This question paper contains **3** printed pages]

Roll No. | | | | | | | | | | |

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.

(*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 $(a_1, a_2, ..., a_m)$ of random component $(\in_i, i = 1, 2, ..., m)$ 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