EASTERN UNIVERSITY, SRI LANKA

THIRD EXAMINATION IN SCIENCE - 2005/2006

(Aug./Sep.' 2007)

FIRST SEMESTER

ST 301 - TIME SERIES ANALYSIS

(proper & Repeat)

Answer all questions

Time : Two hours

1. (a) The Modified exponential curve is given by the following equation

$$U_t = a + bc^t$$

where U_t represents the time series value at the time t and a, b, c are constants. Explain the method of partial sums for fitting this curve to time series data regarding production in various years.

(b) Enumerate the steps you take in computing seasonal indices by link-relative method.

(c) The data below gives the average quarterly prices of a commodity for five years. Calculate the seasonal variations indices by the method of link relatives.

Year / Quarter	1979	1980	1981	1982	1983
I	30	35	31	31	34
II	26	28	29	31	36
III	22	22	28	25	26
IV	31	36	32	35	33

2. (a) Describe the following methods to forecast time - series data that are stationary, or that include no significant, trend, cyclical, or seasonal effects.

   i. Naïve Forecasting models,

   ii. Simple averages,

iii. Weighted moving averages,

iv. Exponential smoothing.

(b) Following are data on the quantity (million pounds) of the U.S. domestic fishing catch for human food from 1980 through 2000. The data are published by the U.S. National Oceanic and Atmospheric Administration.

(i) Use a 3 - year moving average to forecast the quantity of fish for the years 1983 through 2000 for these data. Compute the error of each forecast and then determine the mean absolute deviation (MAD) of error for the forecast.

(ii) Use exponential smoothing and $\alpha = 0.2$ to forecast the data from 1983 through 2000. Let the forecast for the year 1983 equals the average of value of the values from 1980 to 1983. Compute the error of each forecast and then determine the mean absolute error for the forecast.

(iii) Compare the results obtained in parts (i) and (ii) using MAD. Which technique seems to perform better? why?

Year	Quantity	Year	Quantity
1980	3654	1991	7031
1981	3547	1992	7618
1982	3285	1993	8214
1983	3238	1994	7936
1984	3320	1995	7667
1985	3294	1996	7474
1986	3393	1997	7244
1987	3946	1998	7173
1988	4588	1999	6832
1989	6204	2000	6912
1990	7041		

3. (a) (i) Explain clearly what is meant by the trend of a time series.

(ii) What are the different methods for determining trend in a time series?
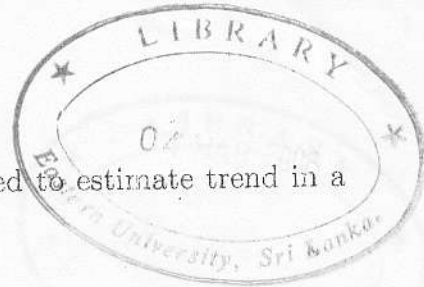
(b) Explain how the 'principle of least squares' used to estimate trend in a time series.

(c) You are given the population figures of India as follows:

Census Year (X)	1911	1921	1931	1941	1951	1961	1971
Population (in 10 millions) Y	25.0	25.1	27.9	31.9	36.1	43.9	54.7

Fit an exponential trend $Y = ab^X$ to the above data by the method of least squares and prove required necessary equations. Also find the trend values. Estimate the population in 1981.

4. (a) Discuss the ratio to trend method in analyzing a time series data and discuss merits and demerits of this method.

(b) Using the ratio to trend method and assuming multiplicative model, determine trend, the quarterly seasonal indices and random variations in the following data:

Quarter Year	I	II	III	IV
1978	10	27	21	40
1979	11	35	29	57
1980	14	51	33	74
1981	19	57	43	78
1982	22	67	45	101