

17P374

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Name.....

Reg. No.....

**THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2018**

(Regular/Supplementary/Improvement)

(CUCSS - PG)

**CC15P ST3 E06 - TIME SERIES ANALYSIS**

(Statistics)

(2015 Admission onwards)

Time : Three Hours

Maximum : 36 Weightage

**PART A**

Answer *all* questions. Each question carries 1 weightage.

1. Define a time series and explain its link to stochastic process.
2. What do you mean by exploratory time series analysis? What is its importance?
3. What is spectral density function? What are its important properties?
4. How do you determine the order of an AR model using Box-Jenkins approach?
5. Identify the constants p, d, q of the ARIMA (p, d, q) model

$$Y_t = Y_{t-1} - 0.25 Y_{t-2} + e_t - 0.1 e_{t-1}.$$

6. Describe a AR(1) model and show that it is Markovian.
7. Obtain the Yule - Walker equations for AR(2) model.
8. What is meant by diagnostic checking in time series analysis?
9. Explain the importance of forecasting in time series analysis.
10. Distinguish between correlogram and periodogram.
11. Define a Autoregressive conditional heteroscedastic model and highlight its applications in the analysis of time series data.
12. Describe a non-linear model in time series analysis and give an example.

**(12 x 1 = 12 Weightage)**

**PART B**

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

13. Define a simple exponential smoothing and explain why it is called so.
14. What is meant by seasonality in time series? Describe a test for testing seasonality.
15. Define auto-covariance function and auto-correlation function of a time series. Prove that the auto-covariance function of a stationary time series is positive definite.
16. Show that the ARMA (1,1) process is stationary and invertible.
17. Obtain the stationary conditions for the AR(2) process in terms of the autoregressive parameters.

18. Establish the duality between MA and AR models.
19. Discuss about the estimation of auto-covariance in large sample theory.
20. Explain maximum likelihood estimation for ARMA processes.
21. Obtain the Yule-Walker equation satisfied by the ACF of an AR(p) model.
22. Describe the structure of correlogram of a (i) Stationary series (ii) Non stationary series.
23. Derive an 1-step ahead forecasting formula for AR(1) model.
24. Define a GARCH(1,1) model and describe its properties.

**(8 x 2 = 16 Weightage)**

### PART C

Answer any *two* questions. Each question carries 4 weightage.

25. (a) Explain Holt winters smoothing method for multiplicative seasonality.  
 (b) Let  $\{e_t\}$  be a zero mean white noise process. If  $Y_t = e_t + \theta e_{t-1}$ , find the autocorrelation function for  $\{Y_t\}$  both when  $\theta = 3$  and when  $\theta = \frac{1}{3}$
26. Explain the method of finding autocorrelation of ARMA (p, q) model. Deduce the autocorrelation of AR(2) process.
27. Describe the least square method of finding the parameter estimates of ARMA (p, q) model.
28. State and prove Herglotz theorem.

**(2 x 4 = 8 Weightage)**

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