QP Code: RA21BTECH806 | Reg. No | | | | | | | | | | | AR 21

# Gandhi Institute of Engineering and Technology University, Odisha, Gunupur
## (GIET University)

B. Tech (Eighth Semester - Regular) Examinations, April – 2025

## 21BCDPE48001 - Time Series Analysis and Forecasting

(CSE- Data Science)

Time: 3 hrs | Maximum: 70 Marks

**Answer ALL questions**

**(The figures in the right hand margin indicate marks)**

**PART – A** **(2 x 5 = 10 Marks)**

| Q.1. Answer ***ALL*** questions | CO # | Blooms Level |
|---|---|---|
| a. What is the difference between trend and seasonality in time series data? | CO1 | K1 |
| b. Why is stationarity important in time series analysis? | CO1 | K2 |
| c. What is the purpose of Partial Autocorrelation Function (PACF) in time series analysis? | CO2 | K2 |
| d. Mention the components of a time series. | CO3 | K1 |
| e. What is the role of the Holt-Winters method in time series forecasting? | CO4 | K2 |

**PART – B** **(15 x 4 = 60 Marks)**

| Answer ***all*** the questions | Marks | CO # | Blooms Level |
|---|---|---|---|
| 2. a. Define Augmented Dickey-Fuller (ADF) Test. How does it help in checking the stationarity of a time series? | 8 | CO1 | K1 |
| b. Describe the role of Autocorrelation and Partial Autocorrelation Functions (ACF & PACF) in time series analysis. How do they help in identifying patterns in data? | 7 | CO2 | K2 |
| (OR) | | | |
| c. Compare and Contrast the different exponential smoothing techniques: Single, Double, and Triple Exponential Smoothing. When should each method be used? | 8 | CO2 | K1 |
| d. Explain the different components of time series data. How do cyclic patterns differ from seasonality? | 7 | CO3 | K2 |
| 3.a. How does time series plotting help in detecting seasonality, trends, and outliers? What is the significance of Autocorrelation and Partial Autocorrelation Functions (ACF & PACF) in time series analysis? | 8 | CO3 | K1 |
| b. How does differencing help in making a time series stationary? Explain with an example and discuss its significance in time series forecasting. | 7 | CO2 | K2 |
| (OR) | | | |
| c. Explain how exponential trend curves are fitted using the principle of least squares? | 8 | CO1 | K1 |
| d. Calculate trend values using 4 yearly-moving average for the time series given below: | 7 | CO4 | K4 |

| Year | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---|---|---|---|---|---|---|---|---|
| Production (kg) | 506 | 620 | 1036 | 673 | 588 | 696 | 1116 | 738 |

| | | | | |
|---|---|---|---|---|
| 4.a. What are the different methods to check and achieve stationarity in a time series? Explain with examples. | 8 | CO3 | K1 |
| b. Describe the role of Autocorrelation and Partial Autocorrelation Functions (ACF & PACF) in time series analysis. How do they help in identifying patterns in data? | 7 | CO2 | K2 |
| (OR) | | | |
| c. Discuss the various components of time series. | 8 | CO2 | K1 |

d. Fit a trend line to the following data by the method of least squares And Calculate the trend values — 7 CO3 K3

| Year | 1970 | 1971 | 1972 | 1973 | 1974 |
|---|---|---|---|---|---|
| Production (in Thousands) | 18 | 21 | 23 | 27 | 26 |

5.a. What is an Autoregressive Integrated Moving Average (ARIMA)? Discuss Moving Average (MA) Models? — 8 CO1 K1

b. Discuss SARIMA model parameter tuning and implementation? — 7 CO2 K2

(OR)

c. Discuss the moving average method. Calculate 5 yearly-moving average from the data given below — 8 CO3 K4

| Year | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 |
|---|---|---|---|---|---|---|---|
| Sales(in Thousands) | 6.4 | 4.3 | 4.3 | 3.4 | 4.4 | 5.4 | 3.4 |

d. Discuss Machine Learning Models for Time Series: Long Short-Term Memory (LSTM) Networks? — 7 CO3 K2

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