2022/TDC/ODD/SEM/STSHCC–302T/113

TDC (CBCS) Odd Semester Exam., 2022

STATISTICS

(Honours)

(3rd Semester)

Course No. : STSHCC–302T

(Survey Sampling and Official Statistics)

<u>Full Marks : 50</u>
Pass Marks : 20

Time : 3 hours

The figures in the margin indicate full marks for the questions

UNIT—I

1. Answer any *two* of the following questions :

2×2=4

 (a) Distinguish between sample survey and population survey.

 (b) Distinguish between sampling errors and non-sampling errors.

 (c) Explain the term 'sampling frame'.

(Turn Over)

2. Answer either *(a)* or *(b)* : 6

(a) Define a simple random sample. Show that in simple random sampling without replacement, probability of selecting a specified unit of the population at any given draw is equal to the probability of its being selected at the first draw. Hence or otherwise find the probability of selecting any specified unit in the sample. 1+4+1=6

(b) Show that in SRSWR, the variance of the sample mean is given by σ^2/n. Also prove that in SRSWOR, $E(s^2) = S^2$. Symbols hold their usual meanings.

2+4=6

UNIT—II

3. Answer any *two* of the following questions :

2×2=4

(a) Define stratified random sampling.

(b) Briefly discuss two advantages of stratified random sampling.

(c) Show that in stratified random sampling, $E(\bar{y}_{st}) = \bar{Y}_N$. Symbols hold their usual meanings.

4. Answer either *(a)* or *(b)* : 6

(a) Show that in stratified random sampling with given cost function of the form
$$C = a + \sum_{i=1}^{k} C_i n_i, \quad V(\bar{y}_{st}) \text{ is minimum if}$$
$n_i \propto \dfrac{N_i S_i}{\sqrt{C_i}}$. Hence obtain the sample size *n*. Symbols hold their usual meanings. 4+2=6

(b) Show that
$$V(\bar{y}_{st})_N \leq V(\bar{y}_{st})_P \leq V(\bar{y}_n)_R$$

Symbols hold their usual meanings. 6

UNIT—III

5. Answer any *two* of the following questions : 2×2=4

(a) Define systematic sampling.

(b) Show that in systematic sampling
$$V(\bar{y}_{sep}) = \frac{N-1}{N} S^2 - \frac{(n-1)k}{N} S_{wsy}^2$$

where $S_{wsy}^2 = \dfrac{1}{k(n-1)} \sum_{i=1}^{k} \sum_{j=1}^{n} (y_{ij} - \bar{y}_i)^2$.

(c) Define cluster sampling.

(Turn Over)

6. Answer either *(a)* or *(b)* : 6

(a) Show that in the presence of a linear trend of the form $Y_i = \mu + i\theta$ where μ and θ are constants.

$$V(\bar{y}_{st}) : V(\bar{y}_{sys}) : V(\bar{y}_n)_R :: \frac{1}{n} : 1 : n$$

Symbols hold their usual meanings.

(b) Show that

$$V(\bar{y}_{sys}) = \frac{k-1}{nk} S^2_{wst} [1 + (n-1)\rho_{wst}]$$

Hence show that

$$\frac{V(\bar{y}_{st})}{V(\bar{y}_{sys})} = \frac{1}{1 + (n-1)\rho_{wst}}$$

Symbols hold their usual meanings.

UNIT—IV

7. Answer any *two* of the following questions : 2×2=4

(a) Define multistage sampling.

(b) Define multiphase sampling.

(c) Define PPS sampling.

(**5**)

8. Answer either (a) or (b) :   6

   (a) Define a ratio estimator. Show that the ratio estimator is an unbiased estimator of the population mean up to the first order of approximation.   2+4=6

   (b) Show that

$$V(\hat{\bar{Y}}_{reg}) \le V(\bar{y}_n)_{srs}$$

Symbols hold their usual meanings.

UNIT—V

9. Answer any two of the following questions :   2×2=4

   (a) Mention the methods of collecting official statistics.

   (b) Mention the government's principal publications regarding data relating to industry and finance.

   (c) Mention the limitations of the sources for collection of official statistics in India.

10. Answer either (a) or (b) :   6

   (a) Discuss briefly the role of the Ministry of Statistics and Programme Implementation.

   (b) Write short notes on NSSO and CSO.

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