Sample Surveys-355

Sem-V

Time - 3hrs

M.M.- 30

Note-: The Candidates are required to attempt two questions from Section A & B
Section C will be compulsory

Section A

1. A sample of size n is drawn from a population having N units by simple random sampling without replacement. A sub-sample of n_1 units is drawn from the n units by simple random sampling without replacement. Let $\overline{y_1}$ denote the mean based on n_1 units and $\overline{y_2}$ be the mean based on $(n - n_1)$ units. Consider the estimator of the population mean $\overline{Y_N}$ given by

$$\overline{y}_w = w\,\overline{y_1} + (1 - w)\overline{y_2}$$

   Show that $E(\overline{y}_w) = \overline{Y_N}$ and obtain its variance.

2. A simple random sample of size $n = n_1 + n_2$ with mean $\overline{y_n}$ is drawn from a finite population and a simple random subsample of size n_1 with mean $\overline{y_{n_1}}$ is drawn from it. Show that $V(\overline{y_{n_1}} - \overline{y_n}) = \left(\frac{1}{n_1} + \frac{1}{n}\right)S^2$, where S^2 is the population mean square.

3. Discuss the basic principles of sample survey. What are the main steps involved in a sample survey?

4. Show that if a random sample of size n is drawn without replacement from a finite population of size N with mean Y_N and variance σ^2; the covariance between any two numbers of the sample is $\left(-\frac{S^2}{N}\right)$, where S^2 is the population mean square $2 \times 4 = 8$

Section B

5. What are the practical difficulties in adopting Neyman method of allocation?
6. Define the term regression estimator with example. Also obtain estimator of population mean.
7. In large samples, with simple random sampling, derive the condition under which the ratio estimate has a smaller variance than the estimate $\hat{Y} = N\bar{y}$ obtained by simple expansion.
8. Justify the statement: "The efficiency of stratified sampling relative to simple random sampling without replacement depends on the allocation of the sample to the various strata". $2 \times 4 = 8$

Section C

9. Write in brief
   a) What is optimum allocation.
   b) Explain the principle of sampling
   c) Prove that the ratio estimator method gives more precise result whenever $\rho > \frac{CV(x)}{2\,CV(y)}$, where CV is the coefficient of correlation and ρ is the correlation between x and y.
   d) Under what situations you should prefer ratio method?
   e) Define stratified random sampling.
   f) Define sampling errors and non-sampling errors.
   g) What common assumptions are made to obtain the approximate variances of ratio estimator and regression estimator?
      $7 \times 2 = 14$