

Unique Paper Code	:	32371302
Name of the Paper	:	Sample Survey and Indian Official Statistics
Name of the Course	:	B.Sc. (Hons.) Statistics under CBCS
Semester	:	III
Duration	:	3 hours
Maximum Marks	:	75 Marks

Instructions for Candidates

Attempt FOUR questions in all. All questions carry equal marks.

1. How does sampling without replacement differ from that with replacement? Which of them gives a lower value of the standard deviation of the sample mean? From a random sample of n units, a random sub-sample of m units is drawn without replacement and added to the original sample. Show that the mean based on $(n + m)$ units is an unbiased estimator of population mean, and obtain the ratio of its variance to that of the mean of the original n units assuming that the population size is large.
2. Give essential characteristics of stratified random sampling. Discuss, in detail, the various methods of allocating a sample in stratified sampling. If \bar{x}_i denotes the mean of a simple random sample of size n_i drawn from the i^{th} stratum having N_i units where $i = 1, 2, \dots, k$, then determine the weights a_i 's so that $\sum_{i=1}^k a_i \bar{x}_i$ is an unbiased estimator of the population total. Obtain its variance. What would be this variance if n_i 's were chosen proportional to N_i 's?
3. In a field of barley, the grain, y_i , and the grain plus straw, x_i , were weighted for each of a large number of sampling units located at random over the field. The total produce (grain plus straw) of the whole field was also weighted. The following data were obtained

C_x	C_y	ρ
1.053	1.063	0.696

Is the ratio method of estimation more efficient than sample mean to estimate total yield of barley? Give your answer with all assumptions and mathematical results. Also compute the percentage of gain in precision obtained by estimating mean grain yield using ratio estimator instead of the mean yield of grain per unit if any.

4. Define systematic sampling and state the circumstances when it is most suitable. How would you tackle the situation when sample drawn is not an integral multiple of its population? Explain with an example. Derive the efficiency of systematic sampling relative to simple random sampling when the correlation between the pair of units within a systematic sample is maximum.
5. In an experiment the numbers of standard pepper in 8 clusters of 5 fields each were selected by SRSWOR out of 250 fields. The following data were available

Estimated S_w^2	Estimated S^2
285.9125	376.5277

where notations have their usual meaning Estimate the intra-class correlation coefficient between fields belonging to the same cluster establishing the results required. Draw conclusion on the efficiency of cluster sampling with respect to simple random sampling. For what value of the intra-class correlation coefficient between fields belonging to the same cluster, cluster sampling is the most efficient?

6. Which organization conducts employment and unemployment surveys? Write a brief note on this organization. How is the unemployment data collected by the government? Give the different types of data and their methods of collection.