

U.G. 5th Semester Examination - 2021**STATISTICS****[HONOURS]****Course Code : STAH-CC-T-12****(Linear Models)**Full Marks : 50(40+10) Time : $2\frac{1}{2}$ Hours*The figures in the right-hand margin indicate marks.**Candidates are required to give their answers in their own words as far as practicable.**Notations and symbols have their usual meanings.*

1. Answer any **five** questions: $2 \times 5 = 10$
- Why is estimation of error variance important?
 - What do you mean by homoscedasticity assumption of a linear model?
 - Why hat matrix is important in the context of regression analysis?
 - What do you mean by an idempotent matrix? What can you say about its rank?
 - What are the basic assumptions of regression analysis?
 - Write down the linear model for one-way classified data with assumptions.
 - Give an example of a mixed effect model.

- h) What do you mean by estimation space and error space?

2. Answer any **two** questions: $5 \times 2 = 10$
- What is meant by the term 'linear hypothesis'? How is such hypothesis tested? $2+3$
 - What do you mean by fixed and random effect models? Why is the interaction effect not considered in the analysis of two-way classified data under fixed effect model with one observation per cell? $2+3$
 - Write down the assumptions of linear regression model. Mention some suggestions to deal with situations where assumptions are not followed. 5
 - Give a comparison among ANOVA, ANCOVA and Regression models with examples. 5
3. Answer any **two** questions: $10 \times 2 = 20$
- Show that OLS estimator β is BLUE for multiple linear regression.
 - For two-way classified data with one observation per cell present the ANOVA table clearly mentioning the model, assumptions, hypotheses under fixed and random effect models.

[Turn over]

- c) Write short notes on: (i) Testing of general linear hypothesis, (ii) Testing of equality of two regression equations.
- d) Consider the Gauss-Markov model:
 $E(y_1) = 2\theta_1 + \theta_2, E(y_2) = \theta_1 - \theta_2, E(y_3) = \theta_1 - \alpha\theta_2$
with usual assumptions. Determine α such that the BLUE's of θ_1, θ_2 are uncorrelated.

[Internal Assessment: 10]
