2019

STATISTICS

(Major)

Paper : 6.2

(Design of Experiments)

Full Marks : 60

Time : 3 hours

The figures in the margin indicate full marks for the questions

1. Answer the following as directed : 1×7=7

(a) Replication means the execution of an experiment more than _____.

(Fill in the blank)

(b) _____ is the simplest design making use of all the three basic principles of design.

(Fill in the blank)

(c) What is a contrast?

(d) The error degrees of freedom in a $p \times p$ LSD is _____.

(Fill in the blank)

(e) In an RBD, the number of plate in a block is equal to the number of _____.

(Fill in the blank)

(f) In the linear model of analysis of variance, the error term is assumed to be distributed as

(i) $N(\mu, \sigma^2)$

(ii) $N(0, \sigma^2)$

(iii) $N(\mu, 0)$

(iv) $N(0, 1)$

(Choose the correct option)

(g) What will be the error d.f. in an RBD with 3 blocks comparing 4 treatments having one missing observation?

2. Answer the following : 2×4=8

(a) Explain what you understand by 'analysis of variance'. State the basic assumptions in an analysis of variance.

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

RMS = 87, CMS = 52, TMS = 457,
Total SS = 1943

Complete the ANOVA table.

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

(d) In a 2^3-factorial experiment in blocks of 4 plots with three fertilizers *N*, *P* and *K*, the control blocks are given below :

Replicate I	*np*	*npk*	(1)	*k*
Replicate II	(1)	*npk*	*nk*	*p*
Replicate III	*pk*	*nk*	(1)	*np*

Identify the confounded effects.

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

(a) Describe how ANOVA technique can be used to test for multiple linear regression model.

(b) What is meant by confounding in a factorial experiment? Why is confounding used even at the cost of loss of information on the confounded effect? Explain the terms 'complete confounding', 'partial confounding' with example.

(c) What do you understand by missing plot technique in a design of experiment? Obtain the estimate of missing observation in an LSD.

(d) Describe the layout of a 2^3-experiment where all the interactions are partially confounded. Give the structure of the AOV table in this case.

(e) What is the principle of allocating treatments in the blocks of an RBD? Give the layout of an RBD with 5 blocks and 4 treatments *A*, *B*, *C* and *D*.

(Continued)

4. *(a)* Discuss the analysis of covariance technique in a two-way classified data. 10

Or

(b) Explain the assumptions underlying the results of a Latin square design and the types of hypotheses that can be tested. Draw up the analysis of variance table and give the expected values of mean squares. 2+2+3+3=10

5. *(a)* What is a split plot design? Give the analysis of this design. Why is it said that this design confounds main effects? 2+6+2=10

Or

(b) Give an outline of the analysis of variance of a randomized block design. Find the standard error of the difference between two treatment means, when one of them has a missing observation in a randomized block design. 5+5=10

6. *(a)* Suppose we have a 2^3-experiment with three factors each at two levels. There are three replicates each divided into two blocks. Show how will you confound *ABC* in the first replication, *AC* in the second replication and *BC* in the third replication. Give the analysis of the design. 3+7=10

Or

(b) (i) What is a factorial experiment? In what respect is it different from a number of single-factor experiments, the number being equal to the number of factors in the factorial experiment? 5

(ii) Explain three basic principles of experimental design. 5

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