



EASTERN UNIVERSITY, SRI LANKA

THIRD EXAMINATION IN SCIENCE (2004/2005)

FIRST SEMESTER (Jan./Feb., 2006)

ST 301 - TIME SERIES

Answer all questions

Time allowed: Two hours

1. (a) i. Explain clearly what is meant by 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) Below are given the figures of production (in 100 tons) of a sugar factory.
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|--------------|------|------|------|------|------|------|------|
| Year : | 1979 | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 |
| Production : | 80 | 90 | 92 | 83 | 94 | 99 | 92 |
- i. Fit a straight line to the figures by least square method.
ii. Estimate the production for year 1988.
2. (a) With what component would you mainly associate in each of the following:
- A fire in a factory delaying production by four weeks.
 - The increased food production due to a constant increase in population.
 - Decrease in employment in a sugar factory during off-seasons.
 - An era of prosperity.
 - An after Easter sales in a department store.
- (b) Enumerate the steps you take in computing seasonal indices by link relative method.
- (c) Calculate the seasonal indices by the link relative method for the data given below:

Output of Wheat in million tons

Year	1 st Quarter	2 nd Quarter	3 rd Quarter	4 th Quarter
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

3. (a) Describe the 3 selected points method of fitting trend by logistic curve.
- (b) The three selected points u_1 , u_2 and u_3 corresponding to $t_1 = 2$, $t_2 = 30$ and $t_3 = 58$ are given as follows:

$$t_1 = 2 \quad u_1 = 55.8$$

$$t_2 = 30 \quad u_2 = 138.6$$

$$t_3 = 58 \quad u_3 = 251.8$$

Fit the logistic curve by the method of selected points. Also obtain the trend values for $t = 5, 18, 25, 35, 46, 50, 60, 66, 70$.

4. (a) Work Gloves Corp is reviewing its quarterly sales of toughie, the most durable glove they produce. The numbers of their product (in thousands) by quarter are given as follows:

Year	Quarter			
	I	II	III	IV
1989	142	312	488	208
1990	146	318	512	212
1991	160	330	602	187
1992	158	338	572	176
1993	162	380	563	200
1994	162	362	587	205

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- i. Using the ratio-to-moving-average method, determine the four typical quarterly indices.
 - ii. Interpret the typical seasonal pattern.

(b) The planning department of Padget and Kure shoes, the manufacturer of an exclusive brand of women's shoes, developed the following trend equation, in millions of pairs, based on five years of quarterly data.

$$Y' = 3.30 + 1.75 t$$

The following table gives the seasonal factors for each quarter.

	Quarter			
	<i>I</i>	<i>II</i>	<i>III</i>	<i>IV</i>
Index	110.0	120.0	80.0	90.0

Determine the seasonally adjusted forecast for each of the four quarters of the six years.