

Design and Analysis of Experiments

A. Answer the following

1. State the assumptions in general linear model.
2. State a necessary and sufficient condition for estimability of a linear parametric function.
3. State an application of the Gauss-Markoff theorem
4. Define main effect.
5. State a test statistics for testing the significance of the main effect of factor A in a 2^2 factorial experiments with factors A and B.

B. State true or false

1. The normal equations are always consistent.
2. The covariance between any linear function belonging to the error space and any BLUE is zero.
3. The least square estimators of the parameters of general linear model are the unbiased estimators.
4. In a factorial design, all the factors must be quantitative.
5. In a factorial experiment, if errors are normally distributed then all the effects are normally distributed.

C. Fill in the blank

1. the normal equations in general linear model are
2. The variance of least square estimate of b in general linear model is
3. SSE in a general linear model can be expressed as $\epsilon'(\mathbf{I} - \mathbf{P})\epsilon$, where $\mathbf{P} = \dots\dots\dots$
4. The formula for computing main effect A in a 2^3 factorial experiments with factors A, B, and C is
5. The graphical to analyse a single replicate of a factorial experiment is

D. Select the correct option

1. The totals of the response observations of the three replicates of a 2^2 factorial experiment with factors A and B are, namely, (1) = 80, a = 100, b = 60, and ab = 90. The sum of squares due to factor A is
A) 208.33 B) 75 C) 8.33 D) 108.36
2. The degrees of freedom for error sum of squares in a 2^2 factorial experiment with single replicate is
A) 0 B) 1 C) 2 D) 3
3. The totals of the response observations of the three replicates of a 2^2 factorial experiment with factors A and B are, namely, (1) = 80, a = 100, b = 60, and ab = 90. The estimate of β_2 in the regression model $y = \beta_0 + \beta_1x_1 + \beta_2x_2 + \epsilon$ for this experiment is
A) 4.17 B) 2.5 C) -2.5 D) 5
4. The standard order of the treatment combinations in 2^3 design is
A) (1), a, b, ab, c, ac, bc, abc B) (1), a, b, c, ab, ac, bc, abc
C) (1), a, b, c, ab, bc, ac, abc D) a, b, c, ab, bc, ac, abc, (1)
5. The number of effects in a 2^k factorial experiment is
A) 2^k B) $2^k - 1$ C) $2^k + 1$ D) Does not depend on k