Register Number:

DATE:

ST. JOSEPH'S COLLEGE (AUTONOMOUS), BENGALURU-27

M.Sc. STATISTICS - IV SEMESTER

SEMESTER EXAMINATION –JULY 2022

ST: 0220 – DESIGN AND ANALYSIS OF EXPERIMENTS

Time: 2 ½ Hours **Max Marks: 70**

This question paper has **TWO** printed pages and **TWO** sections

SECTION – A

I Answer any SIX of the following: 6 x 3 = 18

1. Develop the $(1-\omega)100\%$ confidence interval for a treatment contrast in CRD.
2. Prove that a block design is connected iff all block contrasts are estimable.
3. Illustrate that PBIBD need not be connected.
4. State and prove relation satisfied by incidence matrix in a symmetric BIBD.
5. Find the rank of model matrix in a Youden square design,
6. Explain the need for analysis of covariance
7. Discuss the Yates method of computing factorial effect totals in a 2^M factorial experiment.
8. Obtain the main effects and interaction effects in a 3^M factorial experiment.

SECTION – B

II Answer any FOUR of the following: 4 x 13 = 52

9 A) Establish the relationships between the parameters in BIBD. 7

B) In a 2^M factorial experiment, prove that 6

i) all factorial effects are treatment contrasts,

ii) any two factorial effects are orthogonal.

10 A) Derive the necessary and sufficient condition for the estimability of a linear parametric function in a general block design. 7

B) Stating the linear model of a 2^M factorial experiment, derive the BLUEs of factorial effects and their variances. 6

11 A) Develop the LR test procedure for testing equality of treatment effects in YSD. 7

B) Find an estimate of a missing observation in LSD and hence the expression for bias in testing the equality of treatment effects. 6

12 A) Carry out the intra-block analysis of a general block design. 7

B) Describe randomized block design and prove that it is orthogonal. 6

13 A) In the ANCOVA for RBD, develop a test for testing (i) the significance of regression parameter (ii) equality of treatment effects. 7

B) Write short notes on 6

i) variance balanced design

ii) efficiency of PBIBD.

14 A) Develop a LR test for testing equality of u out of v treatment effects in a CRD. where $2 \leq u \leq v$. 7

B) Explain the procedure of testing significance of linear and quadratic effects in a 3^M factorial experiment. 6