ST. JOSEPH'S COLLEGE (AUTONOMOUS), BENGALURU -27

B. Sc – V SEMESTER

SEMESTER EXAMINATION: OCTOBER 2022

(Examination conducted in December 2022)

ST 5118: Sampling Theory and Designs of Experiment

Time: 2 ½ Hours   **Max Marks: 70**

This paper contains TWO printed pages and THREE parts

PART-A

I   **Answer any FIVE from the following**   **3 * 5 = 15**

1. Mention different types of errors involved in sampling. Explain any one briefly.

2. Explain the procedure of drawing a systematic sample.

3. Write a note on allocations in Stratified sampling.

4. If the population size is 10 and required sample size is 5 the total number of possible samples in

    i.   Simple Random Sampling with Replacement (SRSWR).

    ii. Simple Random Sampling without Replacement (SRSWOR).

    iii. Systematic random sampling

5. Define (i) Treatment   (ii) Experimental Unit   (iii) Factorial Experiment.

6. Give the assumptions of Analysis of variance (ANOVA)

7. Give the ANOVA table of Latin Square Design (LSD).

PART - B

II   **Answer any FIVE from the following**   **7 * 5 = 35**

8. A) Distinguish between Primary data and Secondary data.

    B) Rayan wants to study the shopping behavior among the people of Bangalore. He is interested in collecting the primary data. Help him to prepare the questionnaire to collect the data required.   (2+5)

9. Prove that $E(s^2) = \begin{cases} S^2 \ under \ SRSWOR \\ \sigma^2 \ under \ SRSWR \end{cases}$ with usual notation.   (7)

10. What are the basic ideas behind the Stratified random sampling? Obtain an unbiased estimator for population mean along with its variance under stratified random sampling.   (7)

11. A) Write a note on determination of sample size.

B) Identify the following designs. (4+3)

a)
A	B	C	D
B	C	D	A
C	D	A	B
D	A	B	C

b)
P	Q	R	S
R	S	Q	P
S	P	R	Q
Q	R	S	P

12. A) Explain the basic principles of designs of experiments.

B) Explain how RBD utilizes the principles of design. (4+3)

13. Derive the least square estimators of parameters of Completely Randomized Design model. (7)

14. Explain the Yates method of computation of the sum of squares in 2^3 factorial experiments. (7)

PART - C

III   Answer any TWO from the following   **10 * 2 = 20**

15. A) Derive the variance of sample mean under SRSWR

B) Outline the analysis of Randomized Block Design. (3+7)

16. A) Distinguish between Cluster sampling and Stratified sampling.

B) Show that $V(\bar{y})_{Ney} \leq V(\bar{y})_{Prop} \leq V(\bar{y})_{srs}$ (4+6)

17. A) Explain the statistical analysis of 2^3 factorial experiments

B) Give the mathematical model of Latin square Design and explain the notations used. (6+4)

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