

**19P260**

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Name.....

Reg. No.....

**SECOND SEMESTER M.Sc. DEGREE EXAMINATION, APRIL 2020**

(CUCSS - PG)

**CC19P MST2 C08 - SAMPLING THEORY**

(Statistics)

(2019 Admissions - Regular)

Time: Three Hours

Maximum: 30 Weightage

**Part A**

Answer any *four* questions. Each question carries 2 weightage.

1. Distinguish between sampling and non-sampling errors.
2. Explain any method for selecting simple random sample without replacement scheme.
3. Describe the use of auxiliary information in sample surveys.
4. Briefly describe Horwitz-Thompson estimator.
5. What do you mean by double sampling?
6. Describe Durbin's  $\pi$ ps sampling.
7. What is systematic random sampling? State its advantages.

**(4 x 2 = 8 Weightage)**

**Part B**

Answer any *four* questions. Each question carries 3 weightage.

8. What is simple random sampling? Show that sample proportion is an unbiased estimator of population proportion based on a SRSWOR. Also derive an estimate of variance of sample proportion.
9. Explain linear and circular systematic sampling. Obtain unbiased estimator of population mean based on linear systematic sampling.
10. Define ratio estimator. Show that first approximation to the relative bias of ratio estimator in SRSWOR is,

$$\frac{B(\hat{R})}{R} \cong \frac{1-f}{n} (c_x^2 - \rho c_x c_y).$$

11. Define Midzuno-Sen scheme of sampling. Obtain the inclusion probabilities for the selection of individual and pairwise units.
12. Describe Desraj ordered estimator. Derive Desraj ordered estimator for population mean.
13. Describe cluster sampling with equal and unequal clusters. Obtain the estimate of population mean and its variance under cluster sampling with equal clusters.
14. Describe multistage and multiphase sampling and its uses.

**(4 x 3 = 12 Weightage)**

### Part C

Answer any *two* questions. Each question carries 5 weightage.

15. (a) What is non-sampling error? Give any two sources of non-sampling error.  
(b) Let  $V_{ran}$ ,  $V_{prop}$  and  $V_{opt}$  be the variances of the usual estimators under simple random sampling, proportional allocation and optimum allocation for a given sample size. If  $N_h$  is large then show that  $V_{ran} \geq V_{prop} \geq V_{opt}$ .
16. (a) Show that under proportional allocation the unbiased estimator of population total and its variance is given by,
- $$\widehat{Y}_{st} = \frac{N}{n} \sum_{h=1}^L \sum_{j=1}^{n_h} y_{hj} \text{ and } V(\widehat{Y}_{st}) = \frac{N^2(N-n)}{Nn} \sum_{h=1}^L \frac{N_h}{N} S_h^2.$$
- (b) Compare stratified sampling, cluster sampling and two stage sampling.
17. (a) Explain Lahiri's method for selecting a PPS sample without replacement.  
(b) Show that Murthy's unordered estimator is more precise unbiased estimator compared to an unbiased ordered estimator.
18. (a) Define regression estimator. Give two types of regression estimators based on a stratified random sampling.  
(b) Give any two estimators of the population mean in two stage sampling where first stage units are unequal. Compare the efficiencies.

**(2 x 5 = 10 Weightage)**

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