

Register Number:

DATE: 5-1-21

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BENGALURU-27
M.Sc. STATISTICS - I SEMESTER
SEMESTER EXAMINATION – JANUARY 2021
STA: 7120–SAMPLING THEORY AND STATISTICS FOR NATIONAL
DEVELOPMENT

Time: 2 ½ hrs

Max: 70 Marks

This question paper has **TWO** printed pages and **TWO** parts

SECTION – A

I Answer any SIX of the following:

6 x 3 = 18

1. In SRS, derive the variance of unbiased estimator for population proportion.
2. In the Lahiri's scheme, with usual notations, prove that the probability of selecting i^{th} population unit into the sample is $P_i = \frac{X_i}{X}$
3. Explain the rationale behind PPS sampling with an illustration.
4. In stratified random sampling, suggest an unbiased estimator for the population mean and justify your answer.
5. Suggest an unbiased estimator for the population mean when clusters are of unequal size and justify your answer.
6. Derive the expression for the bias of the ratio estimator of population total in SRSWOR scheme.
7. For a predefined regression coefficient, verify whether the estimator of the population mean is unbiased.
8. Discuss Hansen-Hurwitz technique for reduction of bias.
9. Explain GDP as a yard stick of economic prosperity.

SECTION – B

II Answer any FOUR of the following:

4 x 13 = 52

10. A) In SRSWOR, with usual notations, prove that sample variance s^2 is unbiased for population variance S^2 . (6)
- B) With usual notations prove that $V_{opt} \leq V_{prop} \leq V_{ran}$. (7)

11. A) Obtain an estimator of the gain in efficiency due to PPSWR as compared to SRSWR, based on a PPS sample. (6)
B) Discuss the Warner's model in addressing randomized response. (7)
12. A) In circular systematic sampling prove that sample mean is unbiased for population mean. (6)
B) In two-stage sampling, propose an estimator for the population total and obtain its variance. (7)
13. A) In sampling for clusters of equal size, obtain the variance of the estimator of the population mean. (6)
B) In two-stage sampling, obtain an estimator for the variance $V(\hat{Y}_{TS})$. (7)
14. A) Assuming that regression coefficient is unknown, derive the bias of the regression estimator for the population mean. (6)
B) Compare the efficiencies of ratio and regression estimators of the population mean with that of SRS. (7)
15. A) Explain the exponential model to study the population growth. (6)
B) Explain different approaches for the estimation of national income. (7)