Total No. of Questions: 6 *Total No. of Printed Pages:3*

Enrollment No.....

Faculty of Management Studies

End Sem Examination May-2024

MS3EG14 Forecasting Techniques & Decision Analysis

Programme: BBA Branch/Specialisation: Management

Duration: 3 Hrs. **Maximum Marks: 60**

Note: All questions are compulsory. Internal choices, if any, are indicated. Answers of Q.1 (MCQs) should be written in full instead of only a, b, c or d. Assume suitable data if necessary. Notations and symbols have their usual meaning.

Q.1 i. Which of the following models is suitable for time series data with a constant mean and constant variance? **1**

(a) ARIMA (b) ARCH

(c) GARCH (d) Exponential Smoothing

ii. Seasonal decomposition of time series involves separating the data into which components? **1**

(a) Trend, Cycle, and Random

(b) Trend, Seasonal, and Cyclical

(c) Trend, Seasonal, and Irregular

(d) Seasonal, Cyclical, and Irregular

iii. In Single Exponential Smoothing (SES), what is the smoothing parameter denoted by? **1**

(a) α (alpha) (b) β (beta)

(c) γ (gamma) (d) δ (delta)

iv. Which of the following is a characteristic of Double Exponential Smoothing (Holt's method) but not Single Exponential Smoothing (SES)? **1**

(a) It can capture both trend and seasonality in time series data.

(b) It assigns equal weight to all historical observations.

(c) It relies solely on the most recent observation for forecasting.

(d) It incorporates a separate component for modeling trend in the data.

v. In ARIMA (p, d, q) model, what does 'p' represent? **1**
(a) Order of the autoregressive component
(b) Order of the seasonal component
(c) Order of the moving average component
(d) Order of the differencing

vi. The autoregressive (AR) component in ARIMA models represents the relationship between an observation and a fixed number of: **1**
(a) Future observations (b) Lagged observations
(c) Seasonal observations (d) Moving average observations

vii. Regression models are used to analyze the relationship between: **1**
(a) Two or more independent variables
(b) Time series data
(c) Dependent and independent variables
(d) Categorical variables

viii. Time series forecasting methods include: **1**
(a) Regression analysis (b) Classification techniques
(c) Exponential smoothing (d) Principal component analysis

ix. Which error metric penalizes larger errors more heavily, making it suitable for situations where large errors are undesirable? **1**
(a) MAPE (b) MSE
(c) Both (a) and (b) (d) Neither (a) nor (b)

x. In a forecasting problem, if the actual value is 100 and the predicted value is 110, what is the MAPE? **1**
(a) 10% (b) 11% (c) 10/11% (d) 10/100%

Q.2 i. Explain the difference between autocorrelation and partial autocorrelation. **4**

ii. Differentiate between time series datasets with trend and seasonality. Provide examples of each. **6**

OR iii. Explain the role of forecasting in meteorology. How is forecasting used to predict weather conditions and assist in disaster preparedness? **6**

Q.3 i. Describe the process of calculating Weighted Moving Average (WMA) for a time series dataset. **4**

ii. Explain the components of Holt's method, including the level and trend components. How are these components updated over time? **6**

OR iii. Define Single Exponential Smoothing (SES). Explain how it is used in time series forecasting? **6**

Q.4 i. Explain the difference between autoregressive (AR) and moving average (MA) components in an ARMA model. **3**

ii. Describe the three main components of an ARIMA model (p, d, q) and their respective roles in modeling different aspects of the time series data. **7**

OR iii. Explain how the seasonal differencing parameter (D) in Seasonal ARIMA models helps remove seasonal patterns from the data. **7**

Q.5 i. Describe the mathematical equation for a simple linear regression model. Explain the meaning of each component in the equation. **4**

ii. Explain the principle of least squares estimation in the context of linear regression models. How does least squares estimation find the best-fitting line through the data? **6**

OR iii. Define polynomial regression. How it extends linear regression to capture non-linear relationships between variables? **6**

Q.6 Attempt any two:

i. Explain the significance of a positive or negative cumulative sum of forecast errors value. How can cumulative sum of forecast errors be used to assess the bias and accuracy of a forecasting model over time? **5**

ii. Define mean absolute deviation as a measure of forecasting accuracy. What does mean absolute deviation represent, and how is it calculated? **5**

iii. Discuss the interpretation of mean absolute percent error values. What does a of 10% mean absolute percent error indicate about the accuracy of a forecasting model? **5**

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Marking Scheme

Forecasting Techniques for Decision Analysis (T) - MS3EG14

Q.1	i)	a) ARIMA	**1**
	ii)	c) Trend, Seasonal, and Irregular	**1**
	iii)	a) α (alpha)	**1**
	iv)	d) It incorporates a separate component for modeling trend in the data.	**1**
	v)	a) Order of the autoregressive component	**1**
	vi)	b) Lagged observations	**1**
	vii)	c) Dependent and independent variables	**1**
	viii)	c) Exponential smoothing	**1**
	ix)	b) MSE	**1**
	x)	b) 11%	**1**

Q.2	i.	Explain the difference between autocorrelation and partial autocorrelation**.(Atleast 4 difference each 1 marks)**	**4**
	ii.	Differentiate between time series datasets with trend and seasonality. **(3 marks)** Provide examples of each**.(3 marks)**	**6**
OR	iii.	Explain the role of forecasting in meteorology**.(3 marks)**. How is forecasting used to predict weather conditions and assist in disaster preparedness? **.(3 marks)**	**6**
Q.3	i.	Describe the process of calculating Weighted Moving Average (WMA) for a time series dataset.	**4**
	ii.	Explain the components of Holt's method, including the level and trend components. **(3 marks)** How are these components updated over time? **(3 marks)**	**6**
OR	iii.	Define Single Exponential Smoothing (SES) **(3 marks)**and explain how it is used in time series forecasting. **(3 marks)**	**6**
Q.4	i.	Explain the difference between autoregressive (AR) and moving average (MA) components in an ARMA model.	**3**
	ii.	Describe the three main components of an ARIMA model (p, d, q) **(3 marks)**and their respective roles in modeling different aspects of the time series data. **(4 marks)**	**7**
OR	iii.	Explain how the seasonal differencing parameter (D) in Seasonal ARIMA models helps remove seasonal patterns from the data.	**7**
Q.5	i.	Describe the mathematical equation for a simple linear regression model. Explain the meaning of each component in the equation	**4**
	ii.	Explain the principle of least squares estimation in the context of linear regression models. **(3 marks)**How does least squares estimation find the best-fitting line through the data? **(3 marks)**	**6**
OR	iii.	Define polynomial regression**(3 marks)** and explain how it extends linear regression to capture non-linear relationships between variables. **(3 marks)**	**6**
Q.6		Attempt any two:	
	i.	Explain the significance of a positive or negative Cumulative Sum of Forecast Errors value. 3 Marks How can Cumulative Sum of Forecast Errors be used to assess the bias and accuracy of a forecasting model over time? 2 Marks	**5**
	ii.	Define Mean Absolute Deviation as a measure of forecasting accuracy. 3 Marks What does Mean Absolute Deviation represent, 1 Mark and how is it calculated? 1 Mark	**5**
	iii.	Discuss the interpretation of Mean Absolute Percent Error values. 2 Marks What does a of 10% Mean Absolute Percent Error indicate about the accuracy of a forecasting model? 3 Marks	**5**

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P.T.O.