

Time :2.5 hours**Total Marks: 75**

- NB:
1. All questions are compulsory
 2. Attempt any two sub-questions of (a), (b), (c) and (d) from questions 1, 2 and 3.
 3. Attempt any one sub- question of (a) and (b) and any one sub-question of (c) and d from question 4.
 4. Use of nonprogrammable calculators allowed.

- 1 a) State Cochran's theorem. Explain in brief the concept of analysis of variance with suitable illustration. 10
b) For the one way classified fixed effect model $y_{ij} = \mu + \alpha_i + \varepsilon_{ij}$ ($i=1,2,\dots,k$ and $j=1,2,\dots,n_i$) where the symbols have their usual meanings. Obtain expectation of various sums of square. Also give the blank ANOVA table. 10
c) Prove that in one way Analysis of Variance (ANOVA) mean sum of squares of error is an unbiased estimator of σ^2 . 10
d) In two way ANOVA with unequal number of observations give the breakup of the total sum of squares. Construct a blank ANOVA table. State the hypothesis to be tested. Also explain the test procedure. 10
- 2 a) Discuss how the three fundamental principles of design of experiments contribute in controlling the variations. 10
b) State the model of completely randomized design (C.R.D.). State the assumption for the design. Obtain least square estimators of the parameters involved and find variance of these estimators. 10
c) Explain Completely Randomized Design and Randomized Block Design. State the advantages and disadvantages of both the design. 10
d) State the model of Randomized Block Design. Obtain the expectations of various sums of square of Two way ANOVA applied in randomized block design. 10
- 3 a) Define efficiency of design. Derive an expression for efficiency of LSD over RBD when rows are taken as blocks. 10
b) Derive an expression for estimation of one missing observation in LSD with m treatments. Explain the changes you make in the analysis after estimating the missing observation. 10
c) What are factorial experiments? Explain the symbol 2^n in case of factorial experiment. State the advantages of factorial experiment over simple experiment. 10
d) Explain the main and interaction effects in a 2^3 factorial experiment conducted as RBD in r blocks. State the hypothesis to be tested. Write the blank ANOVA. 10

Q.P. Code: 25593

- 4 a) What is random and fixed effect models in ANOVA. List two difference. 08
- b) For a 2^2 factorial experiment with 2 factors A and B write down Yates table. 08
Hence obtain the sum of squares of main effects and interaction effects. State the hypothesis to be tested and also the test procedure.
- c) Define Critical Difference. Obtain its expression for completely randomized design. Explain how it is used in Completely randomized design. 07
- d) Define the following terms: Experimental Unit, Experimental Material, Experimental Error. 07
