



MACHAKOS UNIVERSITY

University Examinations 2022/2023 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (STATISTICS AND PROGRAMMING)

BACHELOR OF SCIENCE (ACTUARIAL SCIENCE

SST 100: INTRODUCTION TO BUSINESS AND SOCIAL STATISTICS

DATE: 14/04/2023

TIME: 08:30 – 10:30 AM

Instructions to the Candidate:

1. Answer **Question 1** and any other **two** questions.
1. You must have a Scientific Calculator for this paper.
2. Solution to each question must start on a new page.

QUESTION ONE (COMPULSORY) (30 MARKS)

- (a) (i) Outline *four* areas of application of index numbers in economics. (4 marks)
- (ii) Outline *four* examples of time series as applied in social data. (2 marks)
- (iii) State *four* socio-economic indicators for improvement in the standard of living in a country. (4 marks)
- (b) Explain *three* possible ways in which a *time series graph* would be a useful tool to the management of an organisation in performing its function of monitoring and control. (6 marks)
- (c) The data presented in the table below shows the wage in thousand Kenya shillings for employees of a certain parastatal over a six-year period.

Year	2015	2016	2017	2018	2019	2020
Wage	28	32	33	35	37	40
Consumer Price Index	102	103	105	108	114	117

Compute the real monthly wage index for each year for the employees. (8 marks)

- (d) The data in the table below shows the basic commodities used in households, their retail prices and the respective standard quantities (weights) over a five-year period, 2016 and 2020.

Commodity	Standard quantity	Price in Ksh	
		2016	2020
	w	p_0	p_n
Bread	600	35	65
Sugar	2,000	80	375
Milk	500	18	45
Flour	1,000	45	115

Calculate each of the following:

- A weighted average of price relatives.
- A weighted aggregate price index. (6 marks)

QUESTION TWO (20 MARKS)

- Define the term *time series* as used in statistics. (2 marks)
- Differentiate between the terms *fixed base* and *chain base* relatives as used in index numbers. (4 marks)
- Describe the *four* components of a time series as applied in statistics. (14 marks)

QUESTION THREE (20 MARKS)

- Outline *four* possible sources of official social statistical data. (8 marks)
- The table below shows the prices charged by an electrical shop for four categories of electric cables and their corresponding standard length in metres for the years 2017 and 2022.

Cable Type	2017		2022	
	Price per metre	Std length	Price per metre	Std length
Type X 1.5 mm	30	30	80	50
Type Y 1.5 mm	35	40	95	75
Type X 2.5 mm	50	30	120	30
Type X 2.5 mm	54	40	140	75

Calculate each of the following taking the year 2017 as the base:

- Laspeyre's price index;
- Paasche's price index. (12 marks)

QUESTION FOUR (20 MARKS)

The consumption of electric power in megawatt hours according to a power distribution company during a period of three consecutive years is as the table below.

Year	Power in megawatt hours			
	Quarter 1	Quarter 2	Quarter 3	Quarter 4
2020	30	60	78	40
2021	37	64	85	44
2022	40	70	94	49

- (i) Determine the *least squares trend* for the consumption of electricity. (8 marks)
- (ii) Using the *additive model*, determine the seasonal variation values for consumption of electricity. (8 marks)
- (iii) Forecast the quarterly consumption of electricity for the year 2023. (4 marks)

QUESTION FIVE (20 MARKS)

A matatu sacco has the data for its daily revenue in thousand Kenya shillings for a period of three consecutive weeks as shown in the table below.

Week / Day	Revenue in Ksh '000'				
	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	10	22	32	24	12
Week 2	14	28	39	30	15
Week 3	19	35	47	37	21

- (i) Determine the *moving average trend* for the time series data. (8 marks)
- (ii) Using the *additive model*, determine the seasonal variation values for the time series data. (8 marks)
- (iii) Forecast the daily sales for the *matatu sacco* for week 4. (4 marks)