UGANDA MARTYRS UNIVERSITY
NKOZI

UNIVERSITY EXAMINATION
July 2022

FACULTY OF SCIENCE

DEPARTMENT OF NATURAL SCIENCES
END OF SEMESTER TWO FINAL ASSESSMENT

BACHELOR OF SCIENCE IN GENERAL (II)
&
BACHELOR OF SCIENCE Financial Mathematics (II)
Nkozi

TIME SERIES & REGRESSION ANALYSIS
STA 2202

DATE: Wednesday, 20th July 2022

TIME: 2:00 – 5: 00 Pm

DURATION: 3HRS
VENUE: AUD

Instructions:

1. *Carefully read through ALL the questions before attempting*
2. ***ANSWER FOUR (4) Questions****ONLY. (Each question carries equal marks)*
3. *No **names** should be written anywhere on the examination book.*
4. *Ensure that your **registration number** is indicated on all pages of the examination answer booklet.*
5. *Ensure your work is **clear** and **readable**. Untidy work shall be penalized*
6. *Any type of examination Malpractice will lead to automatic disqualification*
7. *Do not write anything on the questions paper.*
8. *Use the exam answer booklet for all your rough work*

QUESTION 1

(a) **[05 marks]** Describe what it means by the term time series analysis and give the components of it.

(b) **[05 marks]** Explain the importance of time series analysis

(C,) **[05 marks]** List and explain the problems associated with time series analysis

(d) The following data shows the production (in '000 units) of a commodity from the years 2010 to 2014

Year	2010	2011	2012	2013	2014
Production in ('000 units)	11	13	15	9	5

[10 marks] Fit the trend of the type Y = a + bX to the above (take 2012 as the year of origin) and estimate the production for 2019.

QUESTION 2

The manager of a firm thinks that there is a relationship in a form of a linear regression between advertising expenditures and sales. That other thing remaining constant, the more one invests in advertising the more the sales. He studied the relationship between these variables and below are his findings.

Advertising costs ($) X	44	18	27	21	32	51	43	23	51	42	27	55
Sales ($) Y	380	410	390	375	470	400	450	400	565	515	487	515

REQUIRED

(a) **[10 marks]** Fit a regression line using least squares method. Using the fitted line, what would be the sales with an advertising expenditure of $ 50?

(b) **[02 marks]** What would be the advertising budget be if we want sales of $460?

(c) **[08 marks]** Determine the coefficient of determination and the Pearson Correlation Coefficient.

(d) **[05 marks]** Interpret your findings and comment on the relationship between X and Y.

components

QUESTION 3

(The Director of Uganda motors want to study the relationship between the age of a car and its selling price. Listed below is a random sample of 12 used cars sold at Maumee motors during last year's records.

Car	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Age (yrs) **(x)**	9	7	11	12	8	7	8	11	10	12	6	6
Selling price ($000) **(y)**	8.1	6.0	3.6	4.0	5.0	10.0	7.6	8.0	8.0	6.0	8.6	8.0

(i) **[05 marks]** Draw the scatter diagram of this data.

(ii) **[06 marks]** Compute Carl Pearson product moment correlation coefficient and coefficient of determination

(iii) **[02 marks]** Interpret the above findings

(iv) **[06 marks]** Fit a regression equation y on x for the above data using least squares principle.

(v) **[03 marks]** Estimate the selling price of a 13-year-old car.

(vi) **[03 marks]** Estimate the age of a car whose selling price is 9.0 ($000).

QUESTION 4

(a) **[05 marks]** List different growth curves (models) commonly used in developments.

(b) **[05 marks]** For the models listed above, state where they are properly applied.

(C,) The sales of a company in ($ 000) for the years 2008 to 2012 are given below.

Year	2008	2009	2010	2011	2012
Sales	11	39	20	43	74

[15 marks] Estimate the sales for the year 2018 using an equation of the form,

$Y = ab^x$

Where x = years and Y = Sales.

QUESTION 5

The annual production of a firm by wood products company Ltd, since 2008 follows;

YEAR	2008	2009	2010	2011	2012	2013	2014	2015
Production (thousands)	8	11	9	13	10	12	15	14

(i) **[06 marks]** plot the production data

(ii) **[10 marks]** Determine the least squares equation

(iii) **[09 marks]** Based on the equation for the straight line, what is estimated production for 2018?

QUESTION 6

(a) **[02 marks]** Describe non-linear trend analysis.

(b) It appears that the imports of a product have been increasing percent annually.

Year	2008	2009	2010	2011	2012	2013	2014	2015
Imports (Thousands of tons)	90	100	124	135	143	155	167	178

(i) **[15 marks]** Determine the logarithmic straight-line equation

(ii) **[03 marks]** By what percentage did imports increase on average, during the period?

(iii) **[05 marks]** Estimate imports for the year 2020?

END