Name: **Enrolment No:**	UPES UNIVERSITY WITH A PURPOSE

UNIVERSITY OF PETROLEUM & ENERGY STUDIES

DEHRADUN

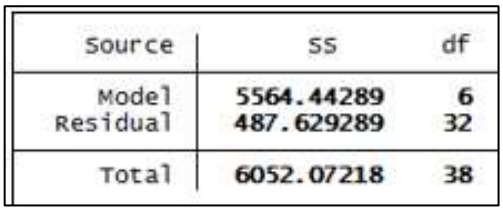
End-Semester Examination May 2019

Program/course	**: MA Economics (EE)**	**Semester**	**: II**
Subject	**: Econometrics Modeling**	**Max. Marks**	**: 100**
Code	**: ECON 7009**	**Duration**	**: 3 Hrs**
No. of page/s	**: 5**		

Section A (attempt all)

Q1. Define the following in **one** sentence.

i.	Econometrics	**[2]**	**CO1**
ii.	R^2	**[2]**	**CO1**
iii.	Dependent variable	**[2]**	**CO1**
iv.	RSS	**[2]**	**CO1**
v.	P-value	**[2]**	**CO1**
vi.	Estimator	**[2]**	**CO1**
vii.	Adjusted R^2	**[2]**	**CO1**
viii.	Conditional Mean	**[2]**	**CO1**
ix.	Degree of freedom	**[2]**	**CO1**
x.	Intercept of the model	**[2]**	**CO1**

	SECTION B **Answer any four questions**		
Q2.	Calculate F-value from the ANOVA table given below: 	**[5]**	**CO3, CO4**
Q3.	Formulate one electricity generation function, write down its functional form and econometric specification for the following variables: Q : Electricity generation C : Coal K : Capital Z : Land L : Labour	**[5]**	**CO3, CO4**
Q4.	From the regression result of crude oil production function, p-values are given below. Prepare a table as given below and state at what level independent variables are affecting crude oil production significantly.	**[5]**	**CO3, CO4**

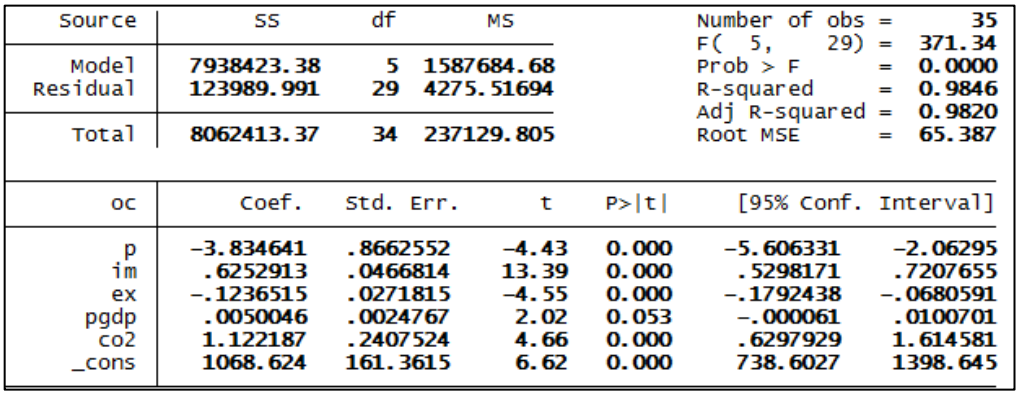
Crude Oil Production	p > |t|	Level of Sig.
Price of Crude Oil	0.001	
Per Capita GDP	0.002	
Refinery Throughputs	0.052	
Proved Reserves of Crude Oil	0.345	
Population	0.124	
Carbon Emission	0.564	

Q5.	Net Energy imports (% of energy use) (EIM) is estimated using GDP per capita (constant 2010 US$) (GDPP) as the explanatory variable and the results are given below. a) Describe what do you mean by 95% confidence interval in the above given result table.	**[5]**	**CO3, CO4**
Q6.	(i) Define degree of freedom for RSS (ii) Define Mean sum of squares	**[5]**	**CO3, CO4**
	SECTION C **Answer any two questions** 2 X 15 = 30		
Q7.	In the following multiple regression result, Gas Production – tonnes (Million tonnes oil equivalent) (GP) is estimated using factors such as: • GDP per capita (constant 2010 US$) (GP), • Domestic credit provided by financial sector (% of GDP) (DCF), • Energy imports, net (% of energy use) (EIM), • Foreign direct investment, net inflows (% of GDP) (FDIP), • Gross capital formation (annual % growth) (GCFR), and • Industry, value added (annual % growth) (IVAR).	**[15]**	**CO1, CO4**

