

MTH 207M

Quiz 3

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**Roll No:**

**Time:** 10 AM to 10:50 AM

**Name:**

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**Problem 1:** Consider the following model

$$E(y_{ij}) = \mu + \alpha_i; \quad i = 1, \dots, k, \text{ and } j = 1, \dots, n. \quad (1)$$

Find an unrestricted estimator of  $\theta = (\mu, \alpha_1, \dots, \alpha_k)^T$  minimizing the residual sum of squares. (3 Marks)

**Problem 2:** Find a restricted estimator of  $\theta = (\mu, \alpha_1, \dots, \alpha_k)^T$  minimizing the residual sum of squares with restriction  $\sum_{i=1}^k \alpha_i = 0$ . (3 Marks)

**Problem 3:** Find the variance of  $\hat{\alpha}_i$ , where  $\hat{\alpha}_i$  is the restricted estimator of  $\alpha_i$ . (2 Marks)

**Problem 4:** Find the covariance of  $\hat{\alpha}_i$  and  $\hat{\alpha}_j$ . (2 Marks)