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PES UNIVERSITY	**PES University, Bengaluru** (Established under Karnataka Act No. 16 of 2013)	**UE20CS934**

Model QP
M TECH DATA SCIENCE AND MACHINE LEARNING_ SEMESTER II

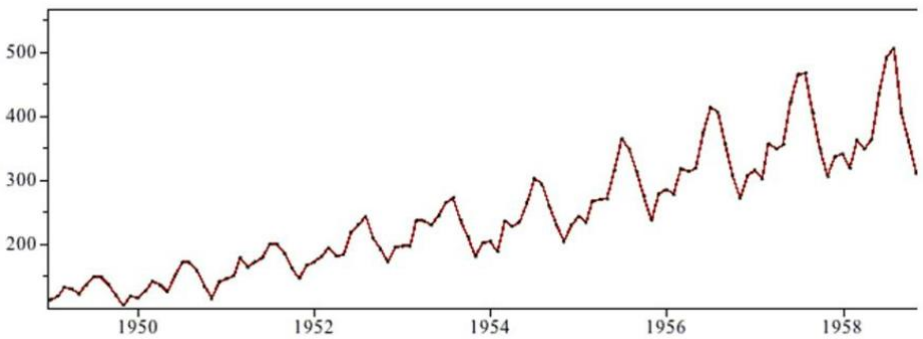
UE20CS934 – Time Series Forecasting

Time: 3 Hrs	Answer All Questions	Max Marks: 80

INSTRUCTIONS

- 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)	1. Which of the following is relatively easier to estimate in time series modeling? A) Seasonality B) Cyclical C) No difference between Seasonality and Cyclical 2. Which of the following can't be a component for a time series plot? (1 Mark) A) Seasonality B) Trend C) Cyclical D) Noise E) None of the above 3.The below time series plot contains both Cyclical and Seasonality component. (1 Mark) 	6

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A. True

B. False

4. If the demand is 100 during October 2016, 200 in November 2016, 300 in December 2016, 400 in January 2017. What is the 3-month simple moving average for February 2017? (2 Marks)

5. Sum of weights in exponential smoothing is _____.(1 Mark)

A)<1
B)=1
C) >1
D) None of the above

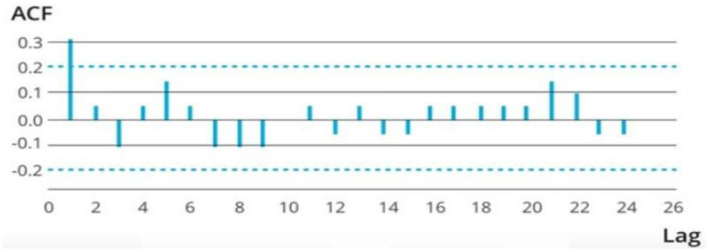
b) 6

1) Consider the following set of data: (2Marks)

{23.32 , 32.33, 32.88, 28.98, 33.16, 26.33, 29.88, 32.69 ,18.98, 21.23, 26.66, 29.89}

What is the lag-one sample autocorrelation of the time series?
A) 0.26
B) 0.52
C) 0.13
D) 0.07

2) Looking at the below ACF plot, would you suggest to apply AR or MA in ARIMA modeling technique? (1 Marks)



A)AR
B)MA
C) Can't Say

3) Consider the following AR(1) model with the disturbances having zero mean and unit variance. $y_t =$

$0.4 + 0.2y_{t-1} + u_t$ The (unconditional) variance of y will be given by ? (2 marks)

4. Suppose, you are a data scientist at Towards Data Science. And you observed the views on the articles increases during the month of Jan-Mar. Whereas the views during Nov-Dec decreases. (1 Marks)
Does the above statement represent seasonality?
A) TRUE
B) FALSE
C) Can't Say (1 Marks)

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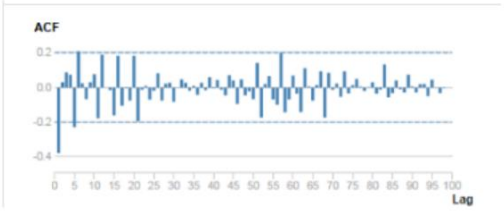
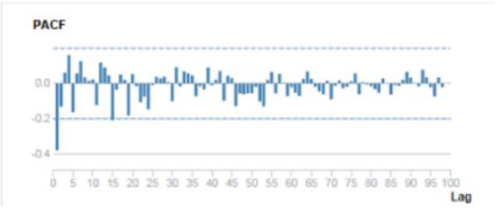
	c)	5.Imagine, you are working on a time series dataset. Your manager has asked you to build a highly accurate model. You started to build two types of models which are given below. (4 marks) Model 1: Decision Tree model Model 2: Time series regression model At the end of evaluation of these two models, you found that model 2 is better than model 1. What could be the possible reason for your inference? A) Model 1 couldn't map the linear relationship as good as Model 2 B) Model 1 will always be better than Model 2 C) You can't compare decision tree with time series regression D) None of these 2) What type of analysis could be most effective for predicting temperature on the following type of data and why? (2 Marks)	8

Date	Temperature	precipitation	temperature/precipitation
12/12/12	7	0.2	35
13/12/12	9	0.123	73.1707317073
14/12/12	9.2	0.34	27.0588235294
15/12/12	10	0.453	22.0750551876
16/12/12	12	0.33	36.3636363636
17/12/12	11	0.8	13.75

A) Time Series Analysis
B) Classification
C) Clustering
D) None of the above

6. How many AR and MA terms should be included for the time series by looking at the above ACF and PACF plots? (2 Marks)





A) AR (1) MA(0)
B) AR(0)MA(1)
C) AR(2)MA(1)
D) AR(1)MA(2)
E) Can't Say

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.	

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	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
		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