

B.Sc. (Honours) Examination, 2019
Semester-IV
Statistics
Course : CC-8
(Survey Sampling & Indian Official System)

Time : 3 Hours

Full Marks : 40

Questions are of value as indicated in the margin

Group - A (Answer **any ten** questions)

1. Answer the following questions by selecting the correct option(s)
 - (a) The total number of possible sample of size 3 drawn by SRSWR from a population of 6 member is
(i) 20 (ii) 36 (iii) 216 (iv) 729.
 - (b) How many ways we can collect information from a population?
(i) 1 (ii) 2 (iii) 3 (iv) 4.
 - (c) An unknown number of minibus in a city suppose to be numbered serially from 1 to N . If the n different minibus you have come across in the city can be assumed to form a random sample, then which of the following is an unbiased estimator of $(N + 1)$
(i) $\bar{x}$ (ii) $2\bar{x} - 2$ (iii) $2\bar{x} - 1$ (iv) $2\bar{x}$.
 - (d) In simple random sampling without replacement probability that a particular member included in the sample is
(i) $\frac{1}{N}$ (ii) $\frac{1}{n}$ (iii) $\frac{n}{N}$ (iv) $\frac{N}{n}$.
 - (e) Two basic principles of sample survey are
(i) validity (ii) optimization (iii) complete enumeration (iv) sampling fluctuations.
 - (f) Which of the following is not a probability sampling
(i) simple random sampling (ii) stratified sampling (iii) systematic sampling (iv) cluster sampling
 - (g) Identify the sample sizes for equal allocation, proportional allocation and Neyman or optimum allocation
(i) $\frac{k}{n}$ (ii) $\frac{nN_i S_i}{\sum_{i=1}^k N_i S_i}$ (iii) $(\frac{n}{N})N_i$ (iv) $\frac{n}{k}$.
 - (h) Identify the correct inequality
(i) $Var(\bar{y}_{opt}) \leq Var(\bar{y}_{wor}) \leq Var(\bar{y}_{prop})$ (ii) $Var(\bar{y}_{opt}) \leq Var(\bar{y}_{prop}) \leq Var(\bar{y}_{wor})$
(iii) $Var(\bar{y}_{prop}) \leq Var(\bar{y}_{wor}) \leq Var(\bar{y}_{opt})$ (iv) $Var(\bar{y}_{prop}) \leq Var(\bar{y}_{opt}) \leq Var(\bar{y}_{wor})$.
 - (i) Which of the following estimators are unbiased estimator of population mean
i) $\bar{y}_{wor}$ (ii) $\bar{y}_{wr}$ (iii) $\bar{y}_{st}$ (iv) $\bar{y}_{sys}$.
 - (j) A statistical measure based on population values, is called
(i) parameter (ii) statistic (iii) estimator (iv) estimate.
 - (k) Which of the following are the major sources on 'Health Statistics' in India?
 1. Sample Registration System (SRS).
 2. Civil Registration System (CRS).

P.T.O.

(2)

3. National Family Health Survey (NFHS).

Select the correct answer using the code below

i) 1 & 2 (ii) 1 & 3 (iii) 2 & 3 (iv) 1,2 & 3.

(l) The first phase of Population Census is associated with which of the following?

1. House Listing
2. Housing Census.
3. Population Enumeration.

Select the correct answer using the code below

i) 1 & 2 (ii) 2 & 3 (iii) 1 & 3 (iv) 1,2 & 3.

(m) The most common sampling design used by NSSO in its socio-economic surveys is

- (i) Simple Random Sampling (ii) Circular Systematic Sampling (iii) Probability Proportional to Size Sampling
- (iv) Two-stage Stratified Sampling.

(n) Which one of the following organizations of the Government is responsible for collection, compilation and dissemination of Trade Statistics in India?

- (i) CSO (ii) Directorate General of Commercial Intelligence and Statistics (iii) Department of Industrial Policy and Promotion
- (iv) Tariff Commission.

(o) Which of the following are part of mandate of Survey Design and Research Division (SDRD)?

1. Planning of Survey.
2. Formulation of Sample Design.
3. Conducting of Sample Survey.
4. Preparation of Survey Reports.

Select the correct answer using the code below

(i) 1,2 & 4 (ii) 1,2 & 3 (iii) 1,3 & 4 (iv) 2,3 & 4.

Group – B (Answer any six questions)

5 × 6 = 30

2. What is simple random sampling? In an SRSWR of size n from a finite population of size N , find an unbiased estimator of the population mean and find the variance of this estimator. Show that $\bar{y}_{wor}$ is more efficient than $\bar{y}_{wr}$. 5
3. What is coefficient of Variation? Determine the sample size such that coefficient of variation of $\bar{y}_{wor}$ should not exceed a given value, say C_0 and find out the smallest sample size needed in this case. Also discuss the situation when N is large. 5
4. Discuss the estimation procedure of population proportion. Show that in case of SRSWOR, $Var(p) = \frac{N-n}{N-1} \frac{PQ}{n}$. 5
5. What do you mean by stratified random sampling? Find out the variance of $\bar{y}_{st}$ in case of proportional allocation. For this sampling, minimize the cost function for the specified variance V_0 and show that

$$n_i = \frac{W_i S_i (\sum_{i=1}^k W_i S_i \sqrt{C_i})}{\sqrt{C_i} (V_0 + \sum_{i=1}^k \frac{W_i S_i^2}{N_i})} \quad 5$$

6. Show that $Var(\bar{y}_{wor}) : Var(\bar{y}_{sys}) = n : 1$ for the population with linear trend and when $1/k$ is negligible. 5

(3)

7. What are the difference between Stratified sampling and cluster sampling? Find out the bias and mean square error of the ratio estimator. When the ratio estimator is more efficient than the sample mean based on SRSWOR ? 5
 8. Write short notes on: Statistical System at the Centre, MoSPI Legal Support for Collection of Data. 5
 9. Briefly describe how the modern era of Indian official statistics inspired by Rangarajan Commission? 5
 10. Discuss about the various divisions of NSSO and their functions. 5
 11. Write down any two major publications of each of the following Ministries: 5
 - a) Ministry of Agriculture and Irrigation b) Ministry of Labour c) Ministry of Finance.
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