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**BRAINWARE UNIVERSITY**

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Term End Examination 2025-2026
Programme – M.Tech.(CSE)-DS-2025
Course Name – Time Series Data Analysis
Course Code - MTD27502 (T)
(Semester II)

Full Marks : 40**Time : 2:0 Hours**

[The figure in the margin indicates full marks. Candidates are required to give their answers in their own words as far as practicable.]

Group-A

(Multiple Choice Type Question)

1 x 10=10

1. *Choose the correct alternative from the following :*

- (i) Which is NOT a component of time series?
 - a) Variance
 - b) Trend
 - c) Seasonality
 - d) Irregular
- (ii) If both ADF and KPSS say non-stationary, the data:
 - a) Is perfect
 - b) Must be differenced
 - c) Needs scaling
 - d) Needs visualization only
- (iii) MA model is constructed using:
 - a) Future values
 - b) Lagged errors
 - c) Lagged trend
 - d) Seasonality
- (iv) SARIMA extends ARIMA by including:
 - a) Seasonal components
 - b) Random terms
 - c) Trend terms
 - d) Neural layers
- (v) HMM assumes data generated by:
 - a) Observed states
 - b) Hidden states
 - c) Linear regression
 - d) Random labels
- (vi) Electricity load with periodic cycles analyzed best by:
 - a) Fourier methods
 - b) ARIMA
 - c) VAR
 - d) KPSS
- (vii) Noise-heavy systems are better modeled using:
 - a) ARIMA
 - b) SARIMA
 - c) VAR
 - d) Kalman
- (viii) Long-term periodic climate patterns analyzed using:
 - a) KPSS
 - b) VAR
 - c) GARCH
 - d) Spectral analysis
- (ix) Manual feature engineering needed most for:

- a) Regression
 - b) LSTM
 - c) Transformer
 - d) CNN
- (x) Which model handles long dependencies best?
- a) Transformer
 - b) AR
 - c) MA
 - d) Regression

Group-B

(Short Answer Type Questions)

3 x 5=15

2. Case study: A dataset becomes stationary after first differencing. What is the value of d in ARIMA? (3)
 3. Define time series data with an example. (3)
 4. Explain the trend component in time series. (3)
 5. Case study: A company wants a complete forecasting solution using Python. Suggest a toolchain. (3)
 6. Compare GARCH and ARIMA in terms of application focus. (3)
- OR**
- Explain how Kalman Filter works in noisy environments. (3)

Group-C

(Long Answer Type Questions)

5 x 3=15

7. Case: A retail chain observes that monthly sales data shows an upward movement, strong festive spikes, and sudden drops during economic slowdowns. Management wants a reliable forecasting model for inventory planning. Question: Identify and analyze the time series components present in this data and explain how incorrect identification may affect business decisions. (5)
 8. Critically analyze the statement: "Deep learning models reduce the need for domain knowledge in time series forecasting." (5)
 9. A company observes that deep learning models outperform tree-based models in long-horizon forecasting but underperform in short-horizon prediction. Explain this behavior. (5)
- OR**
- Justify the statement: "Machine learning models shift time series analysis from assumption-driven modeling to data-driven learning." (5)

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