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(The University Of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

(MMUST)

(MAIN EXAMINATION)

UNIVERSITY EXAMINATIO

2021/2022 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DEGREE

OF

BACHELOR OF SCIENCE IN EPIDEMIOLOGY AND BIOSTATISTICS

COURSE CODE: HEM 324

COURSE TITLE: TIME SERIES ANALYSIS AND FORE CASTING

DATE: 20/04/2022 TIME: 3.00-5.00P M

Instructions to candidates: Answer Question ONE (Compulsory) and ANY other THREE Questions

Time: 2 hours

QUESTION ONE

a. Name the component factors In time series model
(4mks)

b. Use a five length moving average to smooth the following data
4.0, 5.0, 7.0, 6.0, 8.0, 9.0, 5.0, 2.0, 3.5, 5.5, 6.5
(4mks)

c. The following table list the revenue income for a private clinic in kakamega.

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
revenue	18.0	18.5	18.9	18.8	19.8	20.5	20.1	19.6	21.0

2004	2005	2006	2007	2008	2009
21.9	23.1	24.1	28.9	31.9	31.0

i. Using consecutive coded value from 0 through 14, calculate simple regression equation and plot a linear trend
(9mks)

ii. What will be the trend value in the year 2010
(3mks)

QUESTION TWO

a. State three common approaches to forecasting methods in time series (5mks)

b. From the data in the table below that represent annual three month medical report on malaria patients from 1991 to 2009, plot a three year and five year exponential smoothing and comment on your results. (10mks)

Year	Rate
1991	5.38
1992	3.43
1993	3.00
1994	4.25
1995	5.49
1996	5.01
1997	5.06
1998	4.78
1999	4.64
2000	5.82
2001	3.40
2002	1.61
2003	1.01
2004	1.37
2005	3.15
2006	4.73
2007	4.36
2008	1.37

2009	0.15

QUESTION THREE

a. The following table represent trading data stored in a pharmacy company from the year 1830 to 2000.

Decade	1830	1840	1850	1860	1870	1880	1890	1900	1910
Performance	2.8	12.8	6.6	12.5	7.5	6.0	5.5	10.9	2.2

1920	1930	1940	1950	1960	1970	1980	1990	2000
13.3	-2.2	9.6	18.2	8.3	6.6	16.6	17.6	-0.5

i. Plot the time series (3mks)

ii. Fit a three year moving average to the data and plot the result (3mks)

iii. Using a smoothing coefficient of W=0.50, exponentially smooth the series and plot the result (3mks)

iv. What is your exponential forecast for the years 2010s (3mks)

v. Repeat iii and iv using W=0.25 and compare the two results. (3mks)

QUESTION FOUR

a. State the equation of p^{th} order autoregressive model (1mk)

b. State the equations of quadratic and exponential trend model (4mks)

c. Use the table below to perform model selection using first, second and percentage difference for the number of patience per year in a referral hospital

2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
30.0	33.0	36.0	39.0	42.0	45.0	48.0	51.0	54.0	57.0

(10mks)

QUESTION FIVE

a. A researcher in a hospital ha d the following results after analysing data from his research.

	Co-efficient	Std error	t-stat	p-value	Lower95%	Upper95%
constant	-11.6000	7.4457	-1.5579	0.1579	-28.7698	5.5699
Lag1	1.0259	0.4229	2.4259	0.0415	0.0507	0.4669

Lag2	-0.8876	0.5874	-1.5111	0.1692	-2.2421	0.4669
Lag3	1.5180	0.6955	2.1827	0.0606	-0.0857	3.1218

	Co-efficient	Std error	t-stat	p-value	Lower95%	Upper95%
constant	1.6349	4.2228	0.3872	0.7067	-7.7741	11.0440
Lag1	1.3390	0.4448	3.0105	0.0131	0.3480	2.3300
Lag2	-0.3883	0.6115	-0.6350	0.5397	-1.7507	0.9742

	Co-efficient	Std error	t-stat	p-value	Lower95%	Upper95%
constant	-0.5836	2.2702	-0.2571	0.8015	-5.5299	4.3626
Lag1	1.0694	0.1025	10.4314	0.0000	0.8460	1.2928

i. Fit a third order autoregressive equation using 1998 as first year in the series and test for the significance of the highest order parameter
(5mks)

ii. Fit a second order autoregressive equation using 1998 as first year in the series and test for the significance of the highest order parameter
(5mks)

iii. Fit a first order autoregressive equation using 1998 as first year in the series and test for the significance of the highest order parameter
(5mks)

QUESTION SIX

a. Define the term residuals as used in time series (1mks)

b. From the table below, determine the residuals for linear, quadratic, exponential and first order autoregressive methods (14mks)