EIM	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
GDPP	.0224264	.0010231	21.92	0.000	.0203603	.0244925
_cons	−1.444897	.8098442	−1.78	0.082	−3.08041	.190617

Source	SS	df	MS		
Model	5564.44289	6	927.407148	Number of obs =	39
Residual	487.629289	32	15.2384153	F(6, 32) =	60.86
				Prob > F =	0.0000
Total	6052.07218	38	159.265057	R-squared =	0.9194
				Adj R-squared =	0.9043
				Root MSE =	3.9036

GP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
GDPP	−.0156572	.0127679	−1.23	0.229	−.0416646	.0103502
DCF	.4852146	.1718355	2.82	0.008	.1351971	.8352321
EIM	1.44941	.3663004	3.96	0.000	.7032801	2.195539
FDIP	−.7732869	1.427769	−0.54	0.592	−3.681557	2.134983
GCFR	.0577847	.0779678	0.74	0.464	−.1010305	.2165998
IVAR	.2376649	.2601368	0.91	0.368	−.2922164	.7675462
_cons	−19.63859	4.848213	−4.05	0.000	−29.51408	−9.763103

	(i) Test the hypothesis that all the explanatory variables are impacting dependent variable individually. (ii) Test the hypothesis that all the explanatory variables are impacting dependent variable jointly.		
Q8.	Describe 10 assumptions of classical linear regression model.	**[15]**	**CO3, CO4**
Q9.	Oil consumption (oc) is estimated using- • crude oil price (p), • crude oil import (im), • crude oil export (ex), • per capita GDP (pgdp) and • carbon emission (co2). Multiple Regression Results  **(a)** Identify Explained Sum of square (ESS), residual sum of square (RSS) and show that Total sum of square (TSS)= ESS+ RSS. **(b)** Identify R^2 and interpret it. **(c)** Identify intercept of the model and interpret it.	**[15]**	**CO3, CO4**
	Section D **Answer the question** 1 X 30 = 30		

Source	SS	df	MS	Number of obs =	35
Model	7938423.38	5	1587684.68	F(5, 29) =	371.34
Residual	123989.991	29	4275.51694	Prob > F =	0.0000
				R-squared =	0.9846
Total	8062413.37	34	237129.805	Adj R-squared =	0.9820
				Root MSE =	65.387

oc	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
p	-3.834641	.8662552	-4.43	0.000	-5.606331	-2.06295
im	.6252913	.0466814	13.39	0.000	.5298171	.7207655
ex	-.1236515	.0271815	-4.55	0.000	-.1792438	-.0680591
pgdp	.0050046	.0024767	2.02	0.053	-.000061	.0100701
co2	1.122187	.2407524	4.66	0.000	.6297929	1.614581
_cons	1068.624	161.3615	6.62	0.000	738.6027	1398.645

Q10.	Write a report on the following results: In the following multiple regression result, Carbon Emission (co2) is estimated using factors such as: • oil consumption (oc), • per capita GDP (pgdp), • import of goods and services (om), and • export of goods and services (ox). **Source	SS	df	MS** **Model	1020938.61	4	255234.652** **Residual	21585.3769	29	744.323342** **Total	1042523.99	33	31591.6359** **Number of obs = 34** **F(4, 29) = 342.91** **Prob > F = 0.0000** **R-squared = 0.9793** **Adj R-squared = 0.9764** **Root MSE = 27.282** **co2	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]** **oc	.1308342	.0144843	9.03	0.000	.1012106	.1604579** **pgdp	-.0136371	.0045878	-2.97	0.006	-.0230202	-.0042539** **om	.014613	.0102785	1.42	0.166	-.0064089	.0356349** **ox	-.0092261	.0176469	-0.52	0.605	-.0453181	.0268659** **_cons	294.4371	170.1929	1.73	0.094	-53.64647	642.5206**	**[30]**	**CO1, CO3, CO4**

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Section A (attempt all)

