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**JAIPURIA INSTITUTE OF MANAGEMENT, NOIDA**

**PGDM / PGDM (M) / PGDM (SM)**

**FIFTH TRIMESTER (Batch 2022-24)**

**END TERM EXAMINATIONS, JANUARY 2024**

**SET - 2**

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| Course Name | **Business Forecasting** | Course Code | **20831** |
| Max. Time | **2 hours** | Max. Marks | **40 MM** |

**INSTRUCTIONS:**

1. All questions are compulsory to attempt.
2. Do Question1 in Python.
3. Do Question 2,3 and 4 using MS-word.
4. The datasets for Questions are available within the question paper.
5. Upload two separate files on Moodle for the 1 and 2,3,4 questions.
6. Students should consult the question paper for the Python code pertaining to the solution of Question 1.

**Question:1.**

Case: Double Exponential Smoothing, also known as Holt's method, is a technique used for time series forecasting. Below is a Python demonstrating Double Exponential Smoothing for stock price prediction using historical stock price

Python code:

import pandas as pd

import matplotlib.pyplot as plt

from statsmodels.tsa.holtwinters import ExponentialSmoothing

data = {

'Date': ['2023-01-01', '2023-01-02', '2023-01-03', '2023-01-04', '2023-01-05'],

'Price': [100, 105, 110, 115, 120]

}

stock\_data = pd.DataFrame(data)

stock\_data['Date'] = pd.to\_datetime(stock\_data['Date'])

model = ExponentialSmoothing(stock\_data['Price'], trend='add').fit()

forecast = model.forecast(steps=3)

plt.figure(figsize=(8, 5))

plt.plot(stock\_data['Date'], stock\_data['Price'], marker='o', label='Historical Prices')

future\_dates = pd.date\_range(start=stock\_data['Date'].iloc[-1], periods=4)[1:]

plt.plot(future\_dates, forecast, marker='o', color='red', label='Forecasted Prices')

plt.xlabel('Date')

plt.ylabel('Stock Price')

plt.title('Double Exponential Smoothing for Stock Price Prediction')

plt.legend()

plt.grid(True)

plt.show()

Please outline the series of steps executed within the provided Python code. Furthermore, could you provide an interpretation or explanation of how the code functions and the results it produces? Create a managerial report that encapsulates the findings obtained from the preceding scenario. (15 marks)

**Question 2:**

As a data analyst, suppose you are assigned to predict hotel occupancy for the upcoming holiday season using the ARIMA (AutoRegressive Integrated Moving Average) model. Explain the systematic approach you would adopt to utilize the ARIMA model on historical hotel occupancy data. Explain the process involving data preparation, model selection, parameter tuning, and validation techniques you would employ to create reliable forecasts for the hotel's occupancy during the holiday season. (10 marks)

**Question 3:**

Scenario: You possess the past six months' sales data for a company: [120, 130, 125, 140, 150, 155]. Your objective is to utilize Exponential Smoothing (ES) with an alpha value of 0.2 to predict the sales forecast for the upcoming month. Could you outline the step-by-step process along with the solution for forecasting the sales for the next month using Exponential Smoothing with an alpha value of 0.2? Discuss the insights derived from this scenario and create a comprehensive managerial report that encapsulates these findings. (10 marks)

**Question 4:**

In a scenario where you are tasked with analyzing and forecasting sales data for a retail company, delineate the differences between the Weighted Moving Average (WMA) and Simple Moving Average (SMA) methodologies. Highlight how these approaches vary in their computation of averages and elucidate the practical applications of each method in handling and predicting sales trends over time? (5 marks)