Name_____	ID_____

BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
SECOND SEMESTER 2022-2023
Comprehensive Examination - Part-A & B (Closed Book)

Course No.	: ECON F241	Maximum Marks	: 45
Course Title	: Econometric Methods	Duration (Max)	: 90 Minutes
Date	: 15/May/2023		

Instructions: *Write your **Name** and **ID Number** clearly in the answer sheet; There are two parts, Part-A & B. Part A carries a total of 21 MCQs and carries 1 mark each without negative marking; Use the space to provide the correct option; Use of pencil is not allowed; Part B carries 4 short answer questions; Use the given space to answer; Answer written over other space will not be evaluated; Calculator is allowed; however, exchange of calculator is not permitted.*

PART-A - MCQs										
Question	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**
Answer											
Question	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	
Answer											

Part A - Multiple Choice Questions (1 Mark Each)

Q1: Heteroscedasticity is more common in
    a) Time-series data   b) Cross-sectional data   c) Panel data   d) Meta Data

Q2: Which action does not make sense to take in order to struggle against multicollinearity?
    a) Add more regressors in the model   b) Increase more observations
    c) Decrease the number of regressors in the model   d) None of these

Q3: Heteroscedasticity can be detected by plotting the estimated $\hat{u}^2$ against
    a) X_i b) Y_i c) Both $\hat{Y}_i$ and X_i d) $\hat{Y}_i$

Q4: Which of the following is NOT an assumption of regression?
    a) Linearity   b) Homoscedasticity   c) Independence of errors   d) Multicollinearity

Q5: When is the problem of dummy variable trap occur?
a) When we take dummy variables more than categories   b) When we take dummy variables less than categories
c) When we take dummy variables equal to the number of categories   d) Both A and C

Q6: The assumption that the error terms in a regression model follow the normal distribution with zero mean and constant variance is required for
    a) Point estimation of the parameters   b) Hypothesis testing and inference
    c) Estimation of the regression model using OLS method   d) Both a and b

Q7: Comparing two models based on goodness of fit
    a) The sample size must be the same   b) The dependent variable must be the same
    c) The independent variables must be the same   d) Both a and b above

Q8: Reordering of observations with respect to the explanatory variable is the first step in conducting the following heteroscedasticity test
    a) Goldfield-Quandt test   b) Breuseh-Pagan-Godfrey test
    c) Whites general heteroscedasticity test   d) Spearman's rank correlation test

Q9: The reliability of a point estimation is measured by its
    a) Standard deviation   b) Standard normal curve   c) Standard error   d) Coefficient of determination

Q10: Which one of the following is not an example of mis-specification of functional form
    a) Using a linear specification when a double logarithmic model would be more appropriate
    b) Modelling Y as a function of X when in fact, it is scaled as a function of X^2
    c) Modelling Y as a function of X when in fact, it scales as a function of $1/X$
    d) Excluding a relevant variable from a linear regression model

Q11: The regression coefficient estimated in the presence of autocorrelation in the sample data is NOT
    a) Unbiased estimators   b) Consistent estimators   c) Efficient estimators   d) Linear estimators

Q12: In the Log-Linear regression model, the slope coefficient gives
   a) The relative change in Y for an absolute change in X
   b) The percentage change in Y for a given percentage change in X
   c) The absolute change in Y for a percent change in X
   d) By how many units Y change for a unit change in X

Q13: If we multiply Y by 1000 and re-estimate the regression, the intercept coefficient and its standard error will
   a) Increase by 1000 times   b) Decrease by 1000 times
   c) Remain same   d) Increase by (1/1000) times

Q14: The choice of function form in a regression model depends on
   a) Only the underlying theory   b) Only the rate of change of Y with respect to Y
   c) Whether the coefficients of the model chosen satisfy certain a priori expectations   d) All of these

Q15: The statement that -There can be more than one SRF representing a population regression function is
   a) Always true   b) Always false   c) Sometimes true, sometimes false   d)Nonsense statement

Q16: If the coefficient of determination is a positive value, then the regression equation
   a) must have a positive slope   b) must have a negative slope
   c) could have either a positive or a negative slope   d) must have a positive Y intercept

Q17: Multicollinearity is limited to
   a) Cross-section   b) Time-series   c) Pooled data   d) All of these

Q18: If the total sum of squares of a regression equation is 92 and the explained sum of squares is 40, what would be the value of the coefficient of determination?
   a) 25   b) 0.31   c) 0.43   d) 0.25

Q19: Dropping a variable from a model may lead to what is called :
   a) Specification error   b) Sampling error   c) Measurement error   d) Standard error

Q20: If the variance of grades in this course is 16, each student should (unconditionally) expect their grade to deviate from the class average by:
   a) 32 points   b) 16 points   c) 8 points   d) 4 points

