



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY
FACULTY OF HEALTH AND APPLIED SCIENCES**

DEPARTMENT OF MATHEMATICS AND STATISTICS

QUALIFICATION: Bachelor of science ; Bachelor of science in Applied Mathematics and Statistics	
QUALIFICATION CODE: 07BAMS	LEVEL: 7
COURSE CODE: TSA701S	COURSE NAME: TIME SERIES ANALYSIS
SESSION: JUNE 2019	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
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MODERATOR:	DR LILLIAN PAZVAKAWAMBWA

INSTRUCTIONS
<ol style="list-style-type: none">1. Answer ALL the questions in the booklet provided.2. Show clearly all the steps used in the calculations.3. All written work must be done in blue or black ink and sketches must be done in pencil.

PERMISSIBLE MATERIALS

1. Non-programmable calculator without a cover.

THIS QUESTION PAPER CONSISTS OF 4 PAGES (Including this front page)

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TIME SERIES ANALYSIS: TSA701S

EXAMINATION FIRST OPPORTUNITY 2019

Time-3 Hrs

Attempt all Questions

Maximum Marks - 100

1. (a) Discuss the components that may be exhibited in a time series process (12 marks)

(b) Define weak stationarity

(4 marks)

(c) Why is stationarity a desirable property for a time series process?

(4 marks)

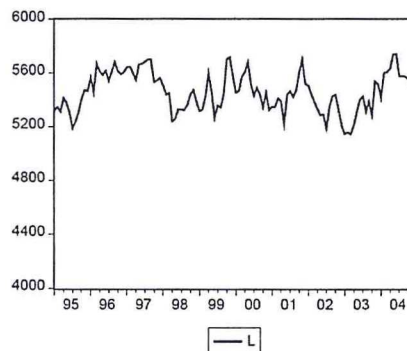
2. Question

(a) Discuss the terms: (i) Autoregressive (AR) and, (ii) Moving average (MA) process, (10 marks)

(b) Clearly distinguish between a (i) *Singular* and (ii) *Regular* processes (6 marks)

(c) Describe the generic form of the ARMA (p,q) process. (4 marks)

3. The graph illustrates the plot of a variable l (=labor) force, that is, number of employees in a large Ugandan company from January 1995 to December 2004.



(a) What are the characteristics of a stationary time series? Is the time series l_t likely to be stationary? Motivate your answer. (8 marks)

(b) A procedure by Dick-Fuller was used to test for stationarity of l_t , and the output, Table below was obtained. With reference to the table of the output, discuss the stationarity of l_t stating the hypothesis were necessary and determine the degree of integration. (6 marks)

Dickey-Fuller Test Equation

Dependent Variable: Δl_t

Method: Least Squares

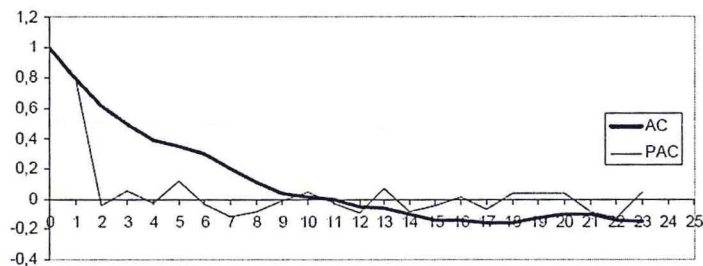
Sample (adjusted): 1995M02 2004M12; observations: 119

Variable	Coefficient	Std. Error	t-Statistic	Prob.
l_{t-1}	-0.200468	0.055277	-3.626566	0.0004
C	1096.460	301.8879	3.632011	0.0004
R-squared	0.101051	Mean dependent var	2.038202	
Adjusted R-squared	0.093368	S.D. dependent var	92.83931	
S.E. of regression	88.39903	Akaike info criterion(σ)	11.81826	
Sum squared resid	914283.5	Schwarz criterion(σ)	11.86497	

The critical value of the t-statistic for a model with intercept c is -2.89 on the 5 % level:

- (c) The correlogram plot of the series l_t is as shown in the Figure below. Required to give a description and an interpretation of the figure. State with a motivation the possible basic model that can be fitted to l_t . (6 marks)

Correlogram



4. The Table below shows an output from E-Views Software on a Time series, l_t (=labour) denoting the quantity of labour force, i. e. the number of employees in a firm. You are required to study the table carefully and answer the questions that follow

Dependent Variable: l_t

Method: Least Squares

Sample 1995M02 2004M12, observations: 119

Variable	Coefficient	Std. Error	t-Statistic	Prob.
CONST	1096.460		3.632011	0.0004
l_{t-1}	0.799532	0.055277		0.0000
R-squared	0.641332	Mean dependent var	5461.386	
Adjusted R-squared	0.638266	S.D. dependent var	146.9782	
S.E. of regression	88.39903	Akaike info criterion	11.81826	
Sum squared resid	914283.5	Schwarz criterion	11.86497	

- (a) Comment on the stationarity of the model with a motivation (4 mark)
- (b) State the Null and alternative hypotheses that relate to the validity of the coefficient of l_{t-1} in the model. (3 marks)
- (c) With reference to the given output, would the null hypothesis stated in (b) be rejected? Motivate your answer. (the 5% critical value is 1,96,) (4 marks)

- (d) Discuss the statistic that would most reliably be used in assessing the overall fit of the model and state its value. (3 marks)
- (e) Comment on the overall fit of the model based on the statistic stated in (d) above. (3 marks)
- (f) Write out the empirical mathematical model for the process. (3 marks)

5. Ten successive observations on a stationary time series Y_t are as follows

1.6, 0.8, 1.2, 0.5, 0.9, 1.1, 1.1, 0.6, 1.5, 0.8

- (a) Plot the observations (not to scale) (5 marks)
- (b) Describe the terms *Sample autocorrelation coefficient* and *Population partial autocorrelation coefficient* as used in time series. (4 marks)
- (c) Compute the autocorrelation coefficient at lag 2. (6 marks)
- (d) Determine whether the population autocorrelation of order 2 for the given series data in part (a) is zero or otherwise. (5 marks)

END