Candidates are required to give their answers in their own words as far as practicable.
The figures in the margin indicate full marks.

Group-A

Answer any *two* questions :   10×2=20

1. (i) With two strata, a sampler would like to have $n_1 = n_2$ for administrative convenience, instead of using values given values by Neyman's allocation. If V and V_{opt} denote the variances given by the $n_1 = n_2$ and the Neyman's allocations, respectively, show that the fractional increase in variance $\dfrac{V - V_{opt}}{V_{opt}} = \left[\dfrac{r-1}{r+2}\right]^2$, where $r = \dfrac{n_1}{n_2}$ as given by Neyman's allocation. Assume that strata sizes are very large.

    (ii) In case of estimating the population mean of a study variable y, obtain an estimator of the gain (defined by sampling variance of the estimator minus that of the other) due to stratification over simple random sampling on the basis of data on study variable y.

5+5

2. (i)   What are the advantages of smaple surveys over complete census?

    (ii) Show that the ratio estimator is an unbiased estimator of the population mean up to the first order of approximation.   5+5

3. (i)   Compare the systematic sampling, stratified sampling and SRS for the population with the linear trend.

    (ii) Suggest some changes that is the need of hour in Indian Census.   6+4

4. (i)   Make a comparison between sampling error and non-sampling error in survey sampling.

    (ii) Show that efficiency of cluster sampling with respect to simple random sampling increases as the variation within cluster increases.   5+5

Group-B

Answer any *four* questions :   5×4=20

5. A large company surveys on working hours of employees by taking random samples of 10 managers and 90 non-managerial employees. It is given that 10 employees work under one manager. Give an unbiased estimator of average working hours of employees of the company and obtain the standard error of the estimator.   5

6. Find an estimator of the population mean based on a linear systematic sample. Is this estimator unbiased? How does circular systematic sampling differ from linear systematic sampling?   2+3

7. State the differences between ratio and regression estimator. Illustrate with an example.   5

8. Give a cost effective sampling design to estimate the average number of hospital beds available in each hospital in Purba Medinipur. Obtain the unbiased estimator under your sampling design.   5

9. Consider a population of size N. A simple random sample of size n is drawn with replacement (WR) and then without replacement (WOR). Show that the probability of selecting the j-th unit in the k-th draw is the same for both SRSWOR and SRSWR.   5

10. Write a short note on Indian Statistical System.   5

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