KABARAK   **UNIVERSITY**

EXAMINATIONS

2008/2009 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF SCIENCE IN

ECONOMICS AND MATHEMATICS

COURSE CODE: **MATH 416**

COURSE TITLE: **TIME SERIES ANALYSIS**

STREAM: **Y4S1**

DAY: **THURSDAY**

TIME: **2.00 – 4.00 P.M.**

DATE: **13/08/2009**

INSTRUCTIONS:

1. Question ONE is compulsory.
2. **Attempt question ONE and any other TWO**

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

a) MA is the most common technique in smoothing; it uses the idea of simple or weighted averaging of the surrounding elements. What would be the advantages and disadvantages of using the median for smoothing?

(3marks)

b) Define and explain the main goals in analyzing time series data.

(5marks)

c) Using the appropriate assumptions show that the ordinary least square method estimator of β in the model below is consistent and unbiased

$$Z_t = X_t - \beta X_{t-i} \qquad\qquad t = 1,2,.............,n. \qquad\qquad \text{(10marks)}$$

d) i) Differentiate between covariance stationarity and strong stationarity.

(3marks)

ii) Using the basic equation of exponential smoothing, show that the weights $\alpha(1-\alpha)^t$ decreases geometrically and sums to infinity is unity.

(5marks)

e) Describe the four components of a time series data.

(5marks)

QUESTION TWO (20 MARKS)

a) Given an $AR(2)$ model

$$X_t = \alpha_1 X_{t-1} + \alpha_2 X_{t-2} + Z_t$$

Show that in terms of parameter values, the stationarity conditions is given by the triangular region satisfying

$$\alpha_2 + \alpha_1 < 1$$
$$\alpha_2 - \alpha_1 < 1$$
$$-1 < \alpha_2 < 1$$

(10marks)

b) i) Interims of MA representation, show that a finite order stationary $AR(p)$ process corresponds to an infinite order MA process.

(6marks)

ii) State the disadvantages of MA and AR process.

(4marks)

QUESTION THREE (20 MARKS)

a) Represent a $ARMA(1,1)$ model as a pure moving average process.

(10marks)

b) Find the estimator of σ_Z^2

QUESTION FOUR (20 MARKS)

a) Consider $AR(1)$ process given by

$$X_t = \alpha X_{t-1} + Z_t \qquad\qquad |\alpha| =< 1 \quad E[Z_T] = 0$$

Find forecast for X_{n+1} and X_{n+k} and their corresponding MSE.

(6marks)

b) i) Give the purposes of decomposition in time series analysis.

(4marks)

ii) $AR(1)$ process $X_t = \alpha X_{t-1} + Z_t$, where Z_t is purely random process with mean zero and variance σ_Z^2 and α is a constant with necessary conditions α derive the variance and the autocovariance of X_t.

(10marks)

QUESTION FIVE (20 MARKS)

Consider the following data containing 12 observations taken over time

Time	1	2	3	4	5	6	7	8	9	10	11	12
Y_t	71	70	69	68	64	65	72	78	75	75	75	70

i) Fit the trend using exponential smoothing technique with parameter $\alpha = 0.1$

ii) Calculate for the value of $\alpha = 0.5$ which one is better $\alpha = 0.1$ and $\alpha = 0.5$, why?

iii) Plot time against Y_t

iv) Superimpose S_t for $\alpha = 0.5$ and $\alpha = 0.1$ on the plot.

(20marks)