## 6 SEM TDC STSH (CBCS) C 13

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(May)

## STATISTICS

(Core)

Paper: C-13

# ( Design of Experiments )

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) Replication in an experiment means
  - (i) the number of blocks
    - (ii) total number of treatments
    - (iii) the number of times a treatment occurs in an experiment
    - (iv) None of the above

(b) In a randomized block design with 4 blocks and 5 treatments having one missing value, the error degrees of freedom will be

(i) 12

(ii) 11

(iii) 10

(iv) 9

- (c) A Latin square design is a
  - (i) one-restrictional design
  - (ii) two-restrictional design
  - (iii) three-restrictional design
  - (iv) non-restrictional design
- (d) A BIBD is said to be symmetrical if the number of blocks =
  - (i) number of factors
  - (ii) number of treatments
  - (iii) number of levels
  - (iv) number of degrees of freedom
- (e) An experiment having several factors with equal number of levels is known as
  - (i) complex treatment
  - (ii) symmetrical factorial experiment
  - (iii) asymmetrical experiment
  - (iv) All of the above...

- 2. Answer the following in brief:  $2 \times 7 = 14$ 

  - What are the requirements of a good (a) experimental design?
  - (b) Define an experimental unit.
  - What are the drawbacks of RBD? (c)
  - (d) Why should not the number of treatments tested in LSD be less than three?
  - Explain what is meant by main effects (e) and interactions in factorial experiment.

order v with all elements e

- you (f)When do call the partial as confounding balanced and unbalanced confounding?
- What are the limitations (g)of confounding?
- 3. (a) Give the statistical model and hypothesis to be tested in an RBD. Also obtain the relative efficiency of an RBD over CRD. 4+5=9

Or ....

What is missing plot technique? When (b) and how is it used in design of experiment? Discuss how a missing observation of RBD is estimated and the analysis of an RBD involving one missing plot. 3+6=9

- 4. (a) (i) Define a balanced incomplete block design (BIBD). State the important relations among the parameters of a BIBD.
  - (ii) If N is the incidence matrix of a symmetric BIBD, then prove that

$$(NN')(NN') = (r - \lambda)N'N + k^2 \lambda E_{yy}$$

where  $E_{vv}$  is a square matrix of order v with all elements equal to 1.

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(b) When does a balanced incomplete block design (BIBD) become resolvable? Explain with an example. For a resolvable BIBD with parameters  $v, b, r, k, \lambda$  prove that  $b \ge v + r - 1$ .

3+2+4=9

4

### 5. Answer any one question:

(a) (i) State the advantages of factorial experiment over a simple experiment. Give complete statistical analysis of 2<sup>3</sup>-designs.

2+7=9

(ii) What is a treatment contrast?

When are two such contrasts said to be orthogonal?

2+2=4

#### Or

(b) (i) In a partially confounded 2<sup>3</sup>factorial experiment, the control
blocks of two replications are as
given below:

1. [	(1)	а	bc	abc
2. [	(1)	b	ac	abc

Identify the confounded effects and write down the other blocks of the replications. 2+2=4

9

- (ii) Give the analysis of a 2<sup>3</sup>-factorial experiment with 4 replications in which the three-factor interaction is confounded with block effects.
- (c) (i) What are fractional replication and factors at two levels?
  - (ii) Write a short note on one-half fraction of 2<sup>3</sup>-factorial experiments. 9

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