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(October)

STATISTICS

(Honours)

(Linear Models, Regression and Operations Research, Design of Experiments)

[STH–52 (TH)]

Marks : 56

Time : 3 hours

The figures in the margin indicate full marks for the questions

Answer **five** questions, taking **one** from each Unit

UNIT—I

1. *(a)* Explain the terms 'estimable parametric function', 'error function' and 'best linear unbiased estimator'.

   (b) Stating all the assumptions, write down the Gauss-Markov linear model.

   (c) State the Gauss-Markov theorem.

   6+4+2=12

(Turn Over)

2. (a) Prove the necessary and sufficient condition for a parametric function to be estimable and that for a linear function of the variable to belong to error.

   (b) Write down normal equation in matrix notation of a Gauss-Markov linear model and hence obtain least square estimate of the parameter vector.

   $$6+(4+2)=12$$

UNIT—II

3. What do you mean by multiple regression? Obtain the equation of the plane of regression of X_1 on X_2 and X_3 of the form

   $$\frac{X_1}{\sigma_1}\omega_{11} + \frac{X_2}{\sigma_2}\omega_{12} + \frac{X_3}{\sigma_3}\omega_{13} = 0$$

   Symbols have their usual meanings. $\quad 2+9=11$

4. Write notes on : $\qquad 3+3+5=11$

   (a) Correlation ratio

   (b) Correlation index

   (c) Violation of usual assumptions concerning normality, co-linearity and homoscedasticity in a regression model

UNIT—III

5. Give the complete analysis of a two-way classified data with m observations per cell stating clearly the mathematical model, assumptions used, hypothesis to be tested, test statistic to be used along with ANOVA table. $\qquad 11$

6. (a) Write notes on :

   (i) Factorial experiment

   (ii) Complete and partial confounding

   (iii) Different main effects and interaction effects in a 2^3-factorial experiment

   (b) Write in brief about analysis of covariance mentioning the mathematical model for one-way classification with a single concomitant variable in CRD. $\qquad (2+3+2)+4=11$

UNIT—IV

7. What do you understand by linear programming problem? What are the conditions that need to be satisfied to solve linear programming problem for optimization? Write the assumptions of linear programming problem and the different steps for the formulation of LPP.

   $$2+3+4+2=11$$

8. *(a)* State general linear programming problem. Define the following terms :

   (i) Solution of LPP

   (ii) Feasible solution

   (iii) Basic feasible solution

   (iv) Basic solution

   (v) Optimum feasible solution

   (b) Write a note on graphical method of solution of LPP and application of LPP.

$$(3+5)+3=11$$

UNIT—V

9. What is transportation problem? Give the mathematical formulation of it. Write the different steps to solve transportation problem by *(a)* north-west corner rule and *(b)* Vogel's approximation method. $5+3+3=11$

10. Write a note on assignment problem and give its mathematical formulation. Write the algorithm to solve an assignment problem by Hungarian method. $3+3+5=11$

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