Time : $2\frac{1}{2}$ Hours]   [Total Marks: 70

Instructions:- 1) There are five compulsory questions in this Q. Paper
          2) All Question carry equal marks.
          3) Statistical Table will be provided on request.

Q-1   a)   Explain the following terms with reference to the design of experiments.   6
            i. Experimental Unit
            ii. Experimental Error
            iii. Treatment Contrast

     b)   What are the three basic principle of design of experiment .Explain in brief.   8

OR

Q-1   a)   Describe the fixed effect mathematical model for ANOVA testing in two way   8
           classification. Stating clearly (i) the assumptions (ii) the hypothesis to be tested
           (iii) the test statistics to be used and (iv) ANOVA Table

     b)   Distinguish between (i) fixed effect model and random effect model in the analysis of   6
          variance.

Q-2   a)   Give the complete analysis of Randomized Block Design. Explain the situation when   7
          it is used.

     b)   Explain missing plot technique in the design of experiment. State its advantages, why   7
          missing plot technique is not applicable in CRD?

OR

Q-2   a)   Outline the various steps in carrying out the ANOVA of Latin Square Design. State its   7
          Merits and demerits

     b)   To study the relative efficiencies of 5 different types of filter following results are   7
          available . Analyze the design completely.

Blocks	Type of Filter				
(Days)	A	B	C	D	E
1	16.3	18.2	17.0	15.1	18.3
2	16.5	19.2	18.1	16.0	18.3
3	17.5	17.1	17.3	17.8	19.8

Q-3   a)   Derive the formula for estimating one missing yield in Latin Square Design. Also state   7
          the ANOVA of such design.

     b)   For the following data, identify the design, estimate the missing yield and analyze the   7
          data completely.

A 251	B ?	D 227	C 229
D 234	C 273	A 274	B 226
C 235	D 236	B 218	A 268
B 195	A 270	C 230	D 225

<div align="center">OR</div>

Q-3 a) Derive the formula for estimating missing yields of Two Plots (of different treatment   9
of different block) in R.B.D. Also state ANOVA for such a design.

  b) Compute relative efficiency of RBD over CRD from the following ANOVA table: 5

Source	D.F.	S.S.	M.S.S.
Treatments	4	83.84	20.96
Blocks	4	49.84	12.46
Error	16	86.56	5.41
Total	24	---	---

Q-4 a) What do you mean by the factorial experiment. State advantages and disadvantages of   7
factorial Experiments.

  b) Explain Yate's method for 2^3 factorial experiments.   7

<div align="center">OR</div>

Q-4 a) In a certain 2^2 factorial experiment, there are 2 factors- N and K. write down all   8
treatment combinations. Derive the formula for estimating- (i) Main effect K, and
ii) Interaction N and K.

  b) Explain treatment contrast and orthogonal contrasts giving illustration of each.   6

<div align="center">OR</div>

Q-5 a) Explain what is meant by main effects and interactions in factorial experiment. A   9
complete 2^3 experiment is replicated r times. Describe the procedure for testing the
presence of different main effects and interactions.

  b) What is confounding ?Define total and partial confounding.   5

<div align="center">OR</div>

Q-5 a) Describe Yate's method for 2^2 factorial experiments.   8

  b) State three interaction of confounded treatment contrast.   6