

[This question paper contains 2 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 1458

I

Unique Paper Code : 2372573501

Name of the Paper : DSC: Introduction to Design of Experiments

Name of the Course : **B.A. / B.Sc. (P) under NEP-UGCF**

Semester : V

Duration : 3 Hours

Maximum Marks : 90

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt Six questions in all.
3. Question no. 1 is compulsory. Attempt any Five questions from the remaining questions.
4. Use of non-programmable scientific calculator is allowed.

1. (a) Fill in the blanks :

- (i) There are _____ basic principles of design of experiments.
 - (ii) If the sum of squares is divided by the corresponding degrees of freedom, the result is frequently called _____ .
 - (iii) The error mean squares always provides unbiased estimate of _____ .
 - (iv) In a CRD with N plots and v treatments, the degrees of freedom for error are _____ .
 - (v) The experimental design which is based on only two basic principles of design of experiments is _____ .
 - (vi) _____ design is an incomplete 3-way layout. (6)
- (b) How the efficiency of a design measured? Discuss how it can be increased. (3)
- (c) What is a treatment contrast? When are two contrasts said to be orthogonal? (3)
- (d) Define resolvable BIBD. Indicate when a resolvable BIBD becomes Affine resolvable. (3)

P.T.O.

2. (a) Explain various principles used in RBD. What are the advantages of RBD over CRD?
- (b) Prove that in an RBD, the mean sum of squares due to error is always an unbiased estimate of the error variance while the mean sum of squares due to treatments and blocks are biased. (7,8)
3. (a) What is LSD? Consider a $m \times m$ LSD. Give the layout and analysis of variance table for this design.
- (b) Derive the expression to measure the efficiency of LSD over CRD, stating clearly the assumptions used in the derivation. (9,6)
4. (a) What is a BIBD? When a BIBD is called symmetric? Show that in a symmetric BIBD, any two blocks have the same number λ of treatments in common.
- (b) In BIBD, calculate the standard error of difference between two estimated treatment means. (8,7)
5. (a) What are factorial experiments? Write down the simple effects of a 2^3 factorial experiment. Derive the expressions for the main effects and interaction effects of 2^3 factorial experiment from these simple effects.
- (b) An experiment for 4 factors, each with two levels, is designed such that only a single replicate of the 16 treatment combinations is runs. Suggest a suitable method for analyzing such a design. (9,6)
6. (a) Distinguish between complete and partial confounding. Construct a 2^4 confounded factorial experiment into four blocks by confounding the effects AB and CD.
- (b) The following are two key blocks of a layout plan before randomization for a 2^4 factorial experiment with factors A, B, C, and D:

Replication I: (1), ac, cd, b

Replication II: (1), abd, acd, be

Identify all the confounded effects. (8,7)
7. Write short notes on any **Three** of the followings :
 - (i) Fractional factorial designs
 - (ii) Generator and aliases
 - (iii) Experimental units and experimental error
 - (iv) Uniformity trials and its utility (5,5,5)