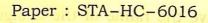
Total number of printed pages-7

3 (Sem-6/CBCS) STA HC 1

2025

STATISTICS

(Honours Core)



(Design of Experiments)

Full Marks: 60

Time: Three hours

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

- 1. Answer the following as directed: 1×7=7
 - (a) Replications provide a valid estimate of ______ · (Fill in the blank)
 - (b) If σ_1^2 is the error variance of design-1 and σ_2^2 of design-2 utilizing the same experiment material, the efficiency of design 1 over 2 is—
 - (i) $\frac{1}{\sigma_1^2} / \frac{1}{\sigma_2^2}$

(ii)
$$\frac{1}{\sigma_2^2} / \frac{1}{\sigma_1^2}$$

- (iii) σ_1^2 / σ_2^2
- (iv) None of the above (Choose the correct option)
- (c) Give the name of the design in which the main effect is confounded.
- (d) _____ is the design where principle of local control is not used.

(Fill in the blank)

- (e) What will be error d.f. in a RBD to compare 5 treatments in 4 blocks, having one missing observation?
- (f) The maximum possible number of orthogonal contrasts among four treatments is—
 - (i) four
 - (ii) three

- (iii) two
- (iv) one

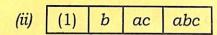
(Choose the correct option)

- (g) What will be the total number of factorial effects in 2ⁿ factorial experiment?
- 2. Answer the following questions: 2×4=8
 - (a) Write a note on the assumptions made in a linear model in Analysis of Variance.

In a 4×4 LSD, the following results were obtained:

Complete the ANOVA table

- (c) In a partially confounded 2³-factorial experiment, the control blocks of two replications are given below:
 - (i) (1) a bc abc



Identify the confounded effects and write down the other blocks of the replications.

- (d) Explain the use of local control in Latin square design.
- 3. Answer any three questions from the following: 5×3=15
 - (a) Discuss the types of model and their underlying assumptions that are associated with the Analysis of Variance (AOV) technique.
 - (b) What is factorial experiment? What is its advantage over single factor experiment?
 - (c) What is a split-plot design? State main advantages and disadvantages of splitplot design.

(d) Six treatments were tested in an R.B.D with 4 blocks and the following sum of squares were detained. Analyse the design and interpret the results. Given $F_{0.05}(3,15) = 5.42$ and $F_{0.05}(5,15) = 4.5$ Treatment SS = 901.19

Block SS = 219.43

Total SS = 1350.26

- (e) Describe the layout of a 2³-experiment where all the interactions are partially confounded. Give the structure of the AOV table in this case.
- 4. Answer the following questions: 10×3=30
 - (a) Starting with a linear mathematical model, give the complete analysis of a two-way classified data.

Or

(b) Obtain the formula for estimating a single missing value of a $p \times p$ Latin square design and give the AOV table.

(c) Suppose in a 2⁴-design, the effects ABC and ABD are confounded. Write down the contents of the control block. Taking four such replications, discuss the analysis of such a design.

Or

- (d) What is balanced incomplete block design (BIBD) with parameters v, b, r, k, λ ?
 - (i) When is a BIBD called symmetric?
 - (ii) For a resolvable BIBD, show that $b \ge v + r 1$.
- (e) Derive the expression to measure the efficiency of LSD over a RBD when—
 - (i) rows are used as blocks.

6

(ii) columns are used as blocks.

Or

in a factorial design. How does partial confounding differ from complete confounding? Give your answer with suitable illustrations.

