20P363 (Pages: 2) Name …….

Reg. No……..

THIRD SEMESTER M.Sc. DEGREE EXAMINATION, NOVEMBER 2021

(CBCSS-PG)

(Regular/Supplementary/Improvement)

CC19P ST3 E02 - TIME SERIES ANALYSIS

(Statistics)

(2019 Admission onwards)

Time: Three Hours Maximum: 30 Weightage

Part A

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

1. Define auto covariance. State the basic properties of auto-covariance function
2. What is spectral density function? Obtain the spectral density of white noise process
3. Explain briefly simple exponential smoothing techniques
4. Write brief notes on diagnostic checking in time series analysis. What is the test statistic used in the analysis?
5. Define linear time series process. When it reduces to moving average process?
6. What is ARCH (p) process? How it differs from AR (p) process? When to apply ARCH (p) model?
7. Describe the Yule walker estimation of parameters in AR(P) model

(4 × 2 = 8 Weightage)

Part B

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

8. Explain the components of time series with examples
9. Define ARMA(1, 1) process. Derive the conditions for stationarity and invertibility in ARMA(1, 1) process .
10. State and prove Hergolt's theorem.
11. Give the situations where double exponential smoothing method is appropriate for forecast procedures. Explain Holt Winter exponential smoothing.
12. Establish the dual relationship between AR(p) and MA(q) processes
13. Define ARIMA (p, d, q) model. Explain minimum mean square error forecasting technique using ARIMA model.
14. Describe the maximum likelihood estimation in ARMA(p, q) model.

(4 × 3 = 12 Weightage)

Part C

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

15. (i) What is correlogram? What is its use?

    (ii) Define the periodogram of observations $\{x_1, x_2, \ldots, x_n\}$.

    (iii) What is adaptive exponential smoothing technique?

    (iv) Give examples of stationary and non stationary time series processes

    (v) Write down the least square estimator of parameter in AR(1) process. Is it an unbiased estimator?

16. (i) Define partial autocorrelation function of stationary stochastic process. Explain the behavior of the partial autocorrelation function of an AR(p) process.

    (ii) Explain how will you estimate seasonality in a given time series. Describe the test for seasonality

    (iii) Give the estimators of mean and auto-covariance function for large samples

17. (i) Describe second order moving average process. State the conditions for invertibility of the process.

    (ii) Show that the function γ defined on the integers defined by

    $\gamma(0) = 1, \gamma(\pm 1) = \rho$, and $\gamma(k) = 0 \; for \; k \neq 0$ and $k \neq \pm 1$ is an autocovariance function if $|\rho| \leq 0.5$

18. Write short notes on the following:

    (i) GARCH (p, q) model

    (ii) Choice of moving average periods in fitting time series data

    (iii) ARIMA (0, 1, 1) model

    (iv) Random walk process

    (v) Difference between forecasting and prediction in time series analysis

(2 × 5 = 10 Weightage)

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