THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

MAIN EXAMINATION

FACULTY OF ARTS & SOCIAL SCIENCES
DEPARTMENT OF ECONOMICS

SEPTEMBER/DECEMBER 2020 SEMESTER
REGULAR PROGRAMME
UNIT CODE: ECN 409
TITLE: BASIC ECONOMETRICS II

Date: DECEMBER 2020	Duration: HOURS
INSTRUCTIONS: Answer Question ONE and any other TWO Questions	

Q1.

a. Explain the rationale of inclusion of a disturbance term in a regression model. (4 Marks)

b. Given the general regression model $Y = X\beta + \varepsilon$ where Y and ε are nx1 vectors β is a (k+1)x1 vector and X is a nx(k+1) matrix:

Where, $Y = \begin{bmatrix} 14 \\ 64 \\ 55 \\ 98 \\ 95 \end{bmatrix}$ and $X = \begin{bmatrix} 1 & 24 & 6 \\ 1 & 33 & 18 \\ 1 & 65 & 13 \\ 1 & 72 & 25 \\ 1 & 10 & 18 \end{bmatrix}$

Obtain the fitted regression model $\hat{\beta} = (X^{I}X)^{-I}X^{I}Y$ (8 Marks)

c. Identify each of the equation in the following system of equations using the Order condition.

$Y_1 = 3X_1 + 4X_2 - 2Y_2$
$Y_2 = Y_1 + 3X_2$
$Y_3 = Y_2 + 2X_2 - 3X_3 + X_1$

(6 Marks)

d. Given the following model:

$Y = a + \beta X + \varepsilon$

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Where, Y=1, 0 and X is a quantitative variable. Discuss and proof the limitations of estimating this model using OLS
(4 Marks)
e. Discuss 5 properties of time series data. (4 Marks)
f. Define the two basic approaches of modelling unobserved effects in panel data. What are the different assumptions that are made in the 2 settings? (4 Marks)

Q2.
a. Given the model $Y = X\beta + \varepsilon$ where Y and ε are nx1 vectors β is a (k+1)x1 vector and X is a nx(k+1) matrix:
   i. Derive the least squares estimators $\hat{\beta} = (X^I X)^{-I} X^I Y$ (6 Marks)
   ii. Determine the mean of $\hat{\beta}$ that is $E(\hat{\beta})$ (4 Marks)
   iii. Compute the variance of $\hat{\beta}$ that is $Var(\hat{\beta})$ (6 Marks)
   iv. Explain what you understand by the concept of a good estimator and state the desirable properties of a good estimator $\hat{\beta}$ (4 Marks)

Q3.
a. MA(1) Process can be expressed as follows:
$$y_t = \mu + \varepsilon_t + \theta \varepsilon_{t-1}$$
   Calculate:
   i. the mean of y_t that is $E(y_t)$ (3 Marks)
   ii. the Variance of y_t that is $Var(y_t)$ (4 Marks)
   iii. Autocorrelation function (ACF) (3 Marks)
b. Explain the importance of hypothesis testing in an econometric analysis and highlight the circumstances under which a researcher would use a *t* test other than *Z* test. (5 Marks)
c. Use the matrix method to demonstrate the OLS assumption of error term being Homoscedastic. (5 Marks)

Q4.
a. Explain the main steps involved in empirical Econometric study. (6 Marks)
b. Consider the simple Keynesian model of income Determination.
$C_t = \beta_0 + \beta_1 Y_t + \mu_t$ $0<\beta_1< 1$

$Y_t = C_t + I_t$
   i. Define and prove the simultaneous equation bias. (6 Marks)
   ii. Discuss the requirements of a logistic regression. (5 Marks)
   iii. Explain the meaning of spurious regression. (3 Marks)

Q5.
a. Discuss the steps used in estimating panel data models using fixed effects model. (3 Marks)
b. Highlight the properties of the error term in a random effects model. (3 Marks)

c. The annual sales revenue (in sh'000) for a product is a function of the gender of sales person and annual advertising expenditure (in sh'00) are summarized in the table below:

Annual Sales Revenue	Gender of Salesperson	Advertisement Expenditure
20	Female	28
23	Male	23
25	Male	38
27	Female	16
21	Male	20
29	Female	28
22	Female	23
24	Female	30
27	Male	26
35	Male	32
24	Male	18
32	Female	26
19	Male	12
42	Male	38
25	Female	21
31	Male	10

Where, Female =1, 0 otherwise.

i. Find the regression equation of annual sales on gender and advertising expenditure. (8 Marks)

ii. Determine the standard error of the regression coefficients. (6 Marks)

END