



MACHAKOS UNIVERSITY

University Examinations 2020/2021 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

FIRST YEAR SECOND SEMESTER EXAMINATION FOR

BACHELOR OF SCIENCE (ACTUARIAL SCIENCE)

SST 100: INTRODUCTION TO BUSINESS AND SOCIAL STATISTICS

DATE: 22/6/2021

TIME: 8.30-10.30 AM

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 their mandate as a government agency. (3 marks)
- iii Outline *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 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 parastatal over a six-year period.

Year	2005	2006	2007	2008	2009	2010
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

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)