EASTERN UNIVERSITY, SRI LANKA
THIRD EXAMINATION IN SCIENCE - 2007/2008
SECOND SEMESTER(December/January, 2008/2009)
ST 301 - TIME SERIES ANALYSIS
(REPEAT)

Answer all Questions   Time: Two hours

Q1. (a) Explain how the 'principal of least squares' used to estimate trend in time series analysis?

(b) Below are given the figures of production (in thousand tons) of a sugar factory.

Year	1975	1976	1977	1978	1979	1980	1981
Production	77	88	94	85	91	98	90

(i) Plot the data on a graph.

(ii) Do the data show a rising or falling trend?

(iii) Fit a straight line by method of least squares and obtain the trend values.

(iv) What is the monthly increase in production?

(v) Eliminate the trend.

Q2. (a) By means of moving average, find the trend and assuming a multiplic
model, find the seasonal indices for each quarter from the given data set b:

Quarter	1975	1976	1977	1978	1979
1	500	525	490	550	600
2	1050	1090	1100	1075	1125
3	250	200	300	290	325
4	1800	2000	1900	1950	2050

(b) The following data are average monthly prices in us dollars for oil from
1996 through April 1997:

16.4, 17.1, 16.9, 17.3, 17.5, 17.2, 17.3, 17.1, 16.9, 17, 17.1, 17.2

Construct the exponential smoothing (use $w=0.4$) model for these data
use it to forecast the price for May 1997.

Q3. (a) You are given the following trend equation:

$$T_c = 240 + 36t$$

Origin: 2000

t- Units: One year

T_c- total annual production.

Convert this equation to a monthly level.

(b) You are given the following trend equation:

$$T_c = 20 + 4t$$

Origin: 1999

t- Units: One year

T_c- production in thousands of tones.

Shift the origin to January 1, 2000.

(c) Table below shows the output of wheat in million tones.

Year	Q1	Q2	Q3	Q4
1995	60	65	62	69
1996	62	68	65	68
1997	65	70	64	62
1998	70	75	68	67
1999	72	80	70	78

Calculate the seasonal index by the link relative method.

Q4. (a) You are given the population figures of India as follows:

Census Year(X)	1911	1921	1931	1941	1951	1961	1971
Population (in cores)	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 find the trend values. Estimate the population in 1981.

(b) On the basis of monthly sales(in million rupees) of a certain commodity for a certain number of years, the following calculations were made:

$$\text{Trend: } T_c = 25.74 + 0.45t;$$

where origin is at 1982, $t = $ time unit (one month) and $T_c = $ monthly sales.

Month	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
S.I	79	76	95	98	106	97	86	89	103	122	113	136

Assuming multiplicative model, estimate the monthly sales for 1982.