2015

(4th Semester)

STATISTICS

FOURTH PAPER

(Sampling Theory)

Full Marks : 55

Time : 2½ hours

(PART : B—DESCRIPTIVE)

(*Marks* : 35)

The questions are of equal value

UNIT—I

1. *(a)* What are the principal steps for conducting a sample survey? Explain any four of it.

Or

(b) Give the structure of statistical system in India. Write the objectives and functions of NSSO.

UNIT—II

2. *(a)* Define simple random sampling. Explain the two types of simple random sampling. Show that sample mean is an unbiased estimate of population mean.

Or

(b) Explain probability sampling. Prove that in SRSWOR, everyone of the possible samples ${}^{N}C_n$ has an equal chance $\frac{1}{{}^{N}C_n}$ of being selected in a sample. Write the different types of random number tables.

UNIT—III

3. *(a)* If finite population correction factor cannot be neglected, then show that

$$V(\bar{y})_{\text{SRS}} \geq V(\bar{y}_{\text{st}})_{\text{prop}} \geq V(\bar{y}_{\text{st}})_{\text{opt}}$$

Or

(b) Explain stratified random sampling. Discuss the merits and demerits of stratified random sampling.

UNIT—IV

4. *(a)* What do you understand by systematic sampling? Define the estimator $\bar{y}_{\text{sys}}$ in case of systematic sampling. Point out the merits and demerits of systematic sampling.

Or

(b) Distinguish between systematic sampling and cluster sampling. Show that a systematic sample mean is a more efficient estimator than a simple random mean in a population with linear trend.

UNIT—V

5. *(a)* Describe ratio method of estimation. Show that $\overline{Y}_R = \hat{k} \cdot \overline{X}$, where $\hat{k} = \frac{\overline{y}}{\overline{x}}$ is a biased estimator of population mean $\overline{Y}$ and $\overline{X}$. Obtain the expression of its mean square error.

Or

(b) What do you understand by regression method of estimation? Obtain the expression for the variance of the regression estimator of the population mean.

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(PART : A—OBJECTIVE)

(*Marks* : 20)

The figures in the margin indicate full marks for the questions

SECTION—I

(*Marks* : 5)

Tick (✓) the correct answer in the brackets provided : 1×5=5

1. National Sample Survey Organization (NSSO) was established in

(a) 1951 ( )

(b) 1950 ( )

(c) 1952 ( )

(d) 1953 ( )

2. The number of possible samples of size n out of N population units without replacement is

(a) ${}^{N}C_{n}$ ( )

(b) ${}^{n}C_{N}$ ( )

(c) N^{n} ( )

(d) $n!$ ( )

3. Stratified random sampling is a method of selecting a sample in which

(a) the sample is first divided into strata and then random samples are taken from each stratum ( )

(b) various strata are selected from the sample ( )

(c) the population is first divided into strata and the random samples are drawn from each stratum ( )

(d) None of the above ( )

4. In cluster sampling, the unit of sampling is

(a) individual ( )

(b) population ( )

(c) subgroups of the population based on characteristics not related to the research ( )

(d) naturally occurring groups ( )

5. Ratio estimator is

(a) an unbiased estimator ( )

(b) a biased estimator ( )

(c) an unbiased estimator but regression estimator is a biased estimator ( )

(d) None of the above ( )

SECTION—II

(*Marks* : 15)

Answer the following questions in brief : 3×5=15

1. Define sampling. Write the difference between sampling error and non-sampling error.

2. Show that in Simple Random Sampling Without Replacement (SRSWOR), the sample variance s^2 is an unbiased estimate of population variance σ^2, i.e., $E(s^2) = \sigma^2$.

3. Describe proportional allocation in stratified random sampling.

4. If the NM units in a population are grouped at random to form cluster of M units each, show that sampling n cluster with SRSWOR would have the same efficiency as sampling nM units with SRSWOR.

5. Prove that in SRSWR, the probability of selecting a specified unit at any given drawn is equal to the probability of drawing at the first drawn.

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