2014

(5th Semester)

STATISTICS

EIGHTH PAPER

(ANOVA, Design of Experiment and SQC)

Full Marks : 55

Time : 2 hours

(PART : B—DESCRIPTIVE)

(*Marks* : 35)

The questions are of equal value

UNIT—I

1. Derive the analysis of variance of one-way classified data with equal number of observations under fixed effect model.

OR

2. Compare between the fixed effects linear models and the random effects linear models under one-way classified data.

UNIT—II

3. In the design of experiment, prove that replication gives more accurate decision.

OR

4. Explain how the needs of concomitant variables come up in the design of experiment. Write its model and ANOCOVA table.

UNIT—III

5. Write a layout of an RBD having 5 treatments in 4 blocks, using random numbers.

OR

6. Find all the sum of squares required for ANOVA table of an RBD with their degrees of freedom.

UNIT—IV

7. Write the advantages of factorial experiment. Explain why the control units are required.

OR

8. Let $y_{ij} = \mu + \rho_i + k_j + \tau_k + e_{ij}$ be the fixed effects linear model of an LSD of order 4; $i, j, k = 1, 2, 3, 4$ where y_{ij}, μ, ρ_i, k_j, τ_k and e_{ij} are the observations in the (i, j)th cell of the LSD, the general mean, the ith row effect, the jth column effect, the kth treatment effect and the random error of y_{ij} respectively. Explain why the left-hand side and the right-hand side of the model have 4^2 and 4^3 observations respectively.

UNIT—V

9. Explain when d-control chart is necessary. Write both the cases for the standard value of P, given and not given.

OR

10. Explain when R-control chart is necessary. Write both the cases for the standard value of R, given and not given.

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(PART : A—OBJECTIVE)

(*Marks* : 20)

The figures in the margin indicate full marks for the questions

SECTION—A

(*Marks* : 5)

Put a Tick (✓) mark against the correct answer in the brackets provided for it : 1×5=5

1. In an ANOVA table, for calculating F, error mean sum of squares is taken as denominator, because

(a) it is exactly smaller than other mean sum of squares ( )

(b) it is always smaller than other mean sum of squares ( )

(c) it is never smaller than other mean sum of squares ( )

(d) it is greater than other mean sum of squares ( )

2. In a linear model, $y_{ij} = \mu + \alpha_i + \beta_j + \gamma t_{ij} + e_{ij}$, a concomitant variable can be associated with

(a) μ ( )

(b) α_i ( )

(c) β_j ( )

(d) t_{ij} ( )

3. In a CRD with 3 treatments such that the first treatment replicates 2, the second treatment replicates 3, the ANOVA table has 5 error degrees of freedom, the third treatment replicates

(a) 1 ( )

(b) 2 ( )

(c) 3 ( )

(d) 4 ( )

4. Factorial experiment is mainly for

(a) decreasing error components ( )

(b) allowing more number of effects in testing of the significance without increasing the number of plots ( )

(c) compensating to analyse the data easily ( )

(d) None of the above ( )

5. In a control chart of mean ($\bar{x}$)

(a) if UCL is negative, it is substituted with zero ( )

(b) if mean is negative, it is substituted with zero ( )

(c) if LCL is negative, it is substituted with zero ( )

(d) None of the above ( )

SECTION—B

(*Marks* : 15)

Answer the following questions : 3×5=15

1. Explain mixed linear effects models.

2. Write a note on local control, concerning the soil of the experimental field.

3. Partition the total SS of an RBD into TrSS, BSS and ESS.

4. In a 2^3-factorial experiment with the factors A, B and C, prove that $A = \frac{1}{r2^2}(a-1)(b+1)(c+1)$, where r is the replication of each treatment-combination.

5. Describe *C*-chart.

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