

2026

Statistics (Core)

Paper Code : ST-CE-6324

Paper Name : Analysis of Variance & Design of Experiment

Time : 2 hours

Full Marks : 50

The figures in the margin indicate full marks for the questions.

1. Answer the following questions as directed : 1×4=4
 - a) A subject receiving a treatment in an experiment is called _____. (Fill in the blank)
 - b) Greater homogeneity within the block in an experiment is better maintained through _____. (Fill in the blank)
 - c) Errors in a statistical model are always taken to be distributed as -
 - i) $N(0,1)$
 - ii) $N(1,0)$
 - iii) $N(0, \sigma^2)$
 - iv) $N(\mu, \sigma)$ (Choose the correct option)
 - d) A linear combination of K treatment in which the sum of the coefficients of treatments is zero is known as _____. (Fill in the blank)
2. Answer the following questions briefly : 2×3=6
 - a) Explain the experimental errors.
 - b) Show that for 2^3 - factorial experiment, the main effect A and

Contd.

interaction effect AB are mutually orthogonal contrasts.

- c) Why a split plot design may be regarded as a factorial experiment with a main effect confounded ?
3. Answer **any two** of the following questions : 5×2=10
- a) Write a note on basic principles of design of experiment indicating their role and importance in conducting experiments.
 - b) Obtain the estimate of a missing value in a RBD with p treatments and q blocks.
 - c) What do you mean by orthogonal design ? Show that LSD is an orthogonal design.
 - d) What do you mean by analysis of variance ? Describe a linear model, its different types and underlying assumptions.
4. Answer **any three** of the following questions : 10×3=30
- a) Describe completely two way classified data and give complete analysis including model used, hypotheses to be tested, break up of total sum of squares, AoV table and possible conclusion. 10
 - b) What do you understand by confounding in factorial experiments. Briefly explain complete, partial and balanced confounding with examples using 2^3 , 2^4 and 2^5 factorial designs. 4+6=10
 - c) Write short notes on (**any two**) : 5+5=10
 - i) Balance incomplete block design (BIBD).
 - ii) Split plot design (SPD).
 - iii) Efficiency of RBD in comparison to LSD.
 - d) Find the standard error of difference between two treatment means when one of them has a missing observation in Randomised Block Design (RBD). 10

- e) i) Show that in a 2^3 factorial experiment, different effects are mutually orthogonal contrasts. 5
- ii) With a suitable example, show that in a 2^4 factorial experiment, it is not possible to save two factor interactions from getting confounded. 5
- f) Give complete description and analysis of a 2^2 factorial experiment conducted over a RBD with r replications. 10

