KISII UNIVERSITY

UNIVERSITY EXAMINATIONS

FIRST YEAR EXAMINATION FOR THE AWARD OF THE DEGREE OF MASTERS OF APPLIED STATISTICS
SECOND SEMESTER 2022/2023
[JANUARY – APRIL, 2023]

MATH 875: TIME SERIES ANALYSIS

STREAM: Y1 S2 **TIME: 3 HOURS**

DAY: MONDAY, 9:00-12:00 P.M **DATE: 20/03/2023**

INSTRUCTIONS

1. ***Do not write anything on this question paper.***
2. ***Answer question ONE (Compulsory) and any other TWO questions.***

QUESTION ONE-30 MARKS

a) When is a random process stationery? [2 Marks]

b) What is Stationerity in the weak sense and strong sense [5 marks]

c) When is a continuous randoM process $\{X(t), t\epsilon\mathbb{R}\}$ considered to be strict sense stationery [5 Marks

d) How can we test for Stationerity in Time series [5 Marks]

e) What are some of the methods of making a non stationary time series Stationery. [5 Marks]

f) What is auto-correlation and how is it used in time series analysis? [4 Marks]

g) How does auto-correlation help to identify patterns and trends in the data. [4 Marks]

QUESTION TWO-20 MARKS

a) What is the purpose of using a 3-year moving average in time series analysis, and how does it differ from other moving average methods? [5 Marks]

b) From the data below,

Year	1	2	3	4	5	6	7	8	9	10	11	12
Price	52	66	56	79	55	57	51	63	60	77	67	56

i) Find a trend line using semi-average method [8 Marks]

ii) Find out a 3 year moving average [7 Marks]

QUESTION THREE-20 MARKS

a) Explain 5 methods of seasonal variation. [10 Marks]

b) From the data below, calculate quarterly season indices assuming the absence of any type of trend.

c) [10 Marks]

Year		**I**	**II**	**III**	**IV**
2010		152	186	182	159
2011		151	168	154	169
2012		186	-	180	167
2013		151	174	-	176
2014		178	188	189	-
2015		-	167	178	155

QUESTION FOUR-20 MARKS

a) What are some advantages and disadvantages of using strict sense stationarity in time series analysis?

[10 marks]

b) Consider the discrete-time random process $\{X(n), n\epsilon\mathbb{Z} \dots\}$, in which the $X(n)$'s are i.i.d. with CDF $F_{X(n)}(x) = F(x)$. Show that this is a strict sense stationery process. [10 Marks]

QUESTION FIVE-20 MARKS

a) What is a WSS (wide-sense stationary) process, and what are the key properties that define this type of process?

[10 marks]

b) Consider the random process $\{X(t), t\epsilon\mathbb{R}\}$ defined as $X(t) = \cos(t + U)$,

Where $U \backsim Uniform(0,2\pi)$. Show that $X(t)$ is a WSS process.

[10 marks]