LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

M.A. DEGREE EXAMINATION – **ECONOMICS**

SECOND SEMESTER – **APRIL 2025**

PEC2MC03 – ADVANCED econometrics

Date: 29-04-2025 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

	SECTION A – K1 (CO1)
	Answer ALL the questions **(5 x 1 = 5)**
1	**Choose the best answer.**
a)	Which of the following conditions, when violated, leads to the OLS estimator's variance being incorrectly estimated, potentially invalidating statistical inferences? a) Linearity of the model. b) Homoscedasticity of the error terms. c) Zero conditional mean of the error terms. d) The errors are normally distributed.
b)	In a qualitative response model, what does the estimated coefficient typically represent? a) The change in the dependent variable for a one-unit change in the independent variable. b) The change in the probability of the dependent variable occurring for a one-unit change in the independent variable. c) The correlation between the independent and dependent variables. d) The level of significance of the model.
c)	When choosing between a fixed effects and a random effects model in panel data analysis, which test is commonly used to help make the decision? a) The t-test. b) The F-test. c) The Hausman test. d) The chi-squared test.
d)	What is the primary problem that simultaneous equation methods aim to address? a) Heteroscedasticity in the error terms. b) Endogeneity of explanatory variables. c) Multicollinearity among independent variables. d) Autocorrelation in time-series data.
e)	What is the primary objective of "differencing" a time series? a) To increase the variance of the series. b) To remove seasonality from the series. c) To make the time series stationary. d) To create a trend within the time series.
	SECTION A – K2 (CO1)
	Answer ALL the questions **(5 x 1 = 5)**
2	**Define the following:**
a)	Auto correlation.
b)	Inverse Mill ratio.
c)	Distributed Lag Model.
d)	Simultaneous Equation Bias.
e)	Correlogram.

SECTION B – K3 (CO2)

Answer any THREE of the following in 100 words each. (3 x 10 = 30)

3. a. Explain the concept of 'dummy variable trap'. (5 marks)
   b. Prove that $\hat{\beta} = (D^I D)^{-I} D^I Y$, while doing seasonal adjustments using dummy variables. (5 marks).

4. Outline the Probit Model.

5. Elaborate the Random Effect Model by highlighting it's assumptions.

6. Explain the concept of Simultaneous Equation Bias.

7. Briefly explain the concept of Simultaneous Equation Bias. Explain the following:
   a. Fixed Effect W-G Estimator. (5 marks)
   b. Fixed Effect First -Differencing Method. (5 marks)

SECTION C – K4 (CO3)

Answer any TWO of the following in 200 words each. (2 x 12.5 = 25)

8. Prove that in the presence of Heteroscedasticity GLS estimator has better efficiency.

9. Consider the following data:

Y:	6	7	9	10	10	10	11	11	12	14
X:	4	8	6	8	9	11	7	7	10	10

   a. Estimate the function: $Y_i = \beta_1 + \beta_2 X_i + U_i$. (3 marks)
   b. Calculate the variance and standard errors of the estimators. (4 marks)
   c. Test the significance of the regression coefficient at 5 percent level. (3.5 marks)
      [hint: $t_{\alpha=0.025,\ 8\ d:f} = 2.306$].
   d. Interpret the results. (2 marks)

10. Derive the Indirect Least Squares.

11. Explain the following:
   a. Stochastic Process.
   b. Random Walk with and without Drift.
   c. Trend Stationary and Difference Stationary.
   d. Unit-root Stochastic Process.

SECTION D – K5 (CO4)

Answer any ONE of the following in 500 words (1 x 15 = 15)

12. Examine in detail the Logit Model using suitable equations and diagram.

13. Elucidate the Fixed Effect model using Least Square Dummy Variable approach.

SECTION E – K6 (CO5)

Answer any ONE of the following in 1000 words (1 x 20 = 20)

14. Given a General Linear Model, $Y = X\beta + U$, show that $\hat{\beta} = (X^l X)^{-l} X^l Y$. Prove that the OLS estimator satisfies BLUE.

15. Discuss the identifiability state of the following model using both structural and reduced forms:
   $y_1 = 4y_2 - 3x_1 + u_1$.
   $y_2 = 2y_3 + 2x_3 + u_2$.
   $y_3 = 2y_1 - 3y_2 - x_2 - x_3 + u_3$.
