

1. State and prove Gauss-Markov Theorem.
2. If two different solutions ($\widehat{\beta}_1$ and $\widehat{\beta}_2$) of the normal equation exist, will the estimates of the estimable function $\lambda' \beta$ be different? 8+2

1. Prove that the covariance between any BLUE and any function belonging to the error space is zero. *role*
2. What does a function belonging to the error space play? 7+3

1. Find $var(\lambda' \widehat{\beta})$ where $\widehat{\beta}$ is a solution of the normal equation.
2. Consider the following model:

$$y_1 = \beta_1 + \beta_2 + \epsilon_1$$

$$y_2 = \beta_1 + \beta_3 + \epsilon_2$$

$$y_3 = \beta_1 + \beta_2 + \epsilon_3$$

Find a necessary and sufficient condition for the following function

$$\sum_{i=1}^3 \lambda_i \beta_i$$

to be estimable.

3+7