Q21: Negative residual autocorrelation is indicated by which one of the following
   a) Residuals that are close to zero   b) A complete randomness in the residuals
   c) An alternating pattern in the residuals   d) None of these

Part B - Short Answer Type Questions

Q22: '*Durbin's h-test is used to detect the problem of autocorrelation with a special type of regression equation*' What is that regression? Write down the test statistic with an explanation of each term used in the statistic and procedure to arrive at the final calculated value of the statistic.   **[4M]**

Q23: For the linear regression model $(Y_i = \alpha + \beta X_i + U_i)$, the error term is heteroscedastic $\left[Var(U_i) = \sigma_i^2\right]$. Given that the nature of heteroscedasticity is known to us, write down the steps to solve the heteroscedasticity problem using the WLS method. **Note**: Depiction of solution with the help of a transformed regression model and the calculation of new variance is necessary. **[4M]**

Q24: The estimation of the multiple regression model $(Y_t = \alpha + \beta_1 X_{1t} + \beta_2 X_{2t} + \beta_3 X_{3t} + U_t)$ provides the following data for the residual series. Test the hypothesis of No Autocorrelation, given that the disturbance term follows first-order autocorrelation scheme. Values of d_L and d_u at $n=20$ and $K=3$ are 1 and 1.68, respectively. **[8M]**

Space for Answer

Year	e_t				
1	2				
2	-1				
3	4				
4	8				
5	-3				
6	10				
7	-11				
8	6				
9	-3				
10	1				
11	10				
12	-4				
13	-2				
14	0				
15	3				
16	1				
17	-4				
18	8				
19	-12				
20	-13				
Total	**0**				

Q25: What is the impact of taking imprecisely measured independent variable on the right-hand side of the regression equation estimated using the OLS method? Show with the help of suitable example based on classroom discussion. **[8M]**

Birla Institute of Technology & Science, Pilani, Pilani Campus – Rajasthan
Comprehensive Exam (Open Book) ECON F241 [Econometric Methods]
Part C – Long Answer Type Questions

Maximum Marks: 45   **Time Duration**: 90 Minutes
Session 2022-23 (II)   **Dated**: 15/May/2023
Instructions:
Read the questions thoroughly before answering. All questions are compulsory. Please start each question on a new page; In the case of numerical, calculation(s) to arrive at the result(s) and its Interpretation is necessary to get marks; A calculator is allowed. However, the exchange of calculator is not permitted; Make sure you correctly mention your Name, ID, Course, and other details on your answer sheet.

Q1: A researcher has estimated a regression equation using time series data and reported the results in her report. She has not written the value of the coefficient of correlation but provides the following data:

e_t: -1.8   0.8   0.6   -0.2   -1.6   1.3   0.3

Obtain the coefficient of autocorrelation and interpret the result.   **[5M]**

Q2: Given the following data, test the heteroscedasticity problem with the help of the Goldfeld-Quandt test.

X	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Y	2	2	2	1	3	5	8	11	12	10	10	12	15	10	11

[**Note**: The tabulated value to compare is 6.39].   **[10M]**

Q3: Given the following information, test the existence of the problem of multicollinearity with the Farrar-Glauber test. [**Note**: The tabulated value to compare is 15.50]

$$\sum x_1 x_2 = 74; \sum x_2 x_3 = 40; \sum x_1 x_3 = 56; \sum x_1^2 = 81;$$
$$\sum x_2^2 = 121; \sum x_3^2 = 49; n = 10; \sum y_i^2 = 102$$

[15M]

Q4: Given the following structural model from the theory of price determination. The model is mathematically complete because it contains three endogenous variables (D, S, and P), three equations, and two exogenous variables (Y and W). The model is also exactly identified.

$$D = a_0 + a_1 P + a_2 Y + u_1$$
$$S = b_0 + b_1 P + b_2 W + u_2$$
$$D = S$$

D is the quantity demanded, S is the quantity supplied, P is the price, Y is income, and W is the weather conditions. Further, to estimate the above structural model, the following information is given:

D	11	16	11	14	13	17	14	15	12	18
P	20	18	22	21	27	26	25	27	30	28
Y	8.1	8.4	8.5	8.5	8.8	9	8.9	9.4	9.5	9.9
W	42	58	35	46	41	56	48	50	39	52

Calculations in deviation form:
$$\sum d^2 = 52.90; \sum p^2 = 138.4; \sum y^2 = 2.84; \sum w^2 = 506.10$$
$$\sum dy = 6.30; \sum dp = 15.60; \sum dw = 145.3; \sum py = 17.20; \sum pw = -35.8; \sum wy = 6.90$$
$$\bar{D} = 14.1; \bar{P} = 24.4; \bar{Y} = 8.9; \bar{W} = 46.7$$

Estimate the coefficients of the structural model using the Indirect Least Square (ILS) method.

[15M]

*****All the Best******