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BSCSTC 252

Credit Based IV Semester B.Sc. Degree Examination, September 2022

(2019-20 and Earlier Batches)

STATISTICS

Sampling Theory (Paper – IV)

Time : 3 Hours

Max. Marks : 80

Instructions : 1) **Single** answer booklet containing **40 pages** will be issued.

2) **No additional** sheets will be **issued**.

PART – A

1. Answer **any ten** of the following :

(2×10=20)

- a) Define population and a sample.
- b) What do you mean by judgement sampling ?
- c) Define simple random sampling.
- d) Under SRSWR prove that $E(\bar{y}) = \bar{y}$.
- e) Prove that SRSWOR is more precise than SRSWR.
- f) List all possible samples of size three under SRSWOR from a population consisting of five units y_1, y_2, y_3, y_4 and y_5 .
- g) What is finite population correction ?
- h) Briefly explain the need for stratification.
- i) Describe optimum allocation in stratified random sampling.
- j) Under systematic sampling with usual notation prove that $E(\bar{y}_{\text{sys}}) = \bar{y}$.
- k) State any one advantage and disadvantage of systematic sampling.
- l) With usual notations prove that $E(p)=P$.

P.T.O.



PART – B

Answer **any five** of the following :

(6×5=30)

2. Explain census survey and sample survey.
3. Explain the method of drawing a random sample from a frequency table.
4. Show that under SRSWR, $E(s^2) = \sigma^2$.
5. Under SRSWOR prove that sample mean is an unbiased estimator of the population mean.
6. With usual notations, show that $V(\bar{y}_{st})$ is minimum for a fixed sample size n if $n_h \propto N_h S_h$.
7. Prove that $V(\bar{y}_{st})_{prop} \leq V(\bar{y})_{SRSWOR}$.
8. With usual notations, prove that systematic sampling is more efficient than simple random sampling if $S_{wsy}^2 > S^2$.
9. With usual notations, show that $V(p) = \frac{N-n}{N-1} \cdot \frac{PQ}{n}$.

PART – C

Answer **any three** of the following :

(10×3=30)

10. Explain the principal steps in a sample survey.
11. Show that $V(\bar{y}) = \frac{N-n}{Nn} S^2$ under SRSWOR.
12. Prove that in stratified random sampling with given cost function of the form $C = a + \sum c_i n_i$, $i = 1$ to k , $V(\bar{y}_{st})$ is minimum if $n_i \propto \frac{N_i S_i}{\sqrt{C_i}}$.
13. With usual notations prove that $V(\bar{y}_{sys}) = \frac{N-1}{N} \cdot S^2 - \frac{k(n-1)}{N} \cdot S_{wsy}^2$. Also compare $V(\bar{y}_{sys})$ with $V(\bar{y})_{SRSWOR}$.
