ECONOMETRIC METHODS COMPREHENSIVE EXAMINATION
COURSE CODE: ECON F241
SEMESTER II 2022-2023

Time: 2.00 pm-5.00 pm **TOTAL MARKS: 40**

Attempt all questions in serial order (**Paper is printed on both sides**)

Section A (3 marks x 7questions=21 marks)

1. A dummy variable that is incorporated into a regression model to capture shift in the intercept as the result of some qualitative factor is called an intercept dummy variable. TRUE /FALSE? Explain with the help of a regression model and illustrate graphically.

2. Consider the model
   $Y_i = \beta_1 + \beta_2 X_{2i} + \beta_3 X_{3i} + \mu_i$
   Suppose heteroscedasticity takes the following form: $\sigma_i^2 = \sigma^2 Z_i^2$. How would you transform the model to remove heteroscedasticity. Verify that the transformed model is free from the problem of heteroscedasticity.

3. Suppose the disturbance term of a linear regression model is autocorrelated and the value of autocorrelation coefficient is known. How would you estimate such a model? Illustrate algebraically.

4. Consider the following structural model.
   $$X_t = \alpha + \beta Y_t + \varepsilon_t$$
   $$Y_t = X_t + Z_t$$
   i) Write the reduced form equations and highlight the reduced form coefficients.
   ii) If the slope coefficient of X on Z is 0.55 and the slope coefficient of Y on Z is 0.80, compute the value of the structural parameter β in the given simultaneous equation model.

5. Random walk model without drift is a non-stationary stochastic process. True/False. Verify your answer algebraically.

6. White's Test of heteroskedasticity requires prior knowledge about the pattern of heteroskedasticity. True/Flase. Explain your answer.

7. Consider the following autocorrelation relationship: $\varepsilon_t = \rho\varepsilon_{t-1} + \mu_t$, where $|\rho| < 1$. Show that under the first-order autoregressive scheme, the effect of past disturbances wears off gradually.

Section B (6+6+7=19 marks)

8. The OLS estimators are inefficient under heteroscedasticity. True/False. Prove your claim.

9. Consider the following structural model:

   $y_1 = 3y_2 + 2x_1 + x_2 + \mu_1$
   $y_2 = y_3 + x_3 + \mu_2$
   $y_3 = y_1 - y_2 - 2x_3 + u_3$

Where the y's are the endogenous variables and x's are the predetermined variables. Determine the identification status of each equation using both the order condition and rank condition.

10. For the regression model of child labour on school dropout rate, poverty, and per capita the following residuals were generated. Assume any two successive values of disturbance term are correlated and follow AR(1) process. **Compute the value of ρ and Durbin-Watson statistic**. Is it possible to arrive at any conclusion regarding presence of autocorrelation in terms of Durbin-Watson statistic? **Clearly write the hypotheses, the computed value, the critical value and decision.**

Residuals
3.775286
-1.31192
-2.33626
1.144118
-0.14923
-0.68394
0.092488
-0.9267
1.741649
-2.45301
-0.69395
0.590164
1.317119
-0.79023
1.792473
-1.32638
0.433258
-0.66542
0.450483

Table A.11 Durbin-Watson d statistic: 5% Significance Points of d_L and d_U

No. of obs. (n)	The number of regressors excluding the intercept (k)									
	1		2		3		4		5	
↓	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U	d_L	d_U
6	0.610	1.400	–	–	–	–	–	–	–	–
7	0.700	1.356	0.467	1.896	–	–	–	–	–	–
8	0.763	1.332	0.559	1.777	0.367	2.287	–	–	–	–
9	0.824	1.320	0.629	1.699	0.455	2.128	0.296	2.588	–	–
10	0.879	1.320	0.697	1.641	0.525	2.016	0.376	2.414	0.243	2.822
11	0.927	1.324	0.758	1.604	0.595	1.928	0.444	2.283	0.315	2.645
12	0.971	1.331	0.812	1.579	0.658	1.864	0.512	2.177	0.380	2.506
13	1.010	1.340	0.861	1.562	0.715	1.816	0.574	2.094	0.444	2.390
14	1.045	1.350	0.905	1.551	0.767	1.779	0.632	2.030	0.505	2.296
15	1.077	1.361	0.946	1.543	0.814	1.750	0.685	1.977	0.562	2.220
16	1.106	1.371	0.982	1.539	0.857	1.728	0.734	1.935	0.615	2.157
17	1.133	1.381	1.015	1.536	0.897	1.710	0.779	1.900	0.664	2.104
18	1.158	1.391	1.046	1.535	0.933	1.696	0.820	1.872	0.710	2.060
19	1.180	1.401	1.074	1.536	0.967	1.685	0.859	1.848	0.752	2.023
20	1.201	1.411	1.100	1.537	0.998	1.676	0.894	1.828	0.792	1.991
21	1.221	1.420	1.125	1.538	1.026	1.669	0.927	1.812	0.829	1.964
22	1.239	1.429	1.147	1.541	1.053	1.664	0.958	1.797	0.863	1.940