[This question paper contains 4 printed pages.]

2038 *Your Roll No. .....*

B.Sc. (Hons.) / III **E**

STATISTICS – Paper XXII

(Design of Experiments)

(Admissions of 1999 and onwards)

Time : 2 Hours *Maximum Marks : 38*

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt **four** *questions in all selecting* **two** *from each Section.*

SECTION I

1. (a) Explain the importance of a uniformity trial in design of experiments.

   (b) In an LSD, discuss how you would test :

   (i) the hypothesis of equality of all treatment effects.

   (ii) the hypothesis of equality of two specific treatment effects. (3½,6)

P.T.O.

2. Describe the analysis of an RBD with 6 varieties of paddy laid out in 4 homogeneous blocks, when observation corresponding to 3rd treatment under 2nd block is missing, using the missing plot technique. Also, obtain the expression for the standard error of the estimated treatment differences, between two treatment means, one of which involves a missing plot. (9½)

3. (a) Show that, in a split plot design, expected mean square due to whole plot treatments is equal to the expected mean square due to whole plot error under its null hypothesis of homogeneity.

   (b) How is efficiency of a design measured? Determine the efficiency of LSD relative to RBD taking columns as blocks and efficiency of LSD relative to CRD. (6,3½)

SECTION II

4. (a) Define complimentary and derived designs of a BIBD with parameters v, b, k, r and λ. Construct these designs for the following BIB design; where rows are blocks :

1	4	5	9	3
2	5	6	10	4
3	6	7	11	5
4	7	8	1	6
5	8	9	2	7
6	9	10	3	8
7	10	11	4	9
8	11	1	5	10
9	1	2	6	11
10	2	3	7	1
11	3	4	8	2

Are the resultant designs BIBDs ?

(b) For a BIBD, derive the standard error of the difference between two estimated treatment means. (5½,4)

5. (a) Define the term treatment contrast ? When are two contrasts said to be orthogonal ? Show that, in a 2^3 factorial experiment, the set of contrasts due to various effects are mutually orthogonal.

(b) A 2^5 factorial design with factors A, B, C, D, and E is arranged in 4 blocks of 8 plots each. If some

of the elements of one of the blocks are : (1), bc, abd, abe. What are the remaining elements of this block ? Identify all the confounded effects. What is the block composition of the remaining blocks ? (5,4½)

6. (a) Present the Yates' algorithm for computing the total and mean effects and sum of squares due to various effects for a 3^2 factorial experiment with r replications.

(b) Obtain the treatment combinations of a 2^{5-2} design using I = ABE and I = –BCE as design generators. Write down the alias structure and resolution of this design. (5,4½)