

**BACHELOR'S DEGREE (C.B.C.S) EXAMINATION, MARCH 2025**  
**2018, 2019, 2020, 2021, 2022 ADMISSIONS SUPPLEMENTARY**  
**B.Sc. Computer Applications SEMESTER IV - CORE COURSE**  
**ST4B05B18 - Sample Survey and Design of Experiments**

Time : 3 Hours

Maximum Marks : 80

**Part A****I. Answer any Ten questions. Each question carries 2 marks****(10x2=20)**

1. Write the advantages of sampling.
2. Write down the expression for the variance of the estimate of the population total in SRSWOR.
3. Define Sample and population
4. Show that sample mean is an unbiased estimate of population mean in linear systematic sampling.
5. Define strata in stratified sampling.
6. Write down the expression for relative gain in precision of optimum allocation over proportional allocation.
7. Explain replication in design of experiments.
8. Differentiate between variation due to assignable causes and random causes.
9. Define correction factor in ANOVA.
10. Define random errors in experimentation.
11. Give the formula for estimating one missing value in a RBD having b blocks and k treatments with usual notations.
12. Give the mathematical model assumed in LSD.

**Part B****II. Answer any Six questions. Each question carries 5 marks****(6x5=30)**

13. Distinguish between probability sampling and non-probability sampling.
14. Derive the unbiased estimator for the population total for SRSWR.
15. Prove that sample mean square is not an unbiased estimator for population mean square in the case of SRSWR.
16. Derive the variance of the estimate of optimum allocation subject to fixed variance.
17. Compare the efficiencies of proportional allocation and simple random sampling.
18. Explain random error and its distribution in ANOVA.
19. Explain the two way classification of ANOVA.
20. Differentiate between RBD and LSD.
21. In a RBD, one observation is missing. Explain how will you estimate ?

**Part C****III. Answer any Two questions. Each question carries 15 marks****(2x15=30)**

22. In SRSWR, show that the sample mean is an unbiased estimator of population mean. Derive its sampling variance also?

23. 
$$V(\bar{y}_{st}) = \sum_{h=1}^k \frac{w_h^2 s_h^2}{n_h} - \frac{1}{N} \sum_{h=1}^k \frac{w_h s_h^2}{n_h}, \text{ where } w_h = \frac{N_h}{N}.$$

Show that for SRSWR,

24. Explain ANOVA of one category of factors and its obtain its table.
25. Explain the analysis of CRD and obtain the ANOVA table.