

6. (a) Describe present official statistical system in India.
List any two publications of MoSPI.

- (b) For a population with linear trend, show that

$$V(\bar{y}_{st}) \leq V(\bar{y}_{sys}) \leq V(\bar{y}_n)_{SRS}. \text{ (Notations have their usual meaning).} \quad (7, 8)$$

7. (a) Describe the advantages of a sample surveys in comparison over census. Write the circumstances under which census are preferred over sample surveys.

- (b) Write a brief note on the functions of CSO and National Statistical Commission. (6,9)

[This question paper contains 4 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 7413

J

Unique Paper Code : 2372573601

Name of the Paper : Survey Sampling

Name of the Course : B.A./B.Sc. (P) under NEP

Semester : VI

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll. No. on the top immediately on receipt of this question paper.
2. Attempt **six** questions in all.
3. **Question 1** is compulsory.
4. Attempt **any five** questions from the remaining questions.
5. Use of non-programmable Scientific Calculator allowed.

1. (a) Consider a population of 4 units with values 1, 2, 3, 4. Write all possible samples of size 2 (without replacement) from this population. Is the sample mean an unbiased estimator of population mean?
- (b) Describe the effect of sample size on sampling and non-sampling errors. List various sources of non-sampling errors.
- (c) Define simple random sampling with replacement (SRSWR). How does it differ from simple random sampling without replacement (SRSWOR)? Is SRSWOR better than SRSWR? If yes, then justify. (5,5,5)
2. (a) What are the main steps involved in conducting a sample survey? Discuss them briefly.
- (b) If (X_i, Y_i) , $i = 1, 2, \dots, N$ are the pairs of variates defined for every unit of the population of size N and $\bar{x}_n$ and $\bar{y}_n$ are the corresponding means of a sample of size n under SRSWOR, then prove that:

$$\begin{aligned} \text{Cov}(\bar{x}_n, \bar{y}_n) &= \frac{N-n}{Nn} \cdot \frac{1}{N-1} \sum_{i=1}^N (X_i - \bar{X}_N)(Y_i - \bar{Y}_N) \\ &= \frac{N-n}{n(N-1)} \text{Cov}(X, Y). \end{aligned} \quad (7,8)$$

3. (a) Discuss the difficulties in adopting the Neyman's allocation in a stratified sampling.
- (b) Show that in SRSWOR,

$$\text{Var}(\bar{y}_n) = \left(\frac{N-n}{nN}\right) S^2, \text{ where the symbols have their usual meanings.} \quad (7,8)$$

4. (a) Explain stratified random sampling. Prove that $\text{Var}(\bar{y}_{st})$ is minimum for fixed sample size, if $n_i \propto N_i S_i$ (Notations have their usual meaning).
- (b) In SRSWOR, prove that the sample mean square is an unbiased estimator of population mean square. (7, 8)
5. (a) Define systematic sampling and state the circumstances when it is most suitable. If $N \neq nk$, explain how systematic sampling is applied.
- (b) Describe the method of determining the sample size in case of simple random sampling so as to meet the desired margin of error and confidence coefficient, stating the assumptions made. (7,8)