



<b>QUALIFICATION : BACHELOR of SCIENCE IN APPLIED MATHEMATICS AND STATISTICS</b>	
<b>QUALIFICATION CODE: 07BSAM</b>	<b>LEVEL: 7</b>
<b>COURSE: APPLIED ECONOMETRIC MODELLING</b>	<b>COURSE CODE: AEM 702S</b>
<b>DATE: January 2024</b>	<b>SESSION: 1</b>
<b>DURATION: 3 HOURS</b>	<b>MARKS: 100</b>

**SECOND OPPORTUNITY / SUPPLEMENTARY: EXAMINATION QUESTION PAPER**

**EXAMINER: Prof Rakesh Kumar**

**MODERATOR: Dr Isak Neema**

**INSTRUCTIONS:**

1. Answer all questions on the separate answer sheet.
2. Please write neatly and legibly.
3. Do not use the left side margin of the exam paper. This is reserved for the examiner.
4. No books, notes and other additional aids are allowed.
5. Write all answers clearly with their respective question numbers.

**PERMISSIBLE MATERIALS:**

1. Non-Programmable Calculator

**ATTACHEMENTS**

None

**This paper consists of 3 pages including this front page**

**Question 1. [Total Marks 20]**

- (a) Discuss the method of indirect least squares. (5 marks)
- (b) Discuss the estimation of regression parameters in presence of perfect multicollinearity. (10 marks)
- (c) What is the role of adjusted  $R^2$  in regression model building? (5 marks)

**Question 2. [Total Marks: 20]**

- (a) Discuss the method of generalized least squares in handling the problem of heteroscedasticity. (10 marks)
- (b) Discuss the Koyck's approach to distributed lag models? (10 marks)

**Question 3. [Total Marks: 20]**

An investigator is interested in knowing whether the monthly family expenditure is related to the monthly family income. A sample of 10 families is selected at random, the detail is given below.

Family consumption expenditure (USD): Y	70	65	90	95	110	115	120	140	155	150
Family income (USD): X	80	100	120	140	160	180	200	220	240	260

- (a) Find the regression equation of monthly family consumption expenditure on the monthly family income. Predict the monthly family expenditure for monthly family income of USD 300. (15 marks)
- (b) What is the estimated change in the average monthly family expenditure with one unit change in the monthly family income? (2 marks)
- (c) How much variation in the monthly family consumption expenditure is explained by the monthly family income. (3 marks)

**Question 4. [Total Marks: 20]**

State and prove Gauss-Markov theorem. (20 marks)

**Question 5. [Total Marks: 20]**

(a) From the following model obtain the reduced-form equations:

$$Y_{1t} = \beta_{10} + \beta_{12} Y_{2t} + \gamma_{11} X_{1t} + u_{1t}$$

$$Y_{2t} = \beta_{20} + \beta_{21} Y_{1t} + \gamma_{22} X_{2t} + u_{2t}$$

(10 marks)

(c) Using matrix approach prove that in a multiple regression model, the OLS estimators are linear and unbiased. (10 marks)

.....End of Question Paper.....