

This question paper contains 3 printed pages]

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S. No. of Question Paper : 5678

Unique Paper Code : 2372012403

Name of the Paper : Time Series Analysis

Name of the Course : B.Sc. (Hons.) Statistics, NEP-UGCF

Semester : IV

Duration : 3 Hours

Maximum Marks : 90

(Write your Roll No. on the top immediately on receipt of this question paper.)

Attempt any five questions.

Use of simple calculators is allowed.

1. (a) Define a time series. Explain the additive and multiplicative models of a time series, stating clearly the assumptions made.
- (b) Describe the different components of a time series. Give suitable example of each. 9,9
2. (a) Explain how will you decide about the type of trend curve to be fitted to a given time series data. Explain why is the method of least squares not used to fit a modified exponential curve ? Describe the method of partial sums to fit a modified exponential curve.

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- (b) What do you understand by de-seasonalized time series ? Explain how de-seasonalized data can be obtained using the 'Link Relative method' method, stating clearly the assumptions made. 9,9
3. (a) Explain the term cyclical component of a time series. Discuss a method for obtaining the component from a given series.
- (b) Describe a method of estimating the variance of the random component of time series; bringing out clearly the assumptions under which it is applicable. 9,9
4. (a) How will you obtain the autoregressive parameters in terms of autocorrelations of a $AR(p)$ process ? Hence in particular, obtain the estimates of the parameters for $AR(2)$ process.
- (b) Express the model :
- $$X_t = Z_t - 1.3Z_{t-1} + 0.4Z_{t-2},$$
- using B notation and determine whether the model is stationary and/or invertible. 9,9
5. (a) What is a Correlogram ? Prove that for a moving average of extent m with weights $(a_1, a_2, \dots, a_m)$ of random component $(\epsilon_i, i = 1, 2, \dots, m)$ the correlogram of a stationary time series oscillates between $(0, 1)$ and $(m, 0)$ and becomes straight line originating from $(0, 1)$ and ending at $(m, 0)$ for $a_i = \frac{1}{m}$.

- (b) Describe different types of stochastic time series models. Show that AR(2) process can be written as a weighted moving average of random elements and is infinite. 9,9
6. (a) Explain the meaning of forecasting with its application. Also state the problems involve in forecasting. Describe different types of forecasting procedure.
- (b) Consider a SARIMA $(0, 0, 1) \times (1, 1, 0)_{12}$ model. Obtain the one-step ahead, 12-step ahead forecast at time n . 9,9
7. Write short notes on any *three* of the following :
- (i) Ratio to Moving Averages
- (ii) Dicky Fuller test
- (iii) Autoregressive Process
- (iv) Box-Jenkins approach to forecasting. 6,6,6