

EASTERN UNIVERSITY, SRI LANKA

THIRD EXAMINATION IN SCIENCE 2002/2003

(June./July, '2003)

ST 301 - TIME SERIES

Answer all questions

Time: Two hours

- Q1. i) Give the advantages and disadvantages of curve fitting by the method of least squares.
- ii) An economist is researching bank activity and wants to find a model that would help her to predict total net loans by commercial banks. She has the data, presented in the following table.

Year	Loans(in billion of dollars)
1978	833
1979	936
1980	1,006
1981	1,120
1982	1,212
1983	1,313
1984	1,490
1985	1,608

- Plot the time series graph.
- What can you say about the trend?
- Fit a straight-line trend by the least squares method.
- What is the monthly increase in the loans?
- Estimate the total loans for the years 1986 and 1987.
- Draw a graph of trend eliminated values. How would you explain the fluctuations?
- What interpretation would you give to the slope?

h. Do you think, this trend equation would yield a good forecast for 2000? Justify your answer.

Qu2. a) With what component would you mainly associate each of the following:

1. A fire in a factory delaying production by four weeks.
2. The increased food production due to a constant increase in population.
3. Decrease in employment in a sugar factory during off-seasons.
4. An era of prosperity.
5. An after ester sales in a department store.

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

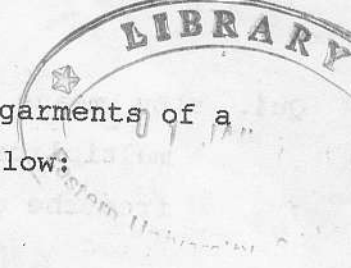
Calculate the seasonal indices by the link relative method for the following data.

Output of Wheat (in million)

Year	First	Second	Third	Fourth
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

Qu3. a) The following table shows the number of letters posted in a particular area during a typical period of four weeks. Assuming that the trend values during the period remains the same, calculate 'seasonal indices' (here daily indices) as percentage of their grand average.

Week	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
1	18	161	170	164	153	181	76
2	18	165	169	147	158	190	80
3	21	162	169	153	145	190	82
4	20	165	170	155	150	180	85



b) The seasonal indices of the sales of readymade garments of a particular type in a certain store are given below:

Quarter	Seasonal index
January-March	98
April-June	89
July-September	82
October-December	130

If the total sales in the first quarter of the year be worth Rs 10,000, determine how much worth of garments of this type should be kept in stock to meet the demand in each of the remaining quarters.

c) The following specific seasonal relatives for quarterly sales of eggs by a super market were obtained for 1972-1977.

Year	Quarter			
	First	Second	Third	Fourth
1972	-----	-----	98.9	97.4
1973	102.9	100.4	97.9	99.8
1974	101.5	99.5	99.2	101.2
1975	100.9	95.1	100.0	105.1
1976	99.5	95.1	100.4	107.6
1977	98.0	92.7	-----	-----

Linear 'trend equations' fitted to the specific seasonal relatives for the first three quarters are:

- First quarter : $S = 104.10 - 1.18 X$; $X = 1$ in 1973.
- Second quarter : $S = 102.5 - 1.98 X$; $X = 1$ in 1973.
- Third quarter : $S = 97.75 + 0.510 X$; $X = 1$ in 1972.

Obtain the 'trend equation' for the fourth quarter. Calculate the seasonal indices for the year 1978.

Qu4. a) By means of moving averages, find the trend and assuming a multiplicative model, find the seasonal indices for each quarter from the given data set below.

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 May 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 and use it to forecast the price for May 1997.

Year	First	Second	Third	Fourth
1977	16.0	16.5	17.0	17.5
1978	17.0	17.5	18.0	18.5
1979	18.0	18.5	19.0	19.5
1980	19.0	19.5	20.0	20.5
1981	20.0	20.5	21.0	21.5
1982	21.0	21.5	22.0	22.5
1983	22.0	22.5	23.0	23.5
1984	23.0	23.5	24.0	24.5
1985	24.0	24.5	25.0	25.5
1986	25.0	25.5	26.0	26.5
1987	26.0	26.5	27.0	27.5
1988	27.0	27.5	28.0	28.5
1989	28.0	28.5	29.0	29.5
1990	29.0	29.5	30.0	30.5
1991	30.0	30.5	31.0	31.5
1992	31.0	31.5	32.0	32.5
1993	32.0	32.5	33.0	33.5
1994	33.0	33.5	34.0	34.5
1995	34.0	34.5	35.0	35.5
1996	35.0	35.5	36.0	36.5
1997	36.0	36.5	37.0	37.5

$Y = a + bX$
 $Y = 16.4 + 0.1X$
 $Y = 16.4 + 0.1(12) = 17.6$
 Forecast for May 1997 is 17.6