24P357 (Pages: 2) Name……..

Reg. No……..

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2025

(CBCSS-PG)

(Regular/Supplementary/Improvement)

CC22PMST3E02 - TIME SERIES ANALYSIS

(Statistics)

(2022 Admission onwards)

Time: Three Hours Maximum: 30 Weightage

PART A

Answer any ***four*** questions. Each question carries 2 weightage.

1. Define the autocorrelation function and partial autocorrelation function.
2. Give an example of two MA processes having the same autocovariance function.
3. What is meant by the trend component of a time series? How can it be removed?
4. Define the ARMA (1,1,2) model.
5. Define spectral density and the periodogram of a time series.
6. What do you mean by minimum mean square forecasting?
7. Explain the link between time series and a discrete parameter stochastic process.

(4 × 2 = 8 Weightage)

PART B

Answer any ***four*** questions. Each question carries 3 weightage.

8. Explain the duality between AR and MA processes. Identify the dual relationship of AR(1) process.
9. Discuss the applications of residuals in time series analysis.
10. Explain the Holt-Winters' smoothing methods.
11. What do you mean by heteroscedasticity in time series? How can it be identified from a given time series?
12. Define ARCH and GARCH time series models.
13. Discuss various methods of trend estimation in a time series.
14. Obtain stationarity condition for autoregressive process of order p.

(4 × 3 = 12 Weightage)

PART C

Answer any ***two*** questions. Each question carries 5 weightage.

15. Consider the AR(2) process given by $X_t = X_{t-1} + \frac{1}{2}X_{t-2} + Z_t$, Check whether the process is stationary. Also find the ACF.

16. Consider the stationary process $X_t = Z_t - \theta Z_{t-1} - 6\theta^2 Z_{t-2}$, where θ is a real non-zero number.
    (a) Under which condition does X_t become invertible.
    (b) Find the ACF of X_t.
17. Identify the spectral density function of an AR (2) and $ARMA$ (1,1) process.
18. Explain:
    (a) Non linear time series.
    (b) Maximum likelihood estimation of a ARMA process.
    (c) State Herglotzic theorem.

(2 × 5 = 10 Weightage)

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