**0201N1441**

Candidate's Seat No :_____

**M.Sc. Sem.-1 Examination**

**404**

**Statistics**

**January-2024**

Time : 2-30 Hours]

[Max. Marks : 70

Note: Attempt all questions.

Q. 1

(i) Explain Stein's method for the determination of sample size. [7]

(ii)Explain the method of determination of sample size when E(L) is specified. [7]

OR

(i) Explain the cumulative total method of drawing a varying probability sample. [7]

(ii) Explain fixed relative standard error method for the determination of sample size. [7]

Q. 2

(i) Suggest an unbiased estimator of population total under ppswr. Obtain its variance and unbiased estimator of this variance. [7]

(ii) Explain Sen-Midzuno method. [7]

OR

(i) Explain gain due to ppswr sampling as compared to srs. [7]

(ii) Discuss Des Raj's estimator. [7]

Q. 3

(i) Suggest an unbiased estimator of population mean when a sample of n clusters of equal size is selected with srswr. Derive its variance and also obtain unbiased estimator of this variance. [7]

(ii) In usual notations show that [7]

$$V\left(\hat{\bar{Y}}_{uni-stage\ srs}\right) \leq V\left(\hat{\bar{Y}}_{two-stage\ sampling}\right) \leq V\left(\hat{\bar{Y}}_{cluster\ sampling}\right).$$

OR

(i) Define cluster sampling. Discuss its advantages and disadvantages. [7]

(ii) Suppose $n$ fsu's are selected with PPSWR and from each selected fsu, $m$ ssu's are selected with SRSWOR. Give an unbiased estimator of the population total $Y$ and derive its sampling variance. Also, obtain an unbiased estimator of this variance. [7]

Q. 4

(i) Define ratio estimator. Obtain the expressions for its bias and variance in case of ppswr. [7]

(ii) Discuss separate and combined regression estimators. [7]

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OR

(i) Discuss unbiased ratio type estimators. [7]

(ii) Define separate and combined ratio estimators. Explain, in what situation you will prefer combined ratio estimator instead of the separate ratio estimator. [7]

Q. 5 Answer any seven: [14]

(i) Define PPS sampling.

(ii) What do you mean by permissible error?

(iii) The ratio of the standard error of the estimator to the expected value of the estimator is known as

(A) variance      (B) relative standard error      (C) error      (D) none of the above

(iv) Which of the following is used to select a sample in pps sampling?

(A) Cumulative total method          (B) Lahiri's method

(C) Sen-Midzuno method          (D) all of the above

(v) In usual notations $\displaystyle\sum_{j(\neq i)=1}^{N} \pi_{ij}$ is equal to

(A) $(n-1)\pi_i$      (B) $(n+1)\pi_i$      (C) $(n+2)\pi_i$      (D) none of the above

(vi) In usual notations $\displaystyle\sum_{j(\neq i)=1}^{N} \left(\pi_{ij} - \pi_i \pi_j\right)$ is equal to

(A) $-\pi_i\left(1-\pi_i\right)$      (B) $\pi_i\left(1-\pi_i\right)$      (C) $-\pi_i\left(2-\pi_i\right)$      (D) none of the above

(vii) Define two stage sampling.

(viii) In usual notations, in cluster sampling, sampling efficiency is given by

(A) $E_s = \dfrac{1}{1+(M-1)\rho_c}$          (B) $E_s = \dfrac{1}{1+(M-2)\rho_c}$

(C) $E_s = \dfrac{1}{2+(M-1)\rho_c}$          (D) $E_s = \dfrac{M}{1+(M-1)\rho_c}$

(ix) In usual notations $\rho_c$ lies in the range

(A) $\{-1/(M-1)\}$ to 2          (B) $\{-2/(M-1)\}$ to 1

(C) $\{-3/(M-1)\}$ to 1          (D) $\{-1/(M-1)\}$ to 1

(x) Define regression estimator.

(xi) Give one application of ratio estimation.

(xii) In case data on an auxiliary variate for individual sampling units are not available, instead , aggregate value for all units of auxiliary variate is available, then one can rely on:

(A) pps sampling scheme          (B) stratified sampling scheme

(C) ratio method of estimation          (D) none of the above

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