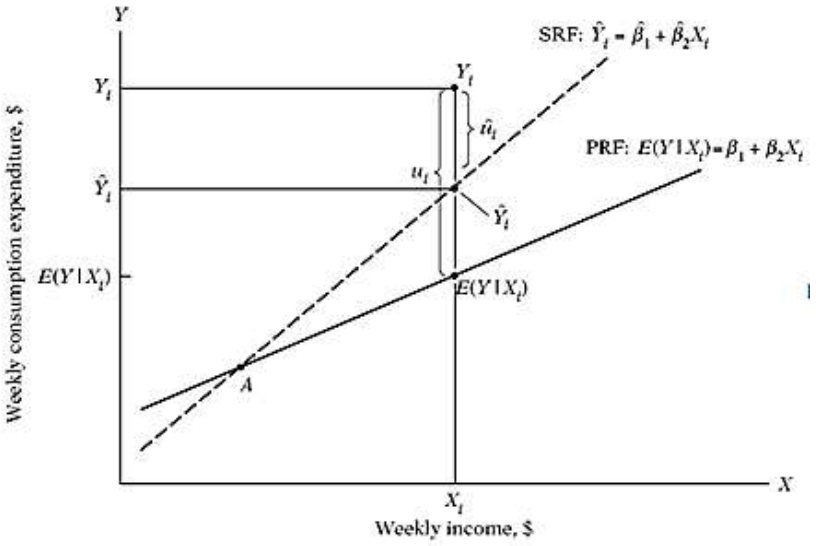
Q1. Select the correct answer

i.	Regression analysis is concerned with estimating mean value of _____ with the help of _____ . a. dependent variable, independent variable b. independent variable, dependent variable c. standard error, variance d. random error, explanatory variable	**[2]**	**CO1**
ii.	A sample regression line is simply the locus of the _____of the dependent variable for the fixed values of the explanatory variable(s) a. conditional variance b. estimated means c. conditional means d. unconditional variance	**[2]**	**CO1**

iii.	If an estimator is said to be unbiased, it is implied that a. On average, the estimated coefficient values will equal the true values b. No other unbiased estimator has a smaller variance c. The estimates will converge upon the true values as the sample size Increases d. The coefficient estimates will be as close to their true values as possible for small and large samples.	**[2]**	**CO1**
iv.	Under the least square procedure, larger the $\hat{u}_i$ (in absolute terms), the larger the_____. a. Intercept c. Residual sum of squares b. Slope coefficients d. Conditional mean	**[2]**	**CO1**
v.	$E(Y\|X_i)=f(X_i)$ is referred to as a. Conditional expectation function c. Population regression line b. Intercept line d. Linear regression line	**[2]**	**CO1**
vi.	Population regression function can be predicted with the help of _____. a. ESS c. RSS b. TSS d. SRF	**[2]**	**CO1**
vii.	The fitted regression equation is given by $\hat{Y}_i = 25 + 0.5X$. What is the value of the residual at the point X=50, Y=100?	**[2]**	**CO1**

	a. -90 c. -10 b. 10 d. 50		
viii.	When the regression line will pass through origin then $\hat{\beta}_1$ is_____. a. 0 c. Negative b. Positive d. Equal to $\hat{\beta}_2$	**[2]**	**CO1**
ix.	For sample size of 500, $\sum x_i y_i = 50$, $\sum x_i^2 = 100$. Then $\hat{\beta}_2 =$ _____ a. 0.5 c. 5 b. 0.005 d. 1.5	**[2]**	**CO1**
x.	When choosing between regression models it is preferable to choose the one with: a. The highest r^2. c. The highest r. b. The least number of independent variables. d. The most number of independent variables.	**[2]**	**CO1**
	SECTION B **Answer any four questions**		
Q2.	Match column A and B by drawing lines. **A** | **B**	**[5]**	**CO3, CO4**

		Y_i	Population Y			
		$\hat{Y}_i$	Conditional mean of Y			
			Actual Y			
		$Y_i = \hat{\beta}_1 + \hat{\beta}_2 X_i + \hat{u}_i$	PRF			
			SRF			
		$E(Y_i \mid X_i)$	Estimated Y			
		$Y_i = \beta_1 + \beta_2 X_i + u_i$	Sample Y			
Q3.	Prove that the mean value of the stochastic error term is zero.				**[5]**	**CO3, CO4**
Q4.	Formulate one crude oil demand function, write down its functional form and econometric specification for the following variables: Q_d : Amount of crude oil demand Y : Gross Domestic Product P : Price of Crude Oil				**[5]**	**CO3, CO4**
Q5.	Explain the following diagram:				**[5]**	**CO3, CO4**



Q6.	Define Econometrics with example.	**[5]**	**CO3, CO4**
	SECTION C **Answer any two questions** 2 X 15 = 30		
Q7.	Carbon intensity of 6 countries for the period from 1992 to 2011 is estimated using Energy Intensity (EI), Urbanization (UB), Growth rate (GR), and Energy Use (EU). The regression result is given below.	**[15]**	**CO3, CO4**

