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	<p align="center">PES University, Bengaluru (Established under Karnataka Act No. 16 of 2013)</p>	<p align="center">UE20CS934</p>
DECEMBER 2021: END SEMESTER ASSESSMENT (ESA) M TECH DATA SCIENCE AND MACHINE LEARNING_ SEMESTER II UE20CS934 – Time Series Forecasting		
Time: 3 Hrs	Answer All Questions	Max Marks: 80

INSTRUCTIONS			
<ul style="list-style-type: none"> All questions are compulsory. Section A should be handwritten in the answer script provided Section B and C are coding questions which have to be answered in the system. 			
Section A (20 marks)			
1	a)	Explain regular components of a time series.	6
	b)	What is stationarity? How will you convert non-stationary series into stationary series?	6
	c)	How will you determine the order of a moving average process? Explain.	8
Section B (30 marks)			
2	Analytics firm wants to forecast the avg spending of customers for the month of Oct 2020. For this, firm has gathered a closing stock price data for the period of Feb 2019 to Sept 2020.		
	a)	What are the number of rows and no. of cols & types of variables? (1 mark) Convert the data into time series (2 marks) Check for defects in the data such as missing values, null, etc. (1 mark) Visualize the time series using relevant plots. (1 mark)	5
	b)	Decompose the time series and check for components of time series. (4 marks) Perform dicky fuller test to check the stationarity? What other actions will you take if series is non-stationary? (3+2 marks) Plot Auto Correlation and Partial Auto Correlation function? What is your inference from these plots? (3+3 marks)	15
	c)	Split dataset into train and test sets. Use last two months of data for testing. (2 marks) Fit ARIMA model and observe the RMSE and MAPE values of the model for test data. (8 marks)	10

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Section C (30)			
3	a)	Fit exponential smoothing model and observe the residuals, RMSE and MAPE values of the model for test data. (10 marks) marks	10
	b)	How would you improve the exponential smoothing model? Make the changes and fit the final exponential smoothing model. (10 marks) Analyze the residuals of this final model. Feel free to use charts or graphs to explain. (5 marks)	15
	c)	Forecast the Avg Spending price for next 1 months using the final model? (5 marks)	5