2021

STATISTICS — HONOURS

Sixth Paper

(Group - A)

Full Marks : 50

The figures in the margin indicate full marks.

*Candidates are required to give their answers in their own words
as far as practicable.*

Answer *any four* from *question nos.* **1-8** and *any two* from *question nos.* **9-12**.

1. 'Randomization gets restricted as we move from CRD to RBD and then to LSD'. Discuss the validity of the statement. 5

2. Give an example of a real life social experiment where CRD is suitable over RBD. 5

3. Justify, stating TRUE or FALSE— 'A standard Latin square of order 3 is not unique'. 5

4. Cite any situation where orthogonality in factorial experiments is deliberately violated. Explain why you should recommend such violation. 1+4

5. Distinguish between partial confounding and total confounding with examples. 5

6. Write a note on different types of biases in survey. 5

7. For a simple random sampling without replacement obtain an optimal value of sample size given a margin of error and confidence interval. 5

8. Give real life examples where the following are applicable

   (a) Simple random sampling with replacement

   (b) Judgment sampling. 2½+2½

9. A comparative study of four different drugs for hypertension is to be carried out in each of the five hospitals in a city. For each hospital a Randomized Block Design with males and females as blocks is planned. Write the model you will use and the hypothesis you will test. Explain how you will perform the test. 15

Please Turn Over

10. (a) With reference to a 2^3 experiment with the factors A, B and C write the matrix D where $\theta = Dt$ and

$$\theta' = (A,\ B,\ AB,\ C,\ AC,\ BC,\ ABC)$$

$$t' = (1, a, b, ab, c, ac, bc, abc).$$

   (b) Construct a balanced $(2^5, 2^3)$ design, achieving balance over all the 2-factor, 3-factor and 4-factor interactions. Show the layout of any one of the replicates. 7+8

11. Consider an RBD with v treatments in r blocks where the observation corresponding to the first treatment in the first block is missing. The missing observation is estimated by minimizing the sum squares of errors in the design.

   (a) Derive the least squares estimates of all the block effects and treatment effects of the design under standard assumptions.

   (b) Obtain the average variances of the estimates of block effects and treatment effects obtained in (i). 8+7

12. (a) For a dichotomized population derive an unbiased estimator of the population mean in case of simple random sampling (i) with replacement (ii) without replacement.

   (b) Derive unbiased estimators of the variance of the estimators in (a). 6+9