Name:

Enrolment No:

UPES
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UNIVERSITY OF PETROLEUM AND ENERGY STUDIES
End Semester Examination, December 2019

Course: Business Modelling in Energy Sector **Semester: III**
Program: MA EE **Time: 03 Hours**
Course code: OGET 8007 **Max. Marks: 100**
Instructions:

SECTION -A **2x10= (20 Marks)**

	Answer all questions	**Marks**	**CO**
1.	Which one of the following indicates negative autocorrelation? a) A cycle pattern in the residuals. b) An alternating pattern in the residuals c) A complete randomness in the residuals. d) Residuals that are all close to zero.	**2**	**CO 1**
2.	Which of the following could be used as a test for autocorrelation up to third order? a) The Durbin Watson test b) White's test d) The Breusch-Godfrey test	**2**	**CO 1**
3.	If a Durbin Watson statistic takes a value close to zero, what will be the value of the first order autocorrelation coefficient? a) close to zero b) close to plus one c) Close to minus one d) Close to either minus one or plus one	**2**	**CO 2**
4	Which of the following could result in autocorrelated residuals? i) Slowness of response of the dependent variable to changes in the values of the independent variables ii) Over-reactions of the dependent variable to changes in the independent variables iii) Omission of relevant explanatory variables that are autocorrelated iv) Outliers in the data a) (ii) and (iv) only b) (i) and (iii) only c) (i), (ii) and (iii) only d) (i), (ii), (iii) and (iv)	**2**	**CO 3**
5	Pseudo out of sample forecasting can b\;' e used for the following reasons with the exception of a. giving the forecaster a sense of how well the model forecasts at the end of the sample. b. estimating the RMSFE. c. analyzing whether or not a time series contains a unit root. d. evaluating the relative forecasting performance of two or more forecasting	**2**	**CO 1**

	models.		
6	One reason for computing the logarithms (ln), or changes in logarithms, of economic time series is that a. numbers often get very large. b. economic variables are hardly ever negative. c. they often exhibit growth that is approximately exponential. d. natural logarithms are easier to work with than base 10 logarithms.	**2**	**CO 5**
7	The AR(p) model (a) is defined as Y$Y_t = \beta_0 + \beta_p Y_{t-p} + '$ (b) A slowly decaying pacf and an acf with 3 significant spikes (c) A slowly decaying acf and pacf (d) An acf and a pacf with 3 significant spikes	**2**	**CO 3**
8	A process, x_t, which has a constant mean and variance, and zero autocovariance for all non-zero lags is best described as (a) A white noise process (b) A covariance stationary process (c) An autocorrelated process (d) A moving average process	**2**	**CO 2**
9	Which of the following conditions must hold for the autoregressive part of an ARMA model to be stationary? (a) All roots of the characteristic equation must lie outside the unit circle (b) All roots of the characteristic equation must lie inside the unit circle (c) All roots must be smaller than unity (d) At least one of the roots must be bigger than one in absolute value.	**2**	**CO 2**
10	Which of the following statements are true concerning time-series forecasting? (i) All time-series forecasting methods are essentially extrapolative. (ii) Forecasting models are prone to perform poorly following a structural break in a series. (iii) Forecasting accuracy often declines with prediction horizon. (iv) The mean squared errors of forecasts are usually very highly correlated with the profitability of employing those forecasts in a trading strategy. (a) (i), (ii), (iii), and (iv) (b) (i), (ii) and (iii) only (c) (ii), (iii) only (d) (ii) and (iv) only	**2**	**CO 1**

SECTION-B			**(20 Marks)**
11	Fill in the Blanks <table><tr><th>Process</th><th>acf</th><th>pacf</th></tr><tr><td>White noise</td><td></td><td>No significant coefficients</td></tr><tr><td>AR(2)</td><td>Geometrically declining or damped sinusoid acf</td><td></td></tr><tr><td>MA(1)</td><td></td><td>Geometrically declining or damped sinusoid pacf</td></tr><tr><td>ARMA(2, 1)</td><td></td><td>Geometrically declining or damped sinusoid pacf</td></tr></table>	**5**	**CO 2**
12	Assume that the following data have been calculated from a regression of y on a single variable x and a constant over 22 observations $\sum x_t y_t = 830102, \quad T = 22, \quad \bar{x} = 416.5, \quad \bar{y} = 86.65,$ $\sum x_t^2 = 3919654, \quad RSS = 130.6$ Determine the appropriate values of the coefficient estimates and their standard errors.	**5**	**CO 3**
13.	Explain what stylised shapes would be expected for the autocorrelation and partial autocorrelation functions for the following stochastic processes: a) white noise b) an AR(2) c) an MA(1) d) an ARMA (2,1)	**5**	**CO 1**
14	Suppose trend component is present in your model. How would you correct the problem in the data? Explain	**5**	**CO 3**
SECTION-C **Answer all questions**		**15x2=(30 Marks)**	
15	The capital asset pricing model (CAPM) can be written as $E(R_i) = R_f + \beta_i[E(R_m) - R_f]$ ……..(1) The first step in using the CAPM is to estimate the Stock's beta using the market model. The market model can be written as $R_{it} = \alpha_i + \beta_i R_{mt} + u_{it}$ …….(2) Where R_{it} is the excess return for security *i* at time *t*, *Rmt* is the excess return on a proxy for the market portfolio at time *t*, and *ut* is an iid random disturbance term. The coefficient beta in this case is also the CAPM beta for security *i*.	**15**	**CO 3**

	Suppose that you had estimated (2) and found that the estimated value of beta for a stock, $\hat{\beta}$ was 1.147. The standard error associated with this coefficient SE ($\hat{\beta}$) is estimated to be 0.0548. A city analyst has told you that this security closely follows the market, but that it is no more risky, on average, than the market. This can be tested by the null hypotheses that the value of beta is one. The model is estimated over 62 daily observations. Test this hypothesis against a one-sided alternative that the security is more risky than the market, at the 5% level. Write down the null and alternative hypothesis. What do you conclude? Are the analyst's claims empirically verified?		
16	You have estimated the following ARMA(1,1) model for some time series data $y_t = 0.036 + 0.69y_{t-1} + 0.42u_{t-1} + u_t$ Suppose that you have data for time to $t-1$, i.e. you know that $y_{t-1} = 3.4$, and $\hat{u}_{t-1} = -1.3$ a) Obtain forecasts for the series y for times t, t +1, and t +2 using the estimated ARMA model. b) If the actual values for the series turned out to be −0.032, 0.961, 0.203 for t, t +1, t +2, calculate the (out-of-sample) mean squared error. c) A colleague suggests that a simple exponential smoothing model might be more useful for forecasting the series. The estimated value of the smoothing constant is 0.15, with the most recently available smoothed value, St−1 being 0.0305. Obtain forecasts for the series y for times t, t +1, and t +2 using this model. d) Given your answers to parts (a) to (c) of the question, determine whether Box–Jenkins or exponential smoothing models give the most accurate forecasts in this application.	**15**	**CO 5**
	SECTION-D	**1x30=(30 Marks)**	
17	If you are working for a MNC in crude oil UPSTREAM business, you are asked to give your input regarding the short-term forecast of crude oil demand in next three months. Explain how you would set up the model and what are basic techniques, which can be used to find the best model for the problem.	**30**	**CO 5**