

Reg. No. : .....

Name : .....

VI Semester B.Sc. Degree (CBCSS – Supple./Improv.) Examination, April 2022  
(2016 – 2018 Admissions)  
**CORE COURSE IN STATISTICS**  
**6B12STA : Design of Experiments**

Time : 3 Hours

Max. Marks : 48

**Instruction : Use of Calculators and Statistical Tables are permitted.**

**PART – A**  
**(Short Answer)**

Answer **all** the 6 questions.

(6×1=6)

1. When do you say that a linear parametric function is estimable ?
2. Write down a situation in which analysis of Covariance is used.
3. Give an example of a one way classified data.
4. What do you mean by a contrast ?
5. Define orthogonal data.
6. Write down the main effects of a  $2^2$  factorial experiment.

**PART – B**  
**(Short Essay)**

Answer **any** 7 questions.

(7×2=14)

7. Define linear hypothesis.
8. Explain the Gauss Markov setup for linear models.

P.T.O.

9. Distinguish between one way and two way classified data.
10. Write down the test statistic and its distribution for conducting ANOVA for a one way classified data.
11. What is the role of local control in experimental designs ?
12. List the advantages and disadvantages of completely randomized design.
13. Write down the relative efficiency of Latin square design over Randomized block design.
14. Define Graeco – Latin square design.
15. Find the degrees of freedom for F-ratio in a  $6 \times 6$  Latin square design.

**PART – C**  
**(Essay)**

Answer **any** 4 questions.

(4×4=16)

16. Let  $y_1 = \theta_1 + e_1$ ,  $y_2 = \theta_1 + \theta_2 + e_2$  and  $y_3 = \theta_2 + e_3$ , where  $\theta_1, \theta_2$  are unknown parameters and  $e_i, i = 1, 2, 3$  are independently and normally distributed with 0 means and common variance  $\sigma^2$ . What is the best estimate of  $\theta_1$  ?
17. Conduct the analysis of variance for a two way classified data.
18. The error variance is an unbiased estimator of population variance for a one way classified data. Prove.
19. Explain the terms :
  - a) Comparative and absolute experiments
  - b) Experimental units
  - c) Experimental error.

20. Explain the basic principles of randomization and replication in experimental designs.
21. Describe the analysis of variance of a Latin square design.

**PART – D**  
**(Long Essay)**

Answer **any** 2 questions.

(2×6=12)

22. State and prove Gauss Markov theorem.
23. How will you conduct the analysis when a concomitant variable is present in a one way classified data ?
24. If a single observation is missing in Latin square design, estimate the missing value and conduct the analysis and write down the ANOVA table.
25. Conduct the analysis of a  $2^2$  factorial experiment.