



MACHAKOS UNIVERSITY

University Examinations 2021/2022 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE (ACTUARIAL SCIENCE)

SST 100: INTRODUCTION TO BUSINESS AND SOCIAL STATISTICS

DATE: 16/3/2022

TIME: 2.00-4.00 PM

INSTRUCTIONS:

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

QUESTION ONE (30 MARKS) (COMPULSORY)

- a) i Explain *three* possible sources of social statistics. (6 marks)
- ii Explain the function(s) of the Kenya National Bureau of Statistics (KNBS) based on the
- iii Outline *four* socio-economic indicators for improvement in the standard of living in a
- 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 in the table below shows the fixed base indices for the prices of petrol in Kenya for the period 2015 to 2021 with a base year of 2000.

Year	2015	2016	2017	2018	2019	2020
Fixed base (2000 = 100)	218.75	226.25	231.25	243.75	262.50	250.00
Fixed base (2015 = 100)						

Determine the fixed base indices for the prices of petrol for the same period, taking the year 2015 as the base. (4 marks)

- d) The data presented in the table below shows the wage in Ksh '000' for employees of a certain paras

Year	2005	2006	2007	2008	2009	2010
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Monthly Wage	20	21	23	25	27	30
Consumer Price Index	103	105	108	110	113	115

- Compute the real monthly wage index for each year for the employees. (6 marks)
- Interpret the result obtained in (i) above. (2 marks)

QUESTION TWO (20 MARKS)

- Define the term *time series* as used in statistics, giving 4 real life examples. (4 marks)
- Differentiate between *additive model* and *multiplicative model* with respect to their suitability in data sets. (4 marks)
- Explain the term *real value index*, illustrating with an example from real life situation (4 marks)
- The data in Table 4 shows the basic commodities used in households, their retail prices and the respective standard quantities (weights) over a five-year period, 2006 and 2011.

Commodity	Standard quantity	Price	
		2006	2011
	w	p_0	p_n
A	50	35	40
B	15	12	15
C	30	54	64
D	10	40	44

Calculate the following:

- A weighted average of price relatives.
- A weighted aggregate price index. (8 marks)

QUESTION THREE (20 MARKS)

- Outline *four* possible sources of official social statistical data. (8 marks)
- Differentiate between the terms *fixed base* and *chain base* relatives as used in index numbers. (4 marks)
- The table shows the fees in Kenya shillings for paid by students in a certain private school and their corresponding class sizes for the years 2005 and 2015.

Student level	2005		2015	
	Fees per student	Class size	Fees per student	Class size
Pre-unit	4,000	20	6,000	15
Nursery	6,000	25	8,000	30
Primary	10,000	20	16,000	30

Secondary	15,000	30	24,000	40
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Determine each of the following, taking 2005 as the base year:

- 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
2019	30	60	78	40
2020	37	64	84	44
2021	45	70	92	49

- Determine the *least squares trend* for the consumption of electricity. (8 marks)
- Using the *additive model*, determine the seasonal variation values for consumption of electricity. (8 marks)
- Forecast the quarterly consumption of electricity for the year 2022. (4 marks)

QUESTION FIVE (20 MARKS)

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

Week / Day	Revenue in Ksh '000'				
	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	10	22	31	24	12
Week 2	14	28	38	30	15
Week 3	19	35	46	37	20

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