

- 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) 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-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) Explain the effect of elimination of trend on Oscillatory component and Random component of the given time series. 07
- Q-3(A) Define periodic time series. What is periodogram? Establish a relation between periodogram and the correlogram. 07
- (B) In usual notations define auto covariance and auto correlation matrix. For  $n=3$ , show that

$$\rho_i \leq 1, i=1,2 \text{ and } -1 \leq \frac{\rho_2 - \rho_1^2}{1 - \rho_1^2} \leq 1. \quad 07$$

- Q-4(A) Show that a real valued function defined on the set of integers is the autocovariance function of a stationary time series iff it is an even function and is non-negative definite. 07

- (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  $Y(h)$  is defined as follows.

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

- Q-5(A) Distinguish between: Ordinary and stationary time series. Let  $X_t = y_t + \theta y_{t-1}$ , where  $y_t$ 's are

- independently and identically distributed with mean '0' and variance  $\sigma^2$ . Show that  $X_t$  is weakly stationary time series. 07
- (B) Explain the concept of "Unit Root Stochastic Process". Write different particular cases of the 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-6(A) Define RWM. Distinguish between: RWM with drift and without drift. 'RWM has Infinite memory'. -Explain this statement. 07
- (B) Explain DF-test to check the stationary of the given time series. 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 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
- Q-8(A) Explain Box-Jenkins methodology. Write its limitations and importance. 07
- (B) Explain the VAR modeling. What is the role of causality in this modeling? 07

### Section II

- Q-9 Answer the following questions in one sentence. (Any eight) 08
- (i) Give an example of time series with downward trend.
  - (ii) Give an example of time series with upward trend.
  - (iii) 'In Variate Difference method homogeneity of two successive estimates of the variance cannot be tested by Variance Ratio test (F- test)'. - (State True or False)
  - (iv) What is Buys-Ballot Table?
  - (v) Define intensity function.
  - (vi) When the intensity function takes high values?
  - (vii) Write any two objectives of the periodogram analysis.
  - (viii) In testing the stationary of the given time series using DF-test if  $\rho < 1$ , then the time series is \_\_\_\_\_.
  - (ix) In testing the stationary of the given time series using DF-test if the null hypothesis  $H: \delta=0$  is accepted then give your interpretation.
  - (x) What is Difference stationary process?

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- (xi) What is detrending?
  
  - (xii) State the difference between Dickey-Fuller test and Phillips-Perron test.
  - (xiii) Write any one advantage of VAR modeling.
  - (xiv) What is the biggest practical challenge in VAR modeling?
  - (xv) When a time series is said to be integrated of order  $d$ ?
  - (xvi) What is the reason for assuming stationary time series in ARIMA modeling?
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