



MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND ACTUARIAL SCIENCE

UNIVERSITY ORDINARY EXAMINATION

2018/2019 ACADEMIC YEAR

**THIRD YEAR SECOND SEMESTER EXAMINATION FOR, BACHELOR OF
SCIENCE APPLIED STATISTICS**

AMS 307 – ECONOMETRICS

DURATION: 2 HOURS

DATE: APRIL 2019

TIME: 2.00 – 4.00 P. M

Instructions to candidates:

1. Answer question One and Any Other Two questions
2. Mobile phones are not allowed in the examination room.
3. You are not allowed to write on this examination question paper.

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION

QUESTION ONE (30 MARKS)

- a) Discuss any three time series models (3marks)
- b) State three source of econometric data (3marks)
- c) Differentiate between regression and correlation (3marks)
- d) Define the following terms
- i) Heteroscedasticity (2mark)
 - ii) Forecasting (2mark)
- e) Discuss a t-test for testing the equality of means (6marks)
- f) Discuss three steps in developing an econometric model (6marks)
- g) Define the term econometrics. (2marks)
- h) Briefly explain the three properties of ordinary least square estimates. (3marks)

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

- a) Discuss the three types of econometrics data (6marks)
- b) The table below shows a counter basket for 2018 in two towns A and B

Item	Town A	Quantity A	Town B	Quantity B
Sugar	200	3	195	2
Salt	20	2	15	1
Bread	40	2	55	3
Cooking oil	300	1	280	2
Cooking gas	1200	2	1000	3
Petrol	5000	4	5500	5
Wheat flour	120	5	115	4

Calculate the LOWE and the Pascheres price indices and use them to select which town was better to live in (6 marks)

c) Given an econometric model of the form; $Y = 1.5 + 0.5x + \mu$

When Y is the consumption and X is income and where $\mu \sim N(0, \delta^2)$. Given an income level of 5 units, calculate

- i) Marginal propensity to consume (3marks)
- ii) Average propensity to consume (3marks)
- d) State two uses of price indices (2marks)

QUESTION THREE (20 MARKS)

a) State two reasons for introducing the error term in an econometric model (2marks)

b) Given an econometric model of the form

$$Y_i = \beta_0 + \beta_1 X_i + \mu_i, \text{ where } \mu_i \sim N(0, \delta^2)$$

Find the ordinary least squares estimates of β_0 and β_1 (8 marks)

c) The following data shows the income levels versus the expenditure for a household.

Expenditure (Y)	20	30	45	67	96	101	120	130	145
Income (X)	220	330	400	450	480	490	500	650	680

- i) Fit a linear regression model to the data (8 marks)
- ii) Use your regression model to estimate the expenditure when the income is 450. How does the value compare to the tabulated value (2 marks)

QUESTION FOUR (20 MARKS)

a) Define an autoregressive process (2marks)

b) Consider an AR (1) process defined below

$$X_t = \alpha_0 + \alpha_1 X_{t-1} + \varepsilon_t$$

Show that it can be converted into an MA process that has a constant mean (3marks)

c) Given the following two MA (1) models.

i) $X_t = \varepsilon_t + \theta \varepsilon_{t-1}$

ii) $X_t = \varepsilon_t + \frac{1}{\theta} \varepsilon_{t-1}$

Show that their auto covariance function cannot be used to uniquely identify them. (6marks)

d) Convert the AR (1) above into an MA process and hence derive its auto covariance and Autocorrelation functions. (9marks)