B.M.S. College of Engineering, Bengaluru-560019

Autonomous Institute Affiliated to VTU

October 2024 Supplementary Examinations

Programme: B.E. **Semester: VI**

Branch: Artificial Intelligence and Machine Learning **Duration: 3 hrs.**

Course Code: 24AM6PCTFM **Max Marks: 100**

Course: TIME SERIES AND FINANCIAL MATHEMATICS

Instructions: 1. Answer any FIVE full questions, choosing one full question from each unit.
2. Missing data, if any, may be suitably assumed.

<div style="writing-mode: vertical">**Important Note:** Completing your answers, compulsorily draw diagonal cross lines on the remaining blank pages. Revealing of identification, appeal to evaluator will be treated as malpractice.</div>

			UNIT - I	CO	PO	Marks
1	a)		Explain the difference between additive and multiplicative models in time series analysis.	CO1	PO1	**4**
	b)		Given a quarterly sales data set for the past three years, use the moving average method to determine the trend component. Quarterly Sales Data (in thousands) Year Q1 Q2 Q3 Q4 2021 120 150 130 170 2022 125 160 140 175 2023 130 165 145 180	CO1	PO2	**6**
	c)		Given quarterly sales data for two years, calculate the trend and seasonal variations using the link relative method. Year Q1 Q2 Q3 Q4 2019 6 6.5 7.8 8.7 2020 5.4 7.9 8.4 7.3 2021 6.8 6.5 9.3 6.4 2022 7.2 7.8 7.5 8.5 2023 6.6 7.3 8.0 7.1	CO1	PO2	**10**
			UNIT - II			
2	a)		Explain the Simple Moving Average (SMA) method and provide an example of how it is used in forecasting.	CO2	PO2	**6**
	b)		What is Holt-Winter's Smoothing and how does it differ from SES?	CO2	PO2	**7**
	c)		Given the following sales data: [50, 55, 60, 58, 62, 65, 70], apply the Simple Exponential Smoothing method with $\alpha = 0.3$ to forecast the next period.	CO2	PO2	**7**
			UNIT - III			
3	a)		What is the Autocorrelation Function (ACF) and the Partial Autocorrelation Function (PACF)? How are they used in time series analysis?	CO3	PO3	**6**

				CO	PO	
	b)	Define a stationary time series. Why is stationarity important in time series analysis?		CO3	PO3	**7**
	c)	Consider the Autoregressive AR (1) model: $$Z_t = 25 + 0.75Z_{t-1} + \propto_t$$ Assume that the variance of the white noise process ($\propto_t$) is 10. Draw Autocorrelation function (ACF) and Partial Autocorrelation function (PACF) plots, given mean = 25.		CO3	PO4	**7**
		UNIT - IV				
4	a)	Explain the difference between risky and non-risky assets.		CO2	PO2	**6**
	b)	What is hedging, and why is it important?		CO2	PO1	**7**
	c)	If the price of a stock is trading at $50. Under what circumstances an investor will opt for Call Option and Put Option.		CO3	PO2	**7**
		OR				
5	a)	Explain the difference between a call option and a put option.		CO2	PO2	**6**
	b)	What is the significance of financial ratios in analyzing a company's performance?		CO2	PO2	**7**
	c)	What is Value at Risk (VaR), and how is it used in risk management?		CO1	PO2	**7**
		UNIT - V				
6	a)	Describe some common features of financial time series.		CO3	PO1	**6**
	b)	Explain the Autoregressive Conditional Heteroscedasticity (ARCH) model and its importance in modeling financial time series.		CO3	PO2	**7**
	c)	Describe the potential impact that the financial institutions can benefit using Generalized Autoregressive Conditional Heteroscedasticity (GARCH) model.		CO3	PO3	**7**
		OR				
7	a)	Derive the Maximum Likelihood Estimation (MLE) for GARCH (1,1) model.		CO3	PO4	**10**
	b)	Describe how you would diagnose if a fitted GARCH (1,1) model adequately captures the volatility of a financial time series.		CO3	PO4	**5**
	c)	Examine the need of heteroscedasticity models in time series analysis.		CO3	PO4	**5**

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