KABARAK   **UNIVERSITY**

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: **MONDAY**

TIME: **2.00 – 4.00 P.M.**

DATE: **07/12/2009**

INSTRUCTIONS:

Attempt question **ONE** and any other **TWO** questions

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

(a) Distinguish between;
   (i) Deterministic and stochastic time series   **(2 marks)**
   (ii) Discrete and continuous Time series   **(2 marks)**

(b) Clearly explain the components of a time series   **(8 marks)**

(c) In a study of demand (d_t) for the past 12 years, has indicated the following

   observations.

$$d_t = 100; \quad t = 1, 2, 3, 4, 5$$
$$= 20; \quad t = 6$$
$$= 100; \quad = 7, 8, 9, 10, 11, 12$$

   compute 5 years moving Average   **(4 marks)**

(d) Show that the process $x_t = a + bt + e_t$ where $e_t \sim N(0, \sigma^2)$ is stationary in the
   weak sense.   **(5 marks)**

(e) Determine whether the following processes are invertible $x_t = e_t + 0.7e_{t-1} - 0.2e_{t-2}$
                                                            (3 marks)
(f) Discuss the method of fitting an exponential curve to a time series.   **(6 marks)**

QUESTION TWO (20 MARKS)

(a) Explain four methods to study or measure trend.   **(8 marks)**

(b) The table below shows the figures of production in thousand tonnes of sugar in a
   factory.

Year	1993	1995	1996	1997	1998	1999	2002
Production of Sugar	167	188	194	185	191	198	200

   (i)   Fit a straight line by method of least squares and tabulate the trend values.
                                                                     (6 marks)
   (ii)   Eliminate the trend hence state the components of trend that arise. **(2 marks)**
   (iii)   Calculate the monthly increase in production of sugar.   **(2 marks)**
   (iv)   Estimate the 2000 production.   **(2 marks)**

QUESTION THREE (20 MARKS)

(a) State and explain the methods of measuring seasonal variations.　　　**(6 marks)**

(b) Calculate the seasonal variation for the following data by ratio-trend method.

(14 marks)

Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
2000	30	40	36	34
2001	34	52	50	44
2002	40	58	54	48
2003	54	76	68	62
2004	80	92	86	82

QUESTION FOUR (20 MARKS)

(a) Briefly explain the effects on components of x_t when moving average filter is used.

(6 marks)

(c) Using the differencing method show that the non-stationarity 2nd order polyninial

$$x_t = a + bt + ct^2 + e_t \quad e_t \sim N(0, \sigma^2)$$ can be transformed to stationarity one.

(4 marks)

(d) Find the Autocorrelation function of the function

$$x_t = {}^1\!/_4 x_{t-1} + {}^3\!/_{64} x_{t-2} + e_t \qquad \text{(10 marks)}$$

QUESTION FIVE (20 MARKS)

(a) Briefly explain the following terms as used in Time series　　　**(10 marks)**

    (i) Auto correlation

    (ii) Auto regressive

    (iii) Spectral Analysis

(b) AR(1) process $x_t = \alpha x_{t-1} + z_t$ where z_t is purely random process with mean
zero and variance σ^2 and α is constant with necessary conditions, derive the variance

and the auto covariance of x_t **(7 marks)**