CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATIONS

RESIT/SPECIAL EXAMINATION

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE

MATH 243: INTRODUCTION TO TIME SERIES ANALYSIS

STREAMS: BSC **TIME: 2 HOURS**

DAY/DATE: FRIDAY 01/09/2023 **11.30 A.M – 1.30 P.M.**

INSTRUCTIONS

- **Answer all questions.**

Question one

a) Define the following:

Time series Model. (2 marks)

Random walk. (2 marks)

b) Distinguish between stationary in strong/strict sense and stationarity in the weak sense. (4 marks)

c) Briefly explain the main components of time series. (8 marks)

d) Suppose the following data represent total revenues (in millions of shillings by a car rental agency over the 11-year period 1990 to 2000: Compute the 5-year moving averages for this annual time series. (6 marks)

Year	Total Revenue
1990	4
1991	5
1992	7
1993	6
1994	8
1995	9
\1996	5
1997	2
1998	3.5
1999	5.5
2000	6.5

e) Fit a straight-line trend by the method of least square to the following data. Also findan estimate for the year2000; (8 marks)

Year	: 19901991		1992	1993	1994	1995	1996	1997
Production	: 38	40	65	72	69	67	95	104

Question two

a)How does analysis of time series help businessforecasting? (3marks)

b)Is the MA(2) process $X_t = 2 - 5e_{t-1} + 6e_{t-2}$ invertible? (5 marks)

c) The data below gives the average quarterly prices of a commodity for five years. Calculate seasonal indices by method of link relatives. (12 marks)

year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
1979	30	26	22	31
1980	35	28	22	36
1981	31	29	28	32
1982	31	31	25	35
1983	34	36	26	33

Question three

a)What is a time series model? (2 marks)

b)Is the MA(2) process $X_t=Z_t+4.25Z_{t-1}+Z_{t-2}$ invertible? (5 marks)

c)Given the time series x=(1,2,4,4,6,5,7,9,9,10) calculate the forecast $x_{10}(1)$ using only the last 5 observations for α=0.1, 0.5 and 0.9 (6 marks)

d)Find the autocorrelations of the AR(2) model below

$$Xt = 0.75\ X_{t-1} - 0.25\ X_{t-2} + a_t$$
