

18P372

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Name.....

Reg. No.....

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2019

(Regular/Supplementary/Improvement)

(CUCSS-PG)

(Statistics)

CC15P ST3 E06 - TIME SERIES ANALYSIS

(2015 Admission onwards)

Time : Three Hours

Maximum : 36 Weightage

PART A

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

1. Define discrete and continuous time series and give one example for each.
2. Show that the autocorrelation function (acf) is an even function of the time lag.
3. What is spectral density function? What are its important properties?
4. Define a weak stationary process.
5. Express an Autoregressive integrated moving average (1, 1, 1) model ARIMA(1, 1, 1) in two forms.
6. Compute the ACF of a process $X_t = Z_t + \theta Z_{t-2}$ where Z_t are i.i.d $N(0,1)$ random variables.
7. Distinguish between forecasting and prediction in time series.
8. What is meant by diagnostic checking in time series analysis?
9. Derive the Yule-walker equations for AR(1) model.
10. State Herglotz theorem.
11. Define periodogram of a time series and mention its applications.
12. Define ARCH model.

(12 x 1 = 12 Weightage)

PART B

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

13. What do you mean by smoothing of time series. Illustrate with an example the smoothing by moving average method.
14. Describe the different methods for testing trend in time series.
15. Can you say that the ACF uniquely determines the underlying model? Establish your claim.
16. Show that if a stationary time series satisfies the difference equation

$$Y_t - Y_{t-1} = e_t, \text{ then } E[e_t^2] = 0$$

17. Show that an AR(1) process can be represented as a MA(∞) model.
18. Describe the method of determining the order of an ARMA model.
19. What do you mean by residual analysis of a time series? Explain any one test for the presence of residual auto correlations.
20. Explain least square estimation for the parameters of an ARMA(1, 1) process.
21. Obtain the Yule-Walker equation satisfied by the ACF of an ARMA(p, q) model.
22. Find the spectral density for a moving average process of order 2
23. Distinguish between linear and non linear time series models.
24. Define a GARCH(1, 1) model and describe its properties.

(8 x 2 = 16 Weightage)

PART C

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

25. (a) Explain Holt winters smoothing method for multiplicative seasonality.
(b) If $Y_t = Y_{t-1} - 0.5 Y_{t-2} + Z_t$, find the autocorrelation function for $\{Y_t\}$
26. Derive the ACF of an ARMA(p, q) process and obtain the invertibility conditions.
27. Describe the use of maximum likelihood method of finding the parameter estimates of ARMA (1, 1) model.
28. Describe the spectral analysis of time series and derive the spectral density function of AR (1) process.

(2 x 4 = 8 Weightage)
