

2022

STATISTICS — HONOURS

Paper : CC-10

(Index Numbers and Time Series Analysis)

Full Marks : 50

The figures in the margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Answer **any five** questions from **questions nos. 1 to 8.**

2×5

1. Write two main usefulness of Consumer Prime Indices.
2. Define the terms price relative, quantity relative and value relative.
3. What are the uses of cost of living index numbers?
4. Explain the multiplicative models of a time series.
5. What are the differences between business cycles and seasonal fluctuations?
6. For a first order AR process, show that $r_k = a^k$, where the process is given by $y_t = ay_{t-1} + \varepsilon_t$
7. What is exponential smoothing? What is the sum of weights in exponential smoothing?
8. What is the necessary condition for weakly stationary time series?

Answer **any two** questions from **questions nos. 9 to 11.**

5×2

9. Explain clearly chain base and fixed base methods in constructing an Index Number. Which method is more frequently used and why?
10. For the autoregressive series of the type

$$u_{t+2} + \alpha u_{t+1} + \beta u_t = \varepsilon_{t+2},$$

$$\text{Show that } 1 - r_1 = \frac{1 + \alpha + \beta}{1 + \beta}$$

$$\text{and hence that } 1 + \alpha + \beta \geq 0.$$

11. Explain how the moving average method for determining trend is related to the method of fitting curves by the principles of least squares. How is trend eliminated?

Please Turn Over

Answer **any three** questions from **questions nos. 12 to 16**.

12. (a) Show that Laspeyres' and Paasche's index numbers may be looked upon as weighted average of price relatives.
- (b) If L_p , P_p and L_q denote, respectively Laspeyres' Price Index, Paasche's Price Index and Laspeyres' quantity index, show that $L_q (P_p - L_p)$ may be looked upon as the weighted covariance between price relatives and quantity relatives, the weights being the base year values. 4+6
13. (a) Explain how will you decide about the type of trend to be fitted to a given time series data.
- (b) Describe any one method of fitting trend by
- (i) Modified exponential curve
 - (ii) Logistic curve
 - (iii) Gompertz curve. 3+7
14. (a) Explain clearly what is meant by trend of a time series.
- (b) Describe the Moving Average method for determining trend.
- (c) Discuss briefly how the other components of a time series are distorted in the procedure of obtaining trend by the method of moving average. 2+2+6
15. (a) Derive the Least Squares estimates for an $AR(1)$ process.
- (b) Derive the normal equations for an $AR(p)$ process and compare with the Yule – Walker equations. 4+6
16. (a) Give an example of Non-Stationary time series.
- (b) If $X_t = \mu + Z_t + \beta Z_{t-1}$ where μ is a constant, show that the autocorrelation function does not depend on μ .
- (c) Describe experimental smoothing method to forecast a non-seasonal time series. 2+3+5
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