LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **STATISTICS**

THIRD SEMESTER – **NOVEMBER 2022**

UST 3501 – SAMPLING THEORY

Date: 24-11-2022   Dept. No.   Max. : 100 Marks
Time: 09:00 AM - 12:00 NOON

SECTION – A

Answer ALL Questions.   **(10 x 2 = 20 Marks)**

1. What is meant by 'Sampling Frame'?

2. Explain the term 'Pretest' in sample survey.

3. In SRSWOR, if the sample size is increased, what will happen to V ($\bar{y}$)?

4. Compare V ($\bar{y}$) under SRSWOR and SRSWR.

5. Mention any two sources of non-sampling errors.

6. What is meant by Stratifying Factor? Mention some of the Stratifying Factors. Under what condition, Neyman allocation reduces to Proportional allocation?

7. Write all systematic samples of size '4' when the population size is '12'.

8. Find the probability of selecting a systematic sample containing 1st and 2nd population units when N = 12 and n = 4.

9. Describe the method of drawing a random sample by Random Number Tables Method.

10. Mention the merits of systematic sampling.

SECTION – B

Answer any FIVE Questions.   **(5 x 8 = 40 Marks)**

11. Write the advantages of sampling over complete census.

12. In SRSWOR, prove that (i) sample mean is unbiased for population mean and

    (ii) sample mean square is unbiased for population mean square.

13. In SRS of attributes, find E (p), Var (p), v (p), Var ($\hat{A}$), and v ($\hat{A}$).

14. Mention the merits and demerits of Stratified Random Sampling.

15. In stratified random sampling, obtain the formula for optimum allocation for fixed cost.

16. Compare V ($\bar{y}_{st}$), under optimum and proportional allocations.

17. Derive the formula for Var ($\bar{y}_{sys}$) in terms of S^2 and S^2_{wsy}.

18. Find the approximate bias and mean square error of the Ratio Estimator.

Answer any TWO Questions. **(2 x 20 = 40 Marks)**

19. Discuss in detail the principal steps involved in the planning and execution of a sample survey? **(20)**

20 (a) Prove that Var ($\overline{y_{srs}}$) ≥ Var ($\overline{y_{sys}}$) ≥ Var ($\overline{y_{st}}$), when the population is linear. **(12)**

(b) Discuss Circular Systematic Sampling and state its advantages. **(8)**

21 (a) Derive Var ($\bar{y}_{sys}$) in terms of population mean square S^2 and intra-class correlation coefficient ρ. **(10)**

(b) Write a brief note on the three types of sampling under which the sampling procedures are broadly classified. **(10)**

22(a) Write a note on the use of 'Auxiliary Information' in Ratio and Regression estimation. **(10)**

(b) In Stratified Random Sampling with given cost function

$C = a + \sum_{i=1}^{k} C_i \, n_i$, prove that Var ($\overline{y_{st}}$) is minimum if $n_i \propto \dfrac{N_i \, S_i}{\sqrt{C_i}}$. **(10)**

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