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6 SEM TDC STSH (CBCS) C 13

2024

(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

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

- (a) What are the requirements of a good experimental design?
- (b) Define an experimental unit.
- (c) What are the drawbacks of RBD?
- (d) Why should not the number of treatments tested in LSD be less than three?
- (e) Explain what is meant by main effects and interactions in factorial experiment.
- (f) When do you call the partial confounding as balanced and unbalanced confounding?
- (g) What are the limitations 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

- (b) What is missing plot technique? When 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. 3+2=5

(ii) If N is the incidence matrix of a symmetric BIBD, then prove that

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

where E_{vv} is a square matrix of order v with all elements equal to 1. 4

Or

(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, λ prove that $b \geq v + r - 1$.

3+2+4=9

5. Answer any one question :

(a) (i) State the advantages of factorial experiment over a simple experiment. Give complete statistical analysis of 2^3 -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 2^3 -factorial experiment, the control blocks of two replications are as given below :

1.	(1)	<i>a</i>	<i>bc</i>	<i>abc</i>
2.	(1)	<i>b</i>	<i>ac</i>	<i>abc</i>

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

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