MACHAKOS UNIVERSITY

University Examinations 2018/2019

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS, STATISTICS AND ACTUARIAL SCIENCE

FIRST YEAR SPECIAL/SUPPLEMENTARY EXAMINATION FOR

BACHELOR OF SCIENCE IN STATISTICS AND PROGRAMMING
BACHELOR OF SCIENCE IN ACTUARIAL SCIENCE
SST 100: INTRODUCTION TO BUSINESS AND SOCIAL STATISTICS

DATE: 27/9/2019 **TIME: 11:00 – 1:00 PM**

Instructions to the Candidate:

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.*

1. (a) (i) Outline *four* areas of application of index numbers in economics. (4 *marks*)

(ii) State *four* socio-economic indicators for improvement in 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 Ksh '000' for employees of a certain parastatal over a six year period.

Year	2010	2011	2012	2013	2014	2015
Wage	28	32	33	35	37	40

Compute the fixed price index and the relative price index taking year 2010 as the base. (8 *marks*)

(d) The data below shows the basic commodities used in households, their retail prices and the respective standard quantities (weights) over a five year period, 2010 and 2015.

Commodity	Standard quantity	Price in Ksh	
		2010	2015
	W	P_o	P_n
Item A	50	35	40
Item B	15	12	15
Item C	30	54	64
Item D	10	40	44

Compute each of the following price relative indices taking year 2010 as the base:

(i) A weighted average of price relatives.
(ii) A weighted aggregate price index. (8 *marks*)

2. (a) Define the each of the following terms as used in social statistics:

(i) index number.
(ii) time series. (4 *marks*)

(b) Differentiate between the *additive model* and the *multiplicative model* with respect to their suitability in analysis of time series data. (4 *marks*)

(c) Differentiate between the terms *fixed base* and *chain base* relatives as used in index numbers. (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	2010	2011	2012	2013	2014	2015
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 taking year 2010 as the base. (8 *marks*)

3. (a) Outline *four* possible sources of official social statistical data. (8 *marks*)

(b) The data in the table shows the amount of fees charged in thousand Kenya shillings per month by a college that offers four course categories and their corresponding number of students in a class for the years 2015 and 2018.

Course Category	2015		2018	
	Fees in Ksh	No of Students	Fees in Ksh	No of Students
Business	20	40	25	46
Computer	34	35	42	40
Engineering	40	32	45	30
Hospitality	30	28	36	25

Determine each of the following index numbers taking the year 2015 as the base:

(i) Laspeyre's price index;

(ii) Paasche's price index. (12 *marks*)

4. The data in the table below represents the quarterly revenue in million Kenya shillings earned by a tourist hotel over a three year period.

Year	Revenue in million Ksh			
	Quarter 1	Quarter 2	Quarter 3	Quarter 4
2009	12	25	33	17
2010	15	31	40	23
2011	20	39	48	32

(i) Determine the *least squares trend* for the quarterly revenue of the hotel. (8 *marks*)

(ii) Using the *additive* model, determine the seasonal variation values for the quarterly revenue of the hotel consumption of electricity. (8 *marks*)

(iii) Forecast the quarterly consumption of electricity for the year 2012. (4 *marks*)

5. The number of phone calls passing through an automatic exchange during the week-days has been recorded a period of three consecutive weeks as shown in table below.

Week / Day	Number phone calls in thousands				
	Monday	Tuesday	Wednesday	Thursday	Friday
Week 1	12	25	35	27	15
Week 2	17	31	42	33	18
Week 3	22	38	50	40	24

(i) Determine the moving average trend for the time series data. (8 *marks*)

(ii) Using the multiplicative model, determine the seasonal variation values for the time series data.(8 *marks*)

(iii) Forecast the daily number of phone calls for week 4. (4 *marks*)