

Seat No. : _____

AA-113

April-2016

M.Sc., Sem.-IV

507 : STATISTICS

(Time Series Analysis and Applications)

Time : 3 Hours]

[Max. Marks : 70

- Instructions :** (1) All questions carry equal marks.
(2) Scientific calculator can be used.

1. (a) Explain 'Input-Output Analysis'. Discuss Leontief's Inter Industry Closed System Model and state its important properties.

OR

Discuss limitations of Input-Output Analysis.

- (b) Discuss Leontief's Open-sector model for Input-Output Analysis.

OR

Discuss Leontief's Closed-sector model for Input-Output Analysis.

2. (a) In usual notations define Marginal propensity to consume (MPC) and Marginal propensity to save (MPS). Derive relation between MPC and MPS.

OR

Discuss Harrod-Domar's growth model (periodic & derivative form).

- (b) Discuss Mahalanobis two Sector Model.

OR

Discuss Samuelson-Hicks model of multiplier accelerator.

3. (a) A series is to be fitted for the curve which best approximate to sets of seven points. What are the weights of the moving average if a cubic provides a satisfactory approximation ? Make your comments if quadratic is fitted instead of cubic; state your general conclusion on it.

OR

Discuss Variate Difference method and show how (i) the trend component of a time series can be estimated and (ii) the variance of the random component is estimated using this method. State clearly the assumptions underlying this method and explain with illustration when the method fails.

- (b) Explain the concept of ARIMA (p, d, q). Write the estimation procedure of the ARIMA model.

OR

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.

4. (a) In usual notations define auto covariance and auto correlation matrix. For $n = 3$,

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

OR

Let $X_t = y \cos \theta t + z \sin \theta t$, where y and z are two uncorrelated random variables each with mean zero and variance unity and $\theta \in (-\pi, \pi)$. Obtain γ_k and ρ_k .

- (b) Obtain the correlogram of the harmonic series.

OR

Write a brief note on periodogram analysis.

5. (a) Choose the appropriate answer.

(1) The Variate Difference method fails when

- (a) Seasonal component is present in the given time series.
- (b) Cyclical component is present in the given time series.
- (c) Random component is present in the given time series.
- (d) None of the above.

(2) 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

(3) 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) Stationary.
- (b) Non-Stationary
- (c) Oscillatory
- (d) Harmonic

- (4) Which of the following statement is true ?
- (a) If a time series is non-stationary, then it is said to be integrated of order zero.
 - (b) if a time series is stationary, then it is said to be integrated of order 'd'.
 - (c) if a time series is stationary, then it is said to unit root stochastic process.
 - (d) If a time series is stationary, then it is said to be integrated of order zero.
- (5) Which of the following statement is false ?
- (a) In testing the stationary of the given time series using DF-test if the null hypothesis $H : \delta = 0$ is rejected then the time series is stationary.
 - (b) In testing the stationary of the given time series using DF-test if the null hypothesis $H : \delta = 0$ is accepted then the time series is non-stationary.
 - (c) In testing the stationary of the given time series using DF-test if $\rho = 1$ then the time series is non-stationary.
 - (d) In testing the stationary of the given time series using DF-test if $\rho < 1$ then the time series is non-stationary.
- (6) Which of the following statement is true ?
- (a) In the method of '2m' yearly moving average, two terms at the beginning and two terms at the end of the series would not be determined.
 - (b) In the method of '2m' yearly moving average, 'm' terms at the beginning and 'm' terms at the end of the series would not be determined.
 - (c) In the method of '2m + 1' yearly moving average, 'm' terms at the beginning and 'm + 1' terms at the end of the series would not be determined.
 - (d) In the method of '2m + 1' yearly moving average, 'm + 1' terms at the beginning and 'm + 1' terms at the end of the series would not be determined.
- (7) Which of the following statement is false ?
- (a) The method of moving average has no effect on the Oscillatory component.
 - (b) The series obtained after elimination of trend will not be free of oscillations.
 - (c) In the method of moving average most of the primary oscillation in the original time series will be eliminated as trend.
 - (d) Using Correlogram analysis we can know the cause of oscillation in the given time series.

- (8) Which of the following statement is true ?
- (a) If by trial sometimes we get $\mu < \lambda$, the intensity function takes high values, otherwise the value is very small.
 - (b) If by trial sometimes we get $\mu > \lambda$, the intensity function takes high values, otherwise the value is very small.
 - (c) If by trial sometimes we get $\mu \neq \lambda$, the intensity function takes high values, otherwise the value is very small.
 - (d) If by trial sometimes we get $\mu = \lambda$, the intensity function takes high values, otherwise the value is very small.
- (9) Which of the following statement is false ?
- (a) The objective of periodogram analysis is to estimate the periodicities λ_i ($i = 1, 2, \dots, k$).
 - (b) The objective of periodogram analysis is to estimate the periodicities λ_i , and to find out the constants a_i 's and b_i 's ($i = 1, 2, \dots, k$)
 - (c) The objective of periodogram analysis is to find out trial period μ_i for which $\lambda_i = \mu_i$ ($i = 1, 2, \dots, k$).
 - (d) The objective of periodogram analysis is to check whether the given time series consisting cyclical component.
- (b) Answer the following questions :
- (1) Define Integrated stochastic process of order d.
 - (2) When intensity function takes high value ?
 - (3) What is Difference stationary process ?
 - (4) What is detrending ?
 - (5) Define RWM with drift and without drift.
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