Name: **Enrolment No:**	UPES UNIVERSITY OF TOMORROW

UPES

End Semester Examination, May 2023

Course: Time Series Econometrics — **Semester: VI**

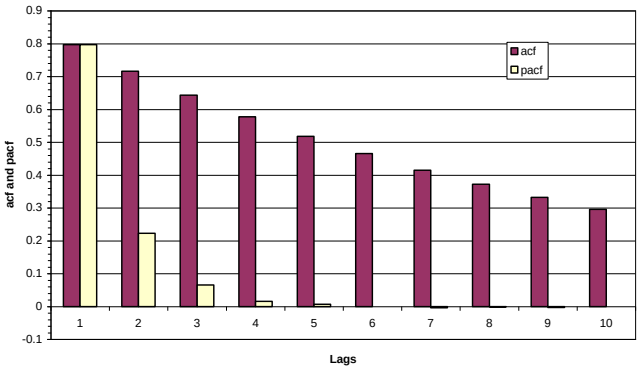
Program: BA ECO — **Time : 03 hrs.**

Course Code: ECON3016 — **Max. Marks: 100**

Instructions: Answer the questions as per the serial no. of the question and clearly write Section Name on your answer sheet.

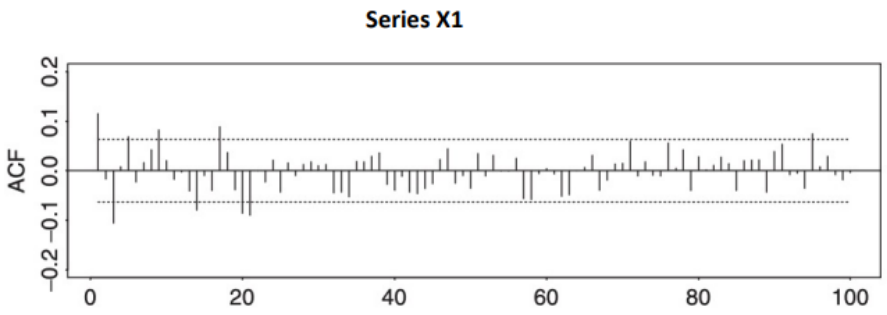
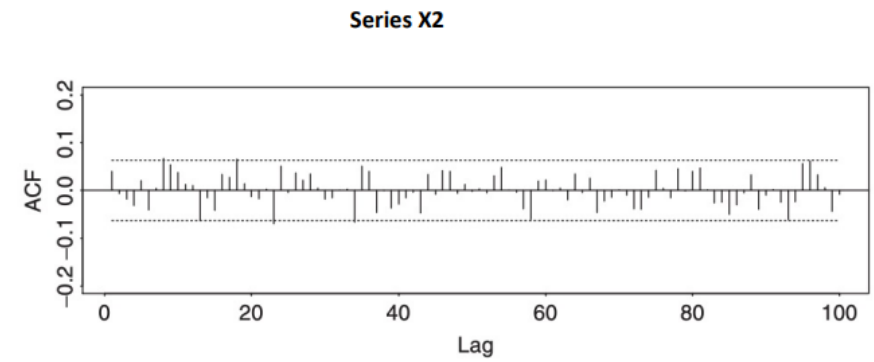
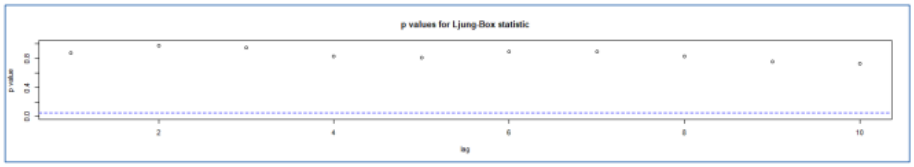
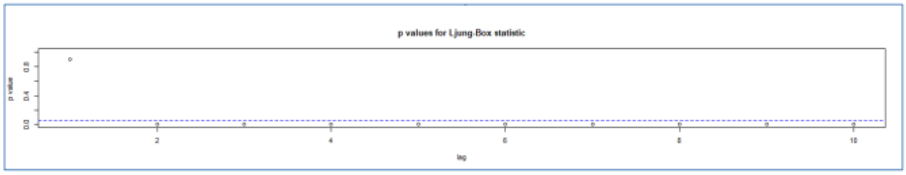
SECTION A

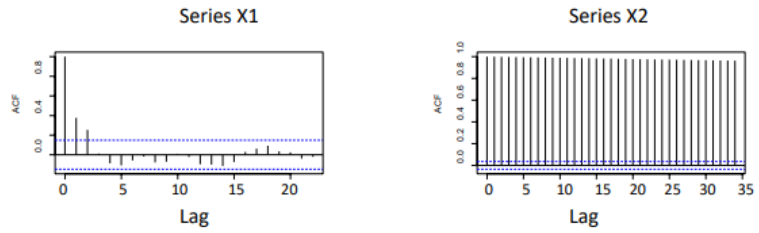
10Qx2M=20Marks

S. No.		Marks	CO
Q 1	Consider the following picture and suggest the model from the following list that best characterises the process:  (a) An AR(1) (b) An AR(2) (c) An ARMA(1,1) (d) An MA(3	**2**	**CO1**
Q 2	Which of the following models can be estimated using ordinary least squares? (i) An AR(1) (ii) An ARMA(2,0) (iii) An MA(1) (iv) An ARMA(1,1).	**2**	**CO1**
Q 3	If a series, *y*, is described as 'mean-reverting', which model from the following list is likely to produce the best long-term forecasts for that series *y*? (a) A random walk (b) The long term mean of the series	**2**	**CO1**

