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Register Number:

DATE:04-03-2022

**ST. JOSEPH’S COLLEGE (AUTONOMOUS), BENGALURU-27**

M.Sc. STATISTICS - I SEMESTER

SEMESTER EXAMINATION: OCTOBER 2021

(Examination conducted in March 2022)

**ST 7321/7120 – 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. Develop the confidence interval for the number of units in the population that possess an attribute.
2. In the cumulative total method, with usual notations, prove that the probability of selecting $i$th population unit into the sample is $P\_{i}=\frac{X\_{i}}{X}$.
3. Distinguish between Des Raj estimator and Murthy’s estimator of order two of population total.
4. Describe two stage sampling.
5. Explain the need for ratio and regression estimators with an example.
6. Derive the expression for the bias the ratio estimator of population total in SRSWOR scheme.
7. Discuss Hansen-Hurwitz technique for reduction of bias.
8. Explain GDP as a yard stick of economic prosperity.

**SECTION – B**

**II Answer any FOUR of the following: 4 x 13 = 52**

1. A) Given the confidence coefficient and the margin of error In estimating the population total, determine the sample size under SRSWOR case. (6)

B) In two-stage sampling, propose an estimator for the population total and obtain its variance. (7)

1. A State the Sen Midzuno scheme. Show that the scheme ensures an unbiased estimator of the population mean (6)

 B) Define the Neyman allocation. Obtain the expression for the same. (7)

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1. A) Obtain an estimator of the gain in efficiency due to PPSWR as compared to SRSWR, based on a PPS sample. (6)

B) For a predefined regression coefficient, verify whether the estimator of the population mean is unbiased. (7)

1. A) In sampling for clusters of unequal size, obtain the variance of the estimator of the population mean. (6)
2. Assuming that regression coefficient is unknown, derive the bias and mean square error of the regression estimator for the population mean. (7)
3. A) In two-stage sampling, obtain an estimator for the variance $V\left( \overbar{y}\right)$ when SRSWR is adopted in both stages. (6)
4. Compare the efficiencies of ratio and regression estimators of the population mean with that of SRS. (7)
5. A) Explain the exponential model to study the population growth. (6)

 B) Discuss the Warner’s model in addressing randomized response. (7)

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