

**EASTERN UNIVERSITY, SRI LANKA**  
**THIRD EXAMINATION IN SCIENCE – 2005/2006**  
**(Dec. 2006)**  
**SECOND SEMESTER**  
**ST 301 – TIME SERIES ANALYSIS**  
**(Special Repeat)**

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**Answer all questions**  
**Time: Two hours**

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Q1. (a) Explain how you will decide about the type of trend to be fitted to a given time series data. Describe the following methods of fitting trend by,

- (i) Modified exponential curve,
- (ii) Logistic curve,
- (iii) Gompertz curve.

(b) The three selected points  $u_1$ ,  $u_2$  and  $u_3$  corresponding to the times  $t_1 = 2$ ,  $t_2 = 30$  and  $t_3 = 38$  are as given follows:

$$\begin{array}{ll} t_1 = 2 & u_1 = 55.8 \\ t_2 = 30 & u_2 = 138.6 \\ t_3 = 58 & u_3 = 251.8 \end{array}$$

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

Q2. (a) (i) Explain clearly what is meant by the trend of a time series.  
(ii) What are the difference 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.

- Q3. (a) (i) What do you understand by the seasonal variations? What are the methods used to determine them?  
 (ii) Enumerate the steps you take in computing seasonal indices by the link relative method.
- (b) (i) Explain what is meant by deseasonalising data.  
 (ii) Calculate the seasonal variation indices by the method of link relatives for the following figures.

Quarterly Figures for Five Years

Quarter	Year				
	1993	1994	1995	1996	1997
I	45	48	49	52	60
II	54	56	63	65	70
III	72	63	70	75	84
IV	60	56	65	72	66

- Q4. (a) Give the advantages and disadvantages of curve fitting by the method of least squares.  
 (b) By means of moving averages, find the trend and assuming a multiplicative model, find the seasonal indices for each quarter from the given set of data as given 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

- (c) The following data are the 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, 17.0, 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.