Roll No:

BTECH
(SEM VII) THEORY EXAMINATION 2023-24
TIME SERIES ANALYSIS AND FORECASTING

TIME: 3 HRS   **M.MARKS: 100**

Note: **1.** Attempt all Sections. If require any missing data; then choose suitably.

SECTION A

1.   **Attempt all questions in brief.**   **2 x 10 = 20**

Q no.	Question	Marks
a.	What are the different types of data used in time series analysis?	2
b.	Define autocorrelation in the context of time series data.	2
c.	What metrics would you use to evaluate the performance of a forecasting model?	2
d.	What is the purpose of plotting smoothed data in time series analysis?	2
e.	What is meant by least squares estimation in linear regression models?	2
f.	What is variable selection methods used in regression analysis?	2
g.	How to identify order of an ARIMA model?	2
h.	Define stationarity in context of ARMA models.	2
i.	What is a seasonal ARIMA model?	2
j.	What are vector AR models?	2

SECTION B

2.   **Attempt any three of the following:**   **10 x 3 = 30**

a.	Define a time series and discuss its structure due to trend, seasonality, cyclic changes, and irregular components. Explain how these elements influence analysis and prediction.	10
b.	Outline the standard approach for creating a time series forecast model, including steps from graphical analysis and pre-processing to model identification, parameter estimation, diagnostic checking, and finally, forecasting	10
c.	Explain the process of model adequacy checking in linear regression models.	10
d.	Outline strengths and limitations of ARIMA forecasts for short and long term horizons.	10
e.	Describe the process of predicting with a seasonal ARIMA model, including the use of past seasonal factors. Give examples of real-world seasonal time series data.	10

SECTION C

3.   **Attempt any one part of the following:**   **10 x 1 = 10**

a.	Discuss the nature and common uses of forecasting. What are some examples where forecasting techniques are applied in real world scenarios?	10
b.	Explain the forecasting process in detail, highlighting the key resources required and steps involved from data collection to model development to forecast output.	10

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4.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

a.	What is the general framework applied for developing a time series forecasting model? Discuss the key steps involved starting from graphical analysis and pre-processing to model identification, parameter estimation and diagnostic checking before generating forecasts.	10
b.	Explain why data transformations like differencing and adjustments for inflation, holidays etc. may need to be applied as part of developing a time series forecasting model. Provide suitable examples to support your explanation.	10

5.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

a.	Discuss first and second-order exponential smoothing models.	10
b.	Discuss generalized and weighted least squares regression focusing on situations like heteroscedasticity and autocorrelation where they become relevant along with differences in formulation/calculations compared to ordinary least squares method.	10

6.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

a.	Discuss the core concepts behind Autoregressive (AR) and Moving Average (MA) models. Explain how they deal with serial correlation patterns and how they are combined in an ARMA model by using lagged values and errors.	10
b.	Explain how autocorrelation and partial autocorrelation plots can help determine important lags to include as AR or MA terms. Also discuss model fitting, estimation and adequacy checking.	10

7.   **Attempt any *one* part of the following:**   **10 x 1 = 10**

a.	Elaborate on key properties of multivariate time series models highlighting necessity when multiple interdependent series influence each other. Also contrast univariate vs multivariate forecasting.	10
b.	Discuss the process of model selection in time series analysis outlining criteria like AIC, BIC, MAPE etc. used to compare model performance on calibration data.	10