SLR-MM – 524

Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2015
STATISTICS (Paper – XIV) (Elective – I)
Time Series Analysis (New CGPA)

Day and Date : Monday, 23-11-2015 Total Marks : 70
Time : 2.30 p.m. to 5.00 p.m.

Instructions *: 1) Attempt* ***five*** *questions.*
2) Q. No. ***(1)*** *and Q. No.* ***(2)*** *are* ***compulsory****.*
3) Attempt ***any three*** *from Q. No.* ***(3)*** *to Q. No.* ***(7)****.*
4) Figures to the ***right*** *indicate* ***full*** *marks.*

1. A) Choose the correct alternative : **5**

1) The long term movement of time series is _____
   a) trend b) cyclical variation
   c) seasonal variation d) noise

2) If mean and covariance function are both independent of time t, then the process is called _____
   a) Weak stationary b) Strict stationary
   c) Evolutionary process d) None of these

3) The ARMA(1,1) process is invertible if _____
   a) $|\theta| > 1$ b) $|\theta| < 1$ c) $|\theta| = 1$ d) $|\theta| > 2$

4) The _____ data is defined as the original time series data with the estimated seasonal component removed.
   a) seasonalised b) seasonal
   c) deseasonalised d) none of these

5) For large n, the sample autocorrelations of an iid sequence $Y_1, Y_2, ..., Y_n$ with finite variance are approximately iid with distribution _____
   a) N(0, 1/n) b) N(0, 1) c) N(n, 1/n) d) None of these

B) Fill in the blanks : **5**

1) $\{X_t\}$ is a _____ stationary time series if $(X_1, ..., X_n)$ is identical in distribution with $(X_{1+h}, ..., X_{n+h})$ for all integers h and $n \geq 1$.

2) An iid sequence is _____ stationary.

P.T.O.

3) A stationary time series is _____ if $\gamma(h) = 0$ whenever $|h| > q$.

4) A sequence of uncorrelated random variables, each with zero mean and variance σ^2 is called _____

5) The Spencer 15-point moving average is a filter that passes polynomials upto degree _____ without distortion.

C) State whether the following statements are **true** or **false** : **4**

1) The random walk is a weak stationary process.

2) Every IID noise is white noise.

3) Every white noise is IID noise.

4) The autocorrelation function $\gamma(h)$ is symmetric in h.

2. a) i) Define Ar(p) Process. Find its Autocorrelation Function (ACF).

ii) Define an invertible process. Give one example. **(3+3)**

b) Write short note on the following :

i) Double exponential smoothing.

ii) Weak and strict stationarity. **(4+4)**

3. a) Define a causal process. State conditions under which an ARMA process is causal. Examine whether the process $X_t + 1.6*X_{t-1} = Z_t - 0.4*Z_{t-1}$ is causal.

b) Define MA(q) process. Obtain its autocovariance function. **(7+7)**

4. a) What do you mean by smoothing of a time series ? Also explain Holt-Winter exponential smoothing.

b) Describe the main components of time series. Discuss any one method of trend removal in the absence of a seasonal component. **(6+8)**

5. a) Describe the need of ARCH and GARCH models.

b) Define the ARIMA model. Discuss the problem of forecasting ARIMA models. **(6+8)**

6. a) Describe the test based on turning points for testing randomness of residuals.

b) For the model $(1 - 0.2\,B)\,X_t = (1 - 0.5\,B)\,Z_t$, evaluate the first three π-weights and the first three Ψ-weights. **(6+8)**

7. a) Discuss in brief about Yule-Walker equations.

b) Describe Durbin-Levinson algorithm for fitting AR(p) model. **(6+8)**

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SLR-MB – 626

Seat No.	

M.Sc. (Part – II) (Semester – III) Examination, 2016
STATISTICS (Paper – XIV)
Elective – I : Time Series Analysis (New CGPA)

Day and Date : Tuesday, 5-4-2016 Total Marks : 70

Time : 2.30 p.m. to 5.00 p.m.

Instructions *: 1) Attempt **five** questions.*
*2) Q. No. (**1**) and Q. No. (**2**) are **compulsory**.*
*3) Attempt **any three** from Q. No. (**3**) to Q. No. (**7**).*
*4) Figures to the **right** indicate **full** marks.*

1. A) Choose the correct alternative : **5**

1) The autocovariance function $\gamma(h)$ satisfies _____

a) $\gamma(0) \geq 0$ b) $|\gamma(h)| \leq \gamma(0)$ for all h

c) $\gamma(h) = \gamma(-h)$ for all h d) all of these

2) A sequence of uncorrelated random variables, each with zero mean and variance σ^2 is called _____

a) IID noise b) White noise

c) MA(1) d) AR(1)

3) The _____ data is defined as the original time series data with the estimated seasonal component removed.

a) seasonalised b) seasonal

c) deseasonalised d) none of these

4) For large n, the sample autocorrelations of an iid sequence Y_1, ..., Y_n with finite variance are approximately iid with distribution _____

a) N(0, 1/n) b) N(0, 1) c) N(n, 1/n) d) None of these

5) The ARMA(1, 1) process is invertible if _____

a) $|\theta| > 1$ b) $|\theta| < 1$ c) $|\theta| = 1$ d) $|\theta| > 2$

P.T.O.

B) Fill in the blanks : **5**

1) $\{X_t\}$ is a _____ stationary time series if $(X_1, ..., X_n)$ is identical in distribution with $(X_{1+h}, ..., X_{n+h})$ for all integers h and $n \geq 1$.

2) If mean and covariance function are both independent of time t, then the process is called _____ stationary.

3) A white noise sequence is _____ stationary.

4) A real-valued function defined on the integers is the autocovariance function of a stationary time series if and only if it is even and _____

5) The MA(1) process is _____ stationary.

C) State whether the following statements are **true** or **false** : **4**

1) Weak stationarity implies strict stationarity.

2) A process $\{X_t\}$ is invertible, if Z_t can be expressed in terms of the present and past values of the process X_s, $s \leq t$.

3) ARCH model is used to describe a changing, possibly volatile variance.

4) The random walk is a weak stationary process.

2. a) Define PACF of a process $\{X_t\}$. Find an expression for PACF of the following process

$X_t = 0.5\ X_{t-1} + Z_t$, $Z_t \sim$ iid $N(0, \sigma^2)$ **8**

b) i) State any two properties of white noise process.

ii) Define an invertible process. Give one example. **(3+3)**

3. a) Explain moving average smoothing. Describe forecasting based on smoothing.

b) Define an ARMA(p, q) process and state conditions for its invertibility. Examine the process $X_t - 0.5X_{t-1} + 0.3\ X_{t-2} = Z_t + 0.2\ Z_{t-1}$ for invertibility. **(7+7)**

4. a) Define MA(q) process. Obtain its autocovariance function.

   b) What are the different methods of diagnostic checking in time series ? Explain the role of residual analysis in model checking. **(7+7)**

5. a) Describe Yule-Walker method of estimating the parameters of an AR(p) process. Obtain the same for AR(2) process.

   b) Obtain the autocorrelation function of a stationary AR(1) process. **(6+8)**

6. a) Explain the concept of spectral density of a time series. Derive the spectral density of an AR(1) process.

   b) Describe the main components of time series. Discuss any one method of trend removal in the absence of a seasonal component. **(8+6)**

7. a) Discuss recursive prediction of an ARMA (p, q) process.

   b) Outline a procedure for model selection of an observed time series. **(7+7)**

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