Compare a systematic sampling with random sampling and also discuss when the estimator based on systematic sample is more precise.
b) Obtain an unbiased estimate of the population mean and compare its efficiency with that of a simple random sampling.