6 SEM TDC STSH (CBCS) C 13

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(June/July)

STATISTICS

(Core)

Paper : C–13

(Design of Experiments)

$$\frac{Full\ Marks : 50}{Pass\ Marks : 20}$$

Time : 2 hours

The figures in the margin indicate full marks
for the questions

1. Choose the correct answer from the following :   1×5=5

   (a) The total number of parameters to be estimated in RBD with three treatments and three blocks is

   (i) 5

   (ii) 6

   (iii) 7

   (iv) 8

(*Turn Over*)

(2)

(b) A BIBD is said to be symmetrical, if number of blocks =

   (i) number of factors

   (ii) number of treatments

   (iii) number of levels

   (iv) number of degrees of freedom

(c) In the sign table for factorial design, except for the first column M, every column has

   (i) equal number of "+" and "–" signs

   (ii) more "+" signs than "–" signs

   (iii) more "–" signs than "+" signs

   (iv) There is no such rule

(d) Confounding ensures more precise estimate of lower order interactions at the cost of higher interactions which are confounded with the

   (i) treatments

   (ii) blocks

   (iii) factors

   (iv) levels

(e) What does the fraction in fractional factorial design of experiments (DOEs) refer to?

    (i) The testing of the samples is only done through a fraction of the normal test range

    (ii) The analysis uses a fraction of the results from a one factor at a time experiment

    (iii) The analysis uses a fraction of the number of tests from a full factorial DOE

    (iv) None of the above

2. (a) Discuss the basic principles of experimental design as developed by R. A. Fisher. Under what condition, RBD is preferable over CRD? Discuss the statistical model for RBD with one observation per cell.   6+3+5=14

Or

(b) What do you understand by a missing plot in design of experiments? Derive a formula for estimating single missing plot in $m \times m$ Latin square design. Can the same procedure be followed for estimating more than one missing observation?   5+6+3=14

3. *(a)* Define a balanced incomplete block design (BIBD). State the important relations among the parameters of a BIBD and prove any one of them.

$$3+2+4=9$$

Or

(b) When a balanced incomplete block design (BIBD) becomes resolvable? Explain with an example. For a resolvable BIBD with parameters v, b, r, k, λ, prove that

$$b \geq v + r - 1 \qquad 3+2+4=9$$

4. *(a)* Explain what are meant by main effects and interactions in factorial experiments. A complete 2^3-experiment is replicated in r times. Describe the procedure for testing the presence of different main effects and interactions.

$$4+9=13$$

Or

(b) What is meant by confounding in factorial experiments? Why is confounding used even at the cost of loss of information on the confounded effects? Give the layout of a 2^4-factorial experiment, where the highest order interaction effect is completely confounded.

$$3+2+8=13$$

5. (a) What are fractional replication and factors at two levels? Discuss the construction of $\frac{1}{2} \times 2^k$ designs.   2+2+5=9

   Or

   (b) Write a short note on one-half fraction of 2^3-factorial experiments.   9

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