



UNIVERSITY OF THE PUNJAB

Seventh Semester – 2019

Examination: B.S. 4 Years Program

Roll No. in Fig.

Roll No. in Words.

PAPER: Time Series Analysis-I
Course Code: STAT-411 Part-I (Compulsory)

MAX. TIME: 15 Min.
MAX. MARKS: 10

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Signature of Supdt.:

Attempt this Paper on this Question Sheet only.

Please encircle the correct option. Division of marks is given in front of each question.

This Paper will be collected back after expiry of time limit mentioned above.

Q.1: Encircle the right answer, cutting and overwriting is not allowed. (1x10=10)

- 1) For a good time series analysis, successive observations of time series data must be ,
 - a) Dependent.
 - b) Independent.
 - c) Identical.
 - d) None of above.
- 2) The mean and variance of _____ are time dependent.
 - a) Purely random process.
 - b) Random walk process.
 - c) Moving average process.
 - d) Autoregressive process.
- 3) An $MA(q)$ process with MA polynomial $\theta(B)$, is considered invertible if the roots of the Equation, $\theta(B) = 0$,
 - a) Must all lie on the unit circle.
 - b) Must all lie inside the unit circle.
 - c) Must all lie outside the unit circle.
 - d) MA process of finite order is always invertible.
- 4) Consider a time series that follows an AR(1) process with mean 4.5 and an auto regressive Coefficient of 0.4, what is the value of autocorrelation at lag-2?
 - a) 0.4
 - b) 4.66
 - c) 0.16
 - d) Not possible to determine the value of auto correlation without knowing error variance.
- 5) An $ARMA(1,1)$ process given by, $Y_t - Y_{t-1} = Z_t - 0.5Z_{t-1}$, can be considered as,
 - a) Stationary and invertible both.
 - b) Stationary but not invertible.
 - c) Invertible but not stationary.
 - d) Neither stationary nor invertible.
- 6) Partial autocorrelation at lag-1 is equal to,
 - a) Zero
 - b) Autocorrelation at lag-1.
 - c) -1.
 - d) +1.

P.T.O.

7) What is the name of the process defined by,

$$(1 + 0.6B^2)Y_t = (1 - 0.9B^2)Z_t$$

- a) *ARIMA*(2,0,2)
- b) *ARMA*(2,2)
- c) *ARMA*(1,1)
- d) Both a) & b)

8) Square root transformations are usually applied to,

- a) Stabilize Mean
- b) Stabilize variance
- c) Remove Trend
- c) None of the above.

9) Significant autocorrelation coefficients after certain time intervals is an indication of presence of _____ in the data.

- a) Non-Stationarity
- b) Outliers
- c) Seasonality
- d) Both a) & b)

10) If graph of time series data exhibits a high low pattern, it indicates that

- a) All autocorrelations will be negative.
- b) All odd lagged autocorrelations will be negative.
- c) All even lagged autocorrelations will be negative.
- d) None of above.



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Seventh Semester – 2019

Examination: B.S. 4 Years Program

Roll No.

PAPER: Time Series Analysis-I
Course Code: STAT-411 Part – II

MAX. TIME: 2 Hrs. 45 Min.
MAX. MARKS: 50

ATTEMPT THIS (SUBJECTIVE) ON THE SEPARATE ANSWER SHEET PROVIDED

Q.2. Answer these short questions.

(4x5=20)

- a) Differentiate between weak and strict stationarity.
b) Consider an AR(p) process, $X_t = \varphi_1 X_{t-1} + \varphi_2 X_{t-2} + \dots + \varphi_k X_{t-k} + Z_t$,

Show that,
$$\sigma_X^2 = \frac{\sigma_Z^2}{1 - \varphi_1 \rho_1 - \varphi_2 \rho_2 - \dots - \varphi_k \rho_k}$$

- c) Define random walk process; show that its mean and variance are time dependent.
d) Define Partial autocorrelation, Given the autocorrelations at lag 1, 2 & 3 of a time series as $-0.55, 0.25$ & -0.014 respectively. Calculate partial autocorrelation at lag-3.

Question No. 3. A time series model is given below,

(12)

$$(1 - B)(1 - 0.2B)X_t = (1 - 0.5B)Z_t$$

- a) Identify the model of X_t .
b) Check stationarity and invertibility of the model.
c) Obtain first three ψ - weights of the model when expressed as an MA model.
d) Obtain first three π - weights of the model when expressed as an AR model.

Question No. 4. Show that AR(2) process ,

(08)

$X_t = \varphi_1 X_{t-1} + \varphi_2 X_{t-2} + Z_t$, will be stationary if;

$$\varphi_1 + \varphi_2 < 1$$

$$\varphi_2 - \varphi_1 < 1$$

$$\varphi_2 > -1$$

Question No. 5. Consider the infinite order MA process $\{X_t\}$, defined by

(10)

$X_t = Z_t + C(Z_{t-1} + Z_{t-2} + \dots)$, where C is a constant. Show that process is non-stationary.

Also show that the series of first differences $\{Y_t\}$, defined by $Y_t = X_t - X_{t-1}$, is a first order MA process and is stationary. Also find the ACF of $\{Y_t\}$.