PG (CBCS) EVEN SEMESTER EXAMINATION, 2024

STATISTICS

2nd Semester

Course No. : STSCC - 202

(Survey Sampling)

Full Marks : 70

Pass Marks : 28

Time : 3 hours

The figures in the margin indicate full marks for the questions

(Answer five questions taking one from each unit)

Unit - I

1. (a) Define sampling unit and sampling frame. Show that in case of simple random sampling without replacement (SRSWOR), the variance of the sample mean is given by 3+4=7

$$V\,(\bar{y}_n) = \frac{\mathrm{N-n}}{\mathrm{N}}.\,\frac{\mathrm{S}^2}{\mathrm{n}}$$

(b) Define simple random sampling. In case of SRSWOR the sample mean square is an unbiased estimate of the population mean square, prove this. 7

2. (a) Explain Neyman's optimum allocation and proportional allocation in case of stratified random

sampling. In case of a stratified random sampling with given cost function

$$C = a + \sum_{i=1}^{n} c_i n_i$$

prove that $v\,(\bar{y}_{st})$ is minimum if 3+4=7

(b) Establish the relation between $v\,(\bar{y}_n)$ random, proportion and Neyman. 7

Unit - II

3. (a) Explain clearly the comparison of probability proportional to size sampling with simple random sampling. 7

(b) Explain probability proportional to size sampling (PPS) and give a method of drawing such a sample. 7

4. Discuss Horvitz-Thompson estimator for PPS sampling. 14

Or

Discuss Midzuno system of sampling for PPS samplng without replacement.

Unit - III

5. Derive the mean and mse for ratio estimator and compare its efficiency with SRS. 3+8+3=14

6. Derive the mean and mse for regression estimator and compare its efficiency with SRS. 3+8+3=14

Unit - IV

7. (a) Write a short note on two-stage sampling. 4

(b) Obtain the efficiency of cluster sampling in terms of intraclass correlation coefficient. 10

8. Define systematic sampling. Also discuss the merits and demerits of systematic sampling.

Prove that if population consists of a linear trend, then

$$n_i \propto \frac{N_i S_i}{\sqrt{c_i}}$$

$$V\,(\bar{Y}_{st}) \le V\,(\bar{Y}_{sys}) \le V\,(\bar{Y}_n)_R$$

Unit - V

9. Mention any five sources of non-sampling errors. Define specification errors, Tabulation errors and Assignment errors. 5+9=14

10. What do you mean by observation error and give an example? Describe the mathematical model for the same. 14

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