



STRATHMORE UNIVERSITY
STRATHMORE INSTITUTE OF MATHEMATICAL SCIENCES
MASTER OF SCIENCE IN STATISTICAL SCIENCES
END OF SEMESTER EXAMINATION
STA 8306 Longitudinal Data Analysis

Date: 22nd April 2022

Time: 2 hours

Instruction: Answer Question one and any other two

Question One

- i. Clearly define the following terms as used LDA
 - a) Loess Smooth Curve
 - b) Longitudinal Study
 - c) Random Effect
 - d) Cross-sectional study
 - e) Variance-Covariance matrix

(5 marks)

- ii. What are the source of correlation in Longitudinal Data Analysis (LDA)

(4 marks)

- iii. Provide a brief description of longitudinal data layout.

(2 marks)

- iv. Describe a Viogram, and how a sample computation is done

(3 marks)

- v. Describe with all characteristics/features of three (3) non-parametric approaches for fitting a smooth curve to longitudinal data

(9 marks)

- vi. Distinguish the following terms in LDA
 - a) Kernel Estimation and Smoothing Spline
 - b) Error-plots and Spaghetti plots
 - c) Generalized Linear Mixed Models and Generalized Estimating Equations.

(6 marks)

Question two

- i. Describe 3 approaches of Longitudinal Data Analysis
(3 marks)
- ii. State the variance-covariance structure of Population-averaged models: (generalized estimating equations-GEE) for β and Subject-specific models: Likelihood methods based on $Y_i \sim \text{MVN}(X_i\gamma, V_i)$ to estimate γ and parameters in V_i
(9 marks)

Question three

- i. Provide 5 Challenges of longitudinal studies
(5 marks)
- ii. Using weighted least square technique derive the parameter estimates of general linear model for longitudinal data
(10 marks)

Question four

Provide a two-step Estimation procedure for Generalized Mixed Effect Model

(15 marks)

Question five

Derive the Covariate-adjusted general linear models

(15 marks)