NRT/KS/19/2184

Bachelor of Science (B.Sc.) Semester—VI Examination
EXPERIMENTAL DESIGNS
Optional Paper—2
(Statistics)

Time : Three Hours]   [Maximum Marks : 50

N.B. :— All questions are compulsory and carry equal marks.

1. (A) In a two-way ANOVA with m (m > 1) entries per cell, explain the linear model and obtain the least square estimates of the parameters in this mathematical model. State the hypothesis to be tested and interpret the conclusions under the following situations in this ANOVA :
   (i)   When the hypothesis of interaction of two factors is accepted at 5% level of significance
   (ii) When it is rejected ?   10

OR

   (E) Write the linear model in case of ANOVA : three way classification explaining the terms involved in it. State the null and alternative hypothesis to be tested in three way ANOVA and write the ANOVA-table.   10

2. (A) Write notes on :
   (i)   Uniformity trials
   (ii) Experimental error.
   (B) Explain the three basic principles of design of experiments describing how they help in minimizing experimental error.   5+5

OR

   (E) Carry out complete analysis of CRD by explaining its layout. Explain the test used for testing the equality of any pair of treatment means in CRD.   10

3. (A) Explain how the three principles of design of experiments are used in an RBD. State the linear model in RBD. Derive expressions for expected values of total sum of square, block sum of squares, treatment sum of squares and error sum squares in an RBD.   10

OR

   (E) What is a Latin Square Design ? Explain its layout and mathematical model. Give an ANOVA-table for LSD with r treatments. Also explain the advantages and disadvantages of LSD with a special reference to RBD.   10

4. (A) What is a treatment contrast ? When are two such contrasts said to be orthogonal ? In a 2^2-factorial experiment with two factors K and N, define the main effects K and N and the interaction effect KN. Obtain expressions for these effects. Show that :
   (i)   The main and interaction effects are treatment contrasts.
   (ii) The main effects K and N are othogonal treatment contrasts.   10

OR

   (E) What are factorial experiments ? How do these experiments differ from simple experiments ? If a 2^3-experiment with 3 factors A, B and C each at two levels is applied in an RBD with r blocks, obtain expressions for
   (i)   Main effects A
   (ii) Interaction effects AB and ABC.
   Stating the hypothesis to be tested, write the ANOVA-table for this experiment.   10

5.   Solve any **TEN** of the following questions :

(A)   Construct a standard Latin Square of order 3 with treatments A, B and C.

(B)   State one major difference between LSD and RBD.

(C)   Give a possible layout of an RBD with 4 treatments and 3 blocks.

(D)   Which basic principle of design of experiment is not used in CRD ?

(E)   Analysis of CRD is equivalent to ANOVA with _____ way classification.

   (Fill in the blanks and rewrite the sentence)

(F)   Define : Treatment and experimental unit in the context of design of experiment.

(G)   State Gauss-Markov's theorem.

(H)   Define BLUE.

(I)   Define mixed-effect model.

(J)   If a 2^3-factorial experiment is applied over LSD then what should be the order of Latin Square ?

(K)   Write the standard order of treatment combinations in a 2^3-experiment with factors A, B and C.

(L)   Write the ANOVA-table of a 2^2-factorial experiment applied over an RBD with 3 blocks.

$1{\times}10{=}10$