Source	SS	df	MS		
Model	5.13373882	4	1.2834347	Number of obs =	120
Residual	1.08372761	115	.009423718	F(4, 115) =	136.19
				Prob > F =	0.0000
Total	6.21746643	119	.052247617	R-squared =	0.8257
				Adj R-squared =	0.8196
				Root MSE =	.09708

CI	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
EI	.0291608	.0046628	6.25	0.000	.0199246	.0383969
UB	.0121599	.0106409	1.14	0.256	-.0089177	.0332374
GR	-.001982	.0026222	-0.76	0.451	-.0071762	.0032121
EU	-.0002326	.0000262	-8.87	0.000	-.0002845	-.0001807
_cons	2.746853	.2916009	9.42	0.000	2.169248	3.324458

a. Identify dependent and independent variables.
b. Identify intercept, partial slope coefficients and interpret them.
c. Interpret result of R-Squared.

Q8.	The Revenue Received (RR) of Delhi electricity DISCOMs is estimated using AT&C loss reduction achieved (%) (ATCLRA), Capital Investment during Transfer Payment Scheme in Rs Cr (CI), Power Purchase Cost in Rs Cr (PPC), Employee Expenses in	**[15]**	**CO1, CO4**

	Rs Cr (EE), A & G Expenses in Rs Cr (AGE), and R & M Expenses in Rs Cr (RME). The regression result is given below. **Source | SS df MS** — **Number of obs = 33; F(6, 26) = 37.62; Prob > F = 0.0000; R-squared = 0.8967; Adj R-squared = 0.8729; Root MSE = 220.91** **Model 11015680.3 6 1835946.72** **Residual 1268807.56 26 48800.2907** **Total 12284487.9 32 383890.246** **RR | Coef. Std. Err. t P>|t| [95% Conf. Interval]** **ATCLRA .0305901 3.625167 0.01 0.993 −7.421048 7.482228** **CI .3687213 .3814026 0.97 0.343 −.4152629 1.152706** **PPC .6268125 .1188288 5.27 0.000 .3825563 .8710686** **EE .1468235 1.951242 0.08 0.941 −3.864011 4.157658** **AGE 8.474875 4.019356 2.11 0.045 .2129709 16.73678** **RME 3.469532 4.341705 0.80 0.431 −5.454971 12.39403** **_cons 213.0803 245.5182 0.87 0.393 −291.5896 717.7502** a. Formulate null and alternative hypothesis for each individual explanatory variables and test hypotheses using confidence interval approach. b. Using the given results prove that RSS=TSS-ESS.		
Q9.	In the following multiple regression result, Carbon Emission in kilo tones (co2) is estimated using factors such as oil consumption in tones (oc), per capita GDP in constant 2010 US$ (pgdp), import of goods and services in constant 2010 US$ (om), and export of goods and services in constant 2010 US$ (ox). **Source | SS df MS** — **Number of obs = 34; F(4, 29) = 342.91; Prob > F = 0.0000; R-squared = 0.9793; Adj R-squared = 0.9764; Root MSE = 27.282** **Model 1020938.61 4 255234.652** **Residual 21585.3769 29 744.323342** **Total 1042523.99 33 31591.6359** **co2 | Coef. Std. Err. t P>|t| [95% Conf. Interval]** **oc .1308342 .0144843 9.03 0.000 .1012106 .1604579** **pgdp −.0136371 .0045878 −2.97 0.006 −.0230202 −.0042539** **om .014613 .0102785 1.42 0.166 −.0064089 .0356349** **ox −.0092261 .0176469 −0.52 0.605 −.0453181 .0268659** **_cons 294.4371 170.1929 1.73 0.094 −53.64647 642.5206** Answer the following questions using the given results: **a.** Identify numerator and denominator degree of freedom and calculate F-value. **b.** Using individual and joint hypothesis testing find out relationship between co2 and its determinants and interpret coefficients of oc, pgdp, om and ox.	**[15]**	**CO3, CO4**
	Section D		

	Answer the question 1 X 30 = 30		
Q10.	Explain the following 8 steps of econometrics methodology with formulating Crude Oil Production function using following variables: Crude Oil Production (Q), Capital (K), Labour (L) and Land (A) <u>Steps of Econometrics Methodology</u> Step 1: Statement of theory or hypothesis Step 2: Specification of the mathematical model of the theory Step 3: Specification of the statistical, or econometric, model Step 4: Collecting the data Step 5: Estimation of the parameters of the econometric model Step 6: Hypothesis testing Step 7: Forecasting or prediction Step 8: Using the model for control or policy purposes.	**[30]**	**CO1, CO3, CO4**