MURANG'A UNIVERSITY OF TECHNOLOGY

SCHOOL OF PURE AND APPLIED SCIENCE

DEPARTMENT OF APPLIED SCIENCE

UNIVERSITY ORDINARY EXAMINATION

2017/2018 ACADEMIC YEAR

SECOND YEAR **SECOND** SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE IN MATHEMATICS AND COMPUTER SCIENCE

AMS307: ECONOMETRICS

DURATION: 2 HOURS

DATE: 19TH APRIL 2018

TIME: 2.00PM – 4.00PM

Instructions to Candidates:

1. Answer **Section A** and **Any Other Two** questions in **Section B**.
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 (30 Marks)

QUESTION ONE

a) Define the following terms
   i. Econometrics (1 Mark)
   ii. Heteroscelacity (1 Mark)
   iii. Price Index (1 Mark)
   iv. Aggregated economic model (1 Mark)
   v. Dynamic Model (1 Mark)

b) Show that in a two variable regression model

$$\gamma_i = \beta_0 + \beta_1 X_i + \mu_i$$
$$COV(\mu_i, X_i) = 0$$

Where μ_i's are the disturbances. (5 Marks)

c) State and briefly explain three (3) conditions necessary for an estimator to be said to be Best Linear Unbiased Estimator (BLUE) (6 Marks)

d) Given an Auto Regressive (AR) process $X_t = \propto X_{t-1} + \varepsilon_t$. Derive the spectral density function of X_t and plot a sketch of the density function at $\propto$=0.5. (6 Marks)

e) Discuss two (2) methods of removing seasonality in time series data. (4 Marks)

f) State four (4) properties of the coefficient of correlation (v). (4 Marks)

SECTION B – ANSWER ANY TWO QUESTIONS IN THIS SECTION

QUESTION TWO (20 MARKS)

a) Differentiate between weak stationary and strictly stationary time series process. (4 Marks)

b) Describe three (3) models of stationary processes. (6 Marks)

c) Given an MA (1) process $X_t = \varepsilon_t + \beta\varepsilon_{t-1}$. Derive;
   i. Conditional Mean. (2 Marks)
   ii. Variance equation (3 Marks)
   iii. Auto correlations (5 Marks)

QUESTION THREE (20 MARKS)

a) An econometrician wished to study the relation between customer satisfaction (Y) and customer age (X_1, in years), quantities bought (X_1, an index) and salary ratio (X_3, an index).

He selected 23 customers and collected data presented below. The larger values of Y, X_2 and X_3 are associated with more satisfaction, more quantities bought and higher salary ratio.

Y	48	57	66	-------	77	52	60
X_1	56	36	40	-------	29	44	43
X_2	51	46	48	-------	52	58	50
X_3	2.3	2.3	2.2	------	2.3	2.9	2.3

Use the R output below to answer the following output

i. Fit regression model $Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3$ to the data. State the estimated regression function. How is $\beta_1, \beta_2 \; and \beta_3$ interpreted here? (4 Marks)

ii. Predict customer satisfaction (Y) given that $X_1 = 54, X_2 = 57 \; and \; X_3 = 2.5$ (2 Marks)

iii. Test whether the customer satisfaction is related to the age, quantity and salary ratio. (3 Marks)

iv. Test the hypotheses $H_0: \beta_1 = 0 \quad H_0: \beta_2 = 0$
$H_1: \beta_1 \neq 0, H_1: \beta_2 \neq 0$ and $H_0: \beta_3 = 0, H_1: \beta_3 \neq 0$ (6 Marks)

v. Give the coefficient of multiple determinations and interpret. (2 Marks)

vi. Comment on the significance of the estimated parameters β_1, β_2 and β_3 (3 Marks)

	Model Summary			
Mode	R	R squared	Adjusted R squared	Std. Error of the Estimate
1	0.820	0.673	0.621	10.289

Anova

Mode	Sum of Squares	df	Mean square	I	Sig.
Regression	4133.633	3	1377.878	13.014	0.00
Residual	2011.584	19	105.873		
Total	6145.217	22			

Coefficients

Model		Unstandardized coefficients		Standardized Coefficients	t	sig
		β	Std. error	β		
1	Constant	162.876	25.776		6.319	0.00
	X1	-1.210	0.301	-0.613	-4.015	0.001
	X2	-0.666	0.821	-0.177	-0.811	0.427
	X3	-8.613	12.241	-0.157	-0.704	0.490

Residual Statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	33.68	84.85	61.35	13.707	23
Residual	-16.954	14.888	0.000	9.562	23
Std. Predicted Value	-2.019	1.715	0.000	1.000	23
Std. Residual	-1.1648	1.447	0.000	0.929	23

QUESTION FOUR (20 MARKS)

a) State three examples of price indices (3 Marks)

b) The data below shows the prices of five commodities in two towns A and B

Time	Item	Price per unit	
		Town A	Town B
2010	Unga (2 units)	52	60
2011	Sugar (3 units)	48	45
2012	Rice (5 units)	45	55
2013	Cooking fat (1 unit)	110	125
2014	Salt (1.5 units)	20	22
2015	Soap (3 units)	125	105
2016	Juice (7 units)	60	64

Calculate;

i. Paasche and Laspeyres price indices. (6 Marks)

ii. Fisher index (2 Marks)

iii. Discuss and compare the results in (i) and (ii) above. (3 Marks)

c) Discuss the following tests for price index formulas

i. Identity test (2 Marks)

ii. Proportionality test (2 Marks)

iii. Invariance to change in scale test. (2 Marks)