

**U.G. 6th Semester Examination - 2022****STATISTICS****[HONOURS]****Course Code : STAT-H-CC-13****(Design of Experiments)**Full Marks : 50(40+10) Time :  $2\frac{1}{2}$  Hours*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.**Notations and symbols have their usual meanings.*1. Answer any **five** of the following questions:  $2 \times 5 = 10$ 

- Define Latin squares. When are two such squares said to be orthogonal?
- Describe a situation where Latin square design is appropriate.
- What are the roles of randomization with reference to a design of experiment?
- Distinguish between design of experiments and design of sample survey.
- Define a normalized treatment contrast. When two such contrasts are said to be orthogonal?

- Differentiate between total and partial confounding in factorial experiments.
- Write down the model of split-plot design with assumptions.
- How is local control achieved through the use of confounding in a factorial experiment?

2. Answer any **two** of the following questions:  $5 \times 2 = 10$ 

- Explain the role of local control in Design of Experiments.
- Find the efficiency of LSD compared to an RBD with the same number of treatments.
- Discuss in detail the analysis of a Latin square design with  $k$  treatments.
- Consider a  $(2^4, 2^2)$  design. Treatment combinations belonging to a block is a, b, cd, abcd. Construct the other three blocks. Also find the confounded effects.

3. Answer any **two** of the following questions:  $10 \times 2 = 20$ 

- How will you estimate the yield of a missing plot in LSD? Explain how you will carry out the analysis of LSD after estimating the yield of missing plot.  
5+5
- Suppose in an RBD with  $v$  treatments and  $b$  blocks, one of the treatments is repeated twice in each

block. Discuss in detail the analysis of such a design. Show that the estimates of block and treatment contrasts are orthogonal to each other. Obtain the average variance of all elementary treatment contrasts. 6+2+2

- c) Distinguish between ANOVA and ANOCOVA models. In an ANOCOVA conducted in an RBD with r replications and t treatments, show that the average variance of estimators of all elementary

treatments is given by 
$$\bar{v} = \frac{2\sigma^2}{R} \left[ 1 + \frac{T_{xx}}{(t-1)E_{xx}} \right]$$

Where  $T_{xx}$  is the treatment SS for x observations and  $E_{xx}$  is the error SS for x observations. 3+7

- d) Briefly discuss fractional factorial design with examples. 10

[Internal Assessment : 10]

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