	(c) A model from the ARMA family (d) A random walk with drift.		
Q 4	Consider the following AR(2) model. What is the optimal 2-step-ahead forecast for y if all information available is up to and including time *t*, if the values of *y* at time *t*, *t*-1 and *t*-2 are –0.3, 0.4 and –0.1, respectively, and the value of u at time *t*-1 is 0.3? $y_t = -0.1 + 0.75y_{t-1} - 0.125y_{t-2} + u_t$ (a) –0.1 (b) 0.27 (c) –0.34 (d) 0.30.	**2**	**CO1**
Q 5	Which of these is NOT a consequence of working with non-stationarity variables? (a) Shocks will be persistent (b) Unjustifiably high R^2 (c) The standard assumptions for asymptotic analysis will be invalid (d) It leads to data mining.	**2**	**CO1**
Q 6	Three characteristics of a weakly stationary process are (I) $E(y_t) = \mu$ (II) $E(y_t - \mu)(y_t - \mu) = \sigma^2 < \infty$ (III) $E(y_{t1} - \mu)(y_{t2} - \mu) = \gamma_{t2-t1} \quad \forall t_1, t_2$ What do the mathematical expressions I, II, and III imply? (a) Constant variance, constant mean, and constant autocovariance, respectively (b) Constant autocovariance structure, constant mean, and constant variance, respectively (c) Constant mean, constant autocorrelation, and constant autocovariance, respectively (d)Constant mean, constant variance, and constant autocovariance structure, respectively.	**2**	**CO1**

	Use the following to answer Questions 8 and 9. Suppose that you have estimated the first five autocorrelation coefficients using a series of length 81 observations and found them to be Lag 1 2 3 4 5 Autocorrelation coefficient 0.412 -0.205 -0.332 0.005 0.54		
Q 8	Which autocorrelation coefficients are significantly different from zero at the 5% level? (a) The first and fifth autocorrelation coefficient (b) The first, second, third, and fifth autocorrelation coefficient (c) The first, third, and fifth autocorrelation coefficient (d) The second and fourth autocorrelation coefficient.	**2**	**CO1**
Q 9	What is the appropriate Box–Pierce test statistic? (a) 4.78 (b)47.83 (c) 59.05 (d) 5.91	**2**	**CO1**
Q 10	Consider the following MA(2) process $y_t = u_t + \theta_1 u_{t-1} + \theta_2 u_{t-2}$ where the errors follow a standard normal distribution. What is the variance of y_t ? (a) $E\left[u_t^2 + \theta_1^2 u_{t-1}^2 + \theta_2^2 u_{t-2}^2\right]$ (b) $\sigma^2 + \theta_1^2\sigma^2 + \theta_2^2\sigma^2$ (c) $1 + \theta_1^2 + \theta_2^2$ (d) All of the above	**2**	**CO1**
SECTION B 4Qx5M= 20 Marks			
Q 11	a) Using the sample ACF plots below, identify which one of the series is white noise.	**5**	**CO2**

	  b) What is the serial correlation between values of a white noise? What is the mean value of a white noise series?		
Q 12	a) Consider the process: $r_t = 1.1 + 1.4r_{t-1} + a_t$ Where a_t is error term. Does r_t seem to be stationary? Why?	**5**	**CO2**
Q 13	Refer to the Ljung Box test outputs of the residuals of two ARIMA models below. Both the models are based on different ARMA orders for the series X. Which model do you think is better suited for X and why? **Model 1**  **Model 2** 	**5**	**CO2**

Q 14	**B]** Figure 4 shows the ACF of two time-series. Argue which one (Series 1 and Series 2) is stationary and which one is not. Explain your result.  (a) Series 1 (b) Series 2 Figure 4: ACF Plots	**5**	**CO2**
SECTION-C **3Qx10M=30 Marks**			
Q 15	You obtain the following sample autocorrelations and partial autocorrelations for a sample of 100 observations from actual data: (a)Can you identify the most appropriate time-series process for this data? (b)Use the Ljung–Box test to determine whether the first three autocorrelation coefficients taken together are jointly significantly different from zero.	**10**	**CO3**
Q 16	Consider the following stationary ARMA(1,1) process: $y_t = \mu + \phi_1 y_{t-1} + u_t + \theta_1 u_{t-1}$ where u_t is a white noise process with zero mean and variance σ_u^2. (a)Calculate the (unconditional) mean of y_t . For the remainder of the question, set $u = 0$ for simplicity. (b)Calculate the (unconditional) variance of y_t . (c)Derive the autocorrelation function for y_t .	**10**	**CO3**
Q 17	Suppose that a researcher had estimated the first 5 autocorrelation coefficients using a series of length 100 observations, and found them to be (from 1 to 5): 0.207, -0.013, 0.086, 0.005, -0.022. Test each of the individual coefficient for significance, and use both the Box-Pierce and Ljung-Box tests to establish whether they are jointly significant.	**10**	**CO3**
SECTION-D **2Qx15M= 30 Marks**			

Lag	1	2	3	4	5	6	7	8
acf	0.420	0.104	0.032	-0.206	-0.138	0.042	-0.018	0.074
pacf	0.420	0.381	0.268	0.199	0.205	0.101	0.096	0.082

Q 18	• Consider the following simple AR(1) model $$y_t = \mu + \phi_1 y_{t-1} + u_t$$ where u_t is a white noise process with zero mean and variance σ_u^2. i. Calculate the (unconditional) mean of y_t. For the remainder of the question, set $\mu = 0$ for simplicity. ii. Calculate the (unconditional) variance of y_t. iii. Derive the autocorrelation function for y_t.	**15**	**CO4**
Q 19	You are asked to do the forecasting GDP data for Indian Economy. Write in detail how you will forecast the GDP data.	**15**	**CO4**