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0306N365

Candidate's Seat No :_____

Master of Science Sem.-2 Examination

507

Statistics

Time : 2-00 Hours] **June 2022** **[Max. Marks : 50**

Instructions: 1. All Questions in **Section-I** carry equal marks.
2. Attempt any **THREE** questions in **Section-I**
3. Question IX in **Section-II is COMPULSORY**

Section I

Q-1(A) Define time series. Illustrate its main components with proper Examples. Describe the importance of time series analysis. 07

(B) Explain the effect of elimination of trend on Oscillatory component and Random component of the given time series. 07

Q-2(A) Discuss Variate Difference method and show how trend component of a time series and the variance of the random component is estimated using this method. 07

(B) A series is to be fitted for the curve which best approximate to sets of five points. Obtain weights of moving average if a quadratic provides a satisfactory approximation. Make your comments if cubic is fitted instead of quadratic. 07

Q-3(A) Define periodic time series. What is periodogram? Establish a relation between periodogram and the correlogram. 07

(B) Show that a real valued function defined on the set of integers is the auto covariance function of a stationary time series iff it is an even function and is non-negative definite. 07

Q-4 (A) In usual notations define auto covariance and auto correlation matrix. For n=3, show that 07

$$\rho_i \leq 1, i=1,2 \text{ and } -1 \leq \frac{\rho_2 - \rho_1^2}{1-\rho_1^2} \leq 1.$$

(B) Prove that the real valued function on z, is an auto covariance function iff $|\rho| < 1/2$; where, $y_t = z_t + \theta z_{t-1}$ with $\{z_t\}$ be the sequence of iid$(0, \sigma^2)$ variables and the auto-covariance function $\Upsilon(h)$ is defined as follows.

$$\gamma(h) = \begin{cases} 1 & if\ h=0 \\ \rho & if\ h=\pm 1 \\ 0 & otherwise \end{cases}$$ 07

Q-5(A) Distinguish between: Ordinary and stationary time series. Let $X_t = y_t + Ay_{t-1}$, where y_t's are independently and identically distributed with mean '0' and variance σ^2. Show that X_t is weakly stationary time series. 07

(B) Explain DF-test to check the stationary of the given time series. 07

Q-6(A) Define RWM. Distinguish between: RWM with drift and without drift. "RWM has Infinite memory". –Explain this statement. 07

(B) Explain the concept of "Unit Root Stochastic Process". Write different particular cases of

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time series $y_t = \beta_1 + \beta_2 t + \beta_3 y_{t-1} + u_t$ where u_t is a white noise error term and t is time. 07

Q-7 (A) Explain the following terms in usual notation with appropriate examples:
(a) AR(p), (b) MA(q), (c) ARMA(p, q) and (d) ARIMA(p, d, q). 07

(B) Explain Box-Jenkins methodology. Write its limitations and importance. 07

Q-8 (A) Explain the estimation procedure of the ARIMA (p, d, q) model. How you would identify the significance of autoregressive and moving average terms. Explain diagnostic checking of your selected model and forecasting of future values. 07

(B) Explain the VAR modeling. What is the role of causality in this modeling? 07

Section II

Q-9 Choose the Appropriate Answer. 08

1. Suppose that monthly death rates in India is given for the last five years (April, 2016 to April, 2021). We can observe an exponential increase in death rate in last two years due to Covid-19 epidemic in the world. We can Interpret increase in death rate in sense of time series analysis as _____.
   (A) Trend Component
   (B) Seasonal Component
   (C) Cyclical Component
   (D) Irregular Component

2. The Variate Difference method fails when
   (A) Cyclical component is present in the given time series.
   (B) Seasonal competent is present in the given time series.
   (C) Random component is present in the given time series.
   (D) None of the above.

3. A stochastic process is said to be Stationary if
   (A) its mean is constant over time
   (B) its variance is constant over time
   (C) its covariance depends only on the lag value
   (D) all of above

4. Which of the following time series is stationary?
   (A) $y_t = y_{t-1} + u_t$
   (B) $y_t = \beta_1 + y_{t-1} + u_t$
   (C) $y_t = \beta_1 + \beta_2 t + u_t$
   (D) $\Delta y_t = \beta_1 + u_t$

5. In testing the stationarity of the given time series using DF-test if the null hypothesis H: $\delta=0$ is accepted then the time series is

   (A) Non-stationary.
   (B) Stationary
   (C) Oscillatory
   (D) Harmonic

6. Which component of time series is mainly applicable in "Decrease in employment in a Diamond factory during the off season"?

   (A) Trend Component
   (B) Seasonal Component
   (C) Cyclical Component
   (D) Irregular Component

7. If we want to find trend using weighted moving average for $U_t = a_0 + a_1t + a_2t^2$ using five successive terms of time series then the weights are

   (A) (1/35)[-3, 2, 17, 2, -3]
   (B) (1/35)[-3, 12, 17, 12, -3]
   (C) (1/35)[3, 2, 17, 2, 3]
   (D) (1/35)[-3, 2, 7, 2, -3]

8. Box-Jenkins is an iterative procedure which contains the following four steps:
   (i) Forecasting
   (ii) Diagnostic checking
   (iii) Identification of the model
   (iv) Parameter estimation of the chosen model
   Choose the right order of the above four steps.

   (A) [(i), (ii), (iii), (iv)]
   (B) [(ii), (iii), (i), (iv)]
   (C) [(ii), (iii), (iv), (i)]
   (D) [(iii), (iv), (ii), (i)]