



Register Number:

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

B.Sc. STATISTICS - V SEMESTER

SEMESTER EXAMINATION – NOVEMBER 2020

ST 5118: SAMPLING THEORY AND DESIGNS OF EXPERIMENTS

Time: 2 ½ Hours

Max: 70 Marks

This question paper has **TWO** printed pages and **THREE** parts.

PART – A

I Answer any FIVE of the following:

5 x 3= 15

1. Define pilot survey
2. Give any three methods to control non sampling error
3. Explain the concept of equal probability sampling
4. List out the principles of Design of Experiments. Explain any one of them
5. Define contrast. Give an example
6. Write a short note on Tuckey's test
7. For a simple random sample of size 100, the 95% confidence interval for population mean is (48.04, 51.96). Estimate population standard deviation using information provided. (Critical value = 1.645)

PART – B

II Answer any FIVE of the following:

5 x 7 = 35

8. A) Write a short note on determination of sample size under simple random sampling without replacement
B) In systematic sampling, prove that sample mean is an unbiased estimator of population mean
(4+3)
9. A) Show that sample variance s^2 is an unbiased estimator of population variance S^2 under simple random sampling without replacement.
B) Briefly explain proportional allocation in stratified random sampling (5+2)
10. A) Compare stratified random sampling and cluster sampling
B) Define cluster sampling mean and show that it is unbiased for population mean when the clusters are of equal size
(3+4)

11. Derive the least square estimator of parameters for Completely Randomized Design (7)
12. A) Explain the construction of Yates table for 2^3 factorial experiments
 B) In 2^2 design show that main effects are orthogonal contrast. (5+2)
13. A) State the assumptions of one-way analysis of variance.
 B) Find (a), (b), (c), (d),(e) in the following ANOVA table and state your conclusion (3+4)

Source of variation	Degrees of freedom	Sum of squares	Mean squares	F ratio	F critical
Due to Treatments	4	16.58	(d)	(e)	3.48
Due to Errors	(a)	(c)	0.455		
Total	(b)	21.13			

14. Give the mathematical model of randomized block design when m observations per cell and the explain the method of computing treatment sum of squares (7)

PART – C

III Answer any TWO of the following: 2 x 10 = 20

15. A) Mention any four methods of primary data collection. Explain any one of them.
 B) Derive the variance of sample mean under SRSWR (5+5)
16. A) What is stratification? State its need. If SRSWOR used within each stratum derive the formula for variance of stratified sample mean.
 B) Explain linear systematic sampling (6+4)
17. A) What is complete confounding? In a 2^3 experiment, write the layout for a replicate with the effect ABC confounded.
 B) Explain the analysis of Latin square design (4+6)