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(May)

STATISTICS

(Major)

Course : 601

(**Design of Experiments**)

Full Marks : 80

Pass Marks : 32

Time : 3 hours

*The figures in the margin indicate full marks
for the questions*

1. Select the correct alternative out of the given ones : 1×8=8
- (a) An experimental unit in a research work is
- (i) an animal
 - (ii) a field plot
 - (iii) a group of insects
 - (iv) All of the above

(b) Randomization in an experiment helps to eliminate

- (i) systematic influences
- (ii) human biases
- (iii) dependence among observations
- (iv) All of the above

(c) Local control is a device to maintain

- (i) homogeneity among blocks
- (ii) homogeneity within blocks
- (iii) Both (i) and (ii)
- (iv) None of the above

(d) Errors in a statistical model are always taken to be

- (i) independent
- (ii) distributed as $N(0, \sigma_e^2)$
- (iii) Both (i) and (ii)
- (iv) None of the above

(e) 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

- (f) A Latin square design controls
- (i) two-way variation
 - (ii) three-way variation
 - (iii) multiway variation
 - (iv) no variation
- (g) The effect which is confounded in all the blocks in an experimental design
- (i) is estimated more precisely
 - (ii) is estimated less precisely
 - (iii) cannot be estimated
 - (iv) None of the above
- (h) If different effects are confounded in different blocks, it is said to be
- (i) complete confounding
 - (ii) partial confounding
 - (iii) balanced confounding
 - (iv) None of the above

2. Answer the following :

2×8=16

- (a) Define an experimental unit.
- (b) Define a treatment with reference to an experiment.
- (c) When do we use Analysis of covariance (ANCOVA)?
- (d) What are the different types of statistical model for experimental design?

- (e) When do you call an experimental design a randomized design? Is Latin square design a randomized design?
- (f) What are the drawbacks of an RBD?
- (g) Why should not the number of treatments tested in LSD be less than three?
- (h) What are the limitations of confounding?

3. Discuss the basic principles of experimental design as developed by R. A. Fisher.

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4. (a) What do you mean by analysis of variance (ANOVA)? What are the basic assumptions in ANOVA? What is one-way classification? Obtain the least square estimates of the parameters of one-way classification and prepare the analysis of variance table. $2+3+2+5=12$

Or

(b) What do you mean by a CRD? Clearly point out the advantages and disadvantages of a CRD. $4+8=12$

5. Give the statistical model and the hypotheses to be tested in an RBD. Also obtain the relative efficiency of an RBD over a CRD.

$2+4+6=12$

6. (a) When do we use an LSD? Give the statistical model and the ANOVA table for an LSD. Show how you would test the hypothesis of equality of all treatment effects. $3+3+4+2=12$

Or

- (b) Explain the missing plot technique and state the situation when it arises. Apply the missing plot technique to the case when a plot of yield is missing in an RBD. $4+2+6=12$

7. (a) What is a factorial experiment? Give the analysis of a z^2 -factorial experiment conducted in r randomized blocks. $4+8=12$

Or

- (b) What are the special features of a split plot design? Mention the merits and demerits of a split plot design. $4+4+4=12$
