3 (Sem–6/CBCS) STA HC 1

2022

STATISTICS

(Honours)

Paper : STA–HC–6016

(Design of Experiments)

Full Marks : 60

Time : Three hours

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

1. Answer ***any seven*** of the following as directed : 1×7=7

   (a) _____ is the simplest design making use of all the three basic principles of design. *(Fill in the blank)*

   (b) The error degrees of freedom in a $m \times m$ L.S.D. is _____ . *(Fill in the blank)*

Contd.

(c) The error d.f. in an RBD with 4 blocks comparing 6 treatments is _____. *(Fill in the blank)*

(d) The error d.f. for a $p \times p$ L.S.D. with one missing observation is _____. *(Fill in the blank)*

(e) In a split plot design _____ effect is confounded. *(Fill in the blank)*

(f) In the linear model considered in analysis of variance the error term is distributed as _____. *(Fill in the blank)*

(g) In a 2^4 factorial experiment with the four factors *A*, *B*, *C*, *D*, each at two levels, the interaction effects *ABC* and *ABD* is confounded. Name the other factor which is also confounded.

(h) Define the term 'contract'.

(i) Write down the main effects and interaction effects for a 3^2 design with two factors *A* and *B* each at three levels 0, 1, 2.

(j) The concept of confounding is not deliberately introduced in a factorial experiment. *(State True **or** False)*

2. Answer ***any four*** questions from the following : 2×4=8

(a) Give the layout of a 4 × 4 Latin square design.

(b) Explain why there cannot be a 2 × 2 L.S.D.

(c) Write a note on the assumptions made in a linear model in analysis of variance.

(d) Explain the use of local control in Latin square design.

(e) In a 5 × 5 LSD, the following results were obtained :

Row mean square = 11·66

Column mean square = 3·5

Treatment mean square = 49·15

Total sums of square = 285·34

Complete the ANOVA table.

(f) A 2^3 experiment was conducted with three factors N, P and k, each at two levels. The central blocks for the replications are

np, npk, (1), k
(1), npk, nk, p
pk, nk, (1), np

respectively. Find the effect confounded in each replication.

(g) Define balanced incomplete block design.

(h) What do you mean by the term 'efficiency' in a design of experiment?

3. Answer ***any three*** questions from the following : 5×3=15

(a) Obtain the estimate of the missing plot in a randomised block design.

(b) What is confounding in a factorial experiment? Explain the difference between complete and partial confounding in case of a 2^4 factorial experiment.

(c) Write a note on the advantages and disadvantages of confounding.

(d) Obtain a balanced confounded 2^4 design in a number of replications having four blocks in each.

(e) Write an introductory note on balanced incomplete block design.

(f) What is factorial experiment? What are the advantages of a factorial experiment over single factor experiment?

(g) Describe the layout of a 2^3 experiment where the 2nd order interaction is confounded in all the four replications. Give the structure of the AOV table in this case.

(h) What is a split plot design? Why is it said that in a split plot design main effect is unfounded?

4. Answer ***any three*** questions from the following : 10×3=30

(a) Give the outline of the analysis of variance of a randomised block design. Obtain the expression for standard error of the difference between two treatment means, when one of them has a missing observation in a randomised block design.

(b) Discuss the analysis of a Latin square design.

(c) The elements of control block of each of six replications of a 2^4 design are (1), *ab*, *acd*, *bcd*. Identify the confounding subgroup and give an outline of the analysis of the data obtained from the experiment.

(d) In a 2^3 factorial experiment conducted with three factors *A*, *B*, *C*, each at two levels, all the interactions effects are confounded in one of the four replications. Give an outline of the analysis of the data.

(e) Describe the layout and give an outline of the analysis of a split plot design.

(f) Find the standard error of the difference between two treatments mean when one of them has a missing observation in a Latin square design. Also write the expression of standard error when there is no missing observation under any of the treatments.

(g) (i) Write a note on uniformity trials. 5

(ii) Give an idea of 3^2 factorial experiment. 5

(h) Discuss briefly ***any two*** of the following :

(i) Basic principles of design of experiment.

(ii) Bio-arrays

(iii) Relative efficiency of LSD and RBD

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