

Name

M 10384

Reg. No.

**SECOND SEMESTER M.Sc. DEGREE EXAMINATION, MAY 2005
(2004 ADMISSION)**

STATISTICS

PAPER 2.3 - DESIGN AND ANALYSIS OF EXPERIMENTS

Time : 3 Hours

Max. Marks: 60

Answer any FIVE questions selecting only ONE from each unit.

Unit - 1

1. a) State and Prove Gauss - Markov theorem.
b) If β is the parameter vector in a linear regression model how do you test $H_0 : \beta = \beta_0$ against $H_1 : \beta \neq \beta_0$ with the help of a given set of observations? **(7+7=14 marks)**
2. a) Explain 'linear hypothesis'. Outline a method of testing linear hypothesis **(5 marks)**
b) Y_1, Y_2, Y_3 and Y_4 are independent stochastic variables with common σ^2 and
 $E(Y_1) = E(Y_2) = \mu + \alpha_1$
 $E(Y_3) = E(Y_4) = \mu + \alpha_2$
(i) Examine whether α_1 , is estimable.
(ii) Find the best unbiased estimator of $\alpha_1 - \alpha_2$
(iii) Obtain the variance of best unbiased estimator of $\alpha_1 - \alpha_2$ **(9 marks)**

Unit - 2

3. a) Explain the principles of experimentation in Design of experiments. How is it implemented in a RBD? Give its ANOVA also.
b) Explain the Tukey's test for additivity. **(10+4=14 marks)**
4. a) Give the layout and analysis of a latin square design replicated r times with rows changed in each replication.
b) Discuss the efficiency of a RBD over CRD.

Unit - 3

5. Define the terms "Main effects" and "Interactions" in connection with factorial experiment. Write down the advantages and disadvantages of factorial experiments. Explain the Analysis of a 2^3 factorial experiment using Yates Method and hence prepare its ANOVA. **(14 marks)**
6. a) Distinguish between complete confounding and partial confounding mentioning their merits and demerits. Give an example.
b) Determine a 2^5 factorial design confounding ABC, ADE, BCDE with 4 blocks each of size 8.

Turn Over

Unit - 4

7. Describe a split plot experiment. Derive the analysis of a split plot design with r replicates, the whole plot treatment A has s levels and the split plot treatment B has t levels.
8. What is a BIBD ? Explain the procedure for intra block analysis of BIBD, adjusted for differences between block effects. If block effects are large, how do you use the inter block information for better analysis of variance ?

Unit - 5

9. What are (i) Graeco Latin square and (ii) Hyper Graeco - Latin square designs. Explain the layout and analysis of Graeco - Latin square design.
10. a) Develop the non-orthogonal data analysis for a randomized block design with single missing observation, stating clearly the assumptions that are made and the hypothesis being tested.
b) Define a concomitant variable. What are the conditions to be satisfied by a concomitant variable. Give two examples.