21c

(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

MAIN EXAMINATION

UNIVERSITY EXAMINATIONS 2021/2022 ACADEMIC YEAR

FOURTH YEAR SECOND SEMESTER EXAMINATIONS

FOR THE DEGREE OF BACHELOR OF SCIENCE IN ECONOMICS

COURSE CODE: **ECO 413**

COURSE TITLE: **ECONOMETRICS**

DATE: TUESDAY, 26-04-2022 **TIME: 12:00-14:00**

INSTRUCTIONS TO CANDIDATES

ATTEMPT QUESTION **ONE** AND ANY OTHER **THREE**

TIME: 2 Hours

MMUST observes ZERO tolerance to examination cheating

This Paper Consists of 4 Printed Pages. Please Turn Over.

QUESTION ONE (COMPULSORY)

a).State five assumptions of classical regression model and give an intuitive explanation of the meaning and need of each of them. **[5 Marks]**

b).Given the linear model:

$\underline{Y} = X\underline{\beta} + \underline{\varepsilon}$

$\underline{\varepsilon} \sim N(0, \sigma^2 I_n)$, where $\underline{Y}$ is an (nx1) vector of observations, X is an (nxm) matrix of known constants, rank(X)=m<n and $\underline{\beta}$ is an (mx1) vector of unknown constants.

i).Derive the ordinary least squares estimate of $\underline{\beta}$ [6 marks]

ii) Show that the estimate obtained above is unbiased. [2 marks]

iii).How can you determine the adequacy (goodness) of the fitted model [2 marks]

c).Differentiate between panel data and cross-sectional data [4 marks]

d). The data in Table 1.1 are the estimated cost of power plant which depends on the capacity (megawatts) and years of operation,

Table 1.1

Plant	Estimated Cost in millions(Y)	Capacity in megawards (X_1)	Years of operation (X_2)
A	14	24	6
B	64	33	18
C	65	65	13
D	98	72	25
E	95	110	18

With the knowledge of BLUE property of linear regression estimates interpret the model as appropriate. [11 marks]

QUESTION TWO

Given the demand and supply model

Demand model $d_t = \alpha_1 + \beta_1 P_t + \varepsilon_{1t}$

Supply model $s_t = \alpha_2 + \beta_2 P_t + \varepsilon_{2t}$

i) Determine whether the demand/ supply equation is exactly identified/ over identified or under identified. [6 marks]

ii) Find the reduced form of the equation [6 marks]

iii) Derive the formula of the structural parameters for the exactly identified equations [4 marks]

iv) Explain Gauss- Mark Theory [4 marks]

QUESTION THREE

a) Define the following terms;

i) Dummy variable [2 Marks]

ii) Dummy variable trap [2 Marks]

iii) Differential intercept [2 Marks]

iv) Differential slope coefficient [2 Marks]

i).Define the term simultaneous equations and distinguish between structural and reduced form equations. [3 Marks]

ii).Consider the following Keynesian model of income determination:

$$Y_t = C_t + I_t + G_t$$
$$C_t = \beta_0 + \beta_1 Y_t - \beta_2 T_t + \varepsilon_{1t}$$
$$I_t = \alpha_0 + \alpha_1 Y_{t-1} - \alpha_2 R_t + \varepsilon_{2t}$$

Where Y=income, C=consumption expenditure, I= investment expenditure, G=government expenditure

Obtain the reduced form equations for this model and identify the simultaneous equation model. [11 Marks]

QUESTION FOUR

a)The following data refers to two variables- status in society and income (Ksh.) collected in the context of an income distribution study.

Status	Poor	Rich	Poor	Rich	Rich	Poor	Rich
Sales	12	14	13	5	15	7	4

i. Fit a logit regression line showing how income affects societal status assuming poor is coded 0 and rich 1. [8 Marks]

ii. Compute the probability when income increases to 21 and interpret your findings. [6 Marks]

b).Data on a three variable problem yield the following results;

$$X^I X = \begin{bmatrix} 33 & 0 & 0 \\ 0 & 40 & 20 \\ 0 & 20 & 60 \end{bmatrix};..X^I Y = \begin{bmatrix} 132 \\ 24 \\ 92 \end{bmatrix}$$

c) Find the estimate of the regression parameters and hence determine the regression equation [6 marks]

QUESTION FIVE

The table below shows the quantity supplied (Y) of a commodity at various prices (X), holding all other factors constant.

N	1	2	3	4	5	6	7	8
Y	12	14	10	13	17	12	11	15
X	5	11	7	8	11	7	6	9

Suppose that you need to fit the simple regression model:

$$Y_i = \beta_0 + \beta_1 X_i + \varepsilon_i$$

Where $E(\varepsilon_i)$ =0, $E(\varepsilon_i, \varepsilon_j = o)$ for $i \neq j$ and var (ε_i)=σ^2.

Using matrix algebra;

a) Find the least square estimator of $\widehat{\boldsymbol{\beta}}$. [6 marks]
b) Find the fitted value for each observation. [4 marks]
c) Find the variance estimate $\hat{\sigma}^2$ [4 marks] [4 marks]
d) Find the variance-covariance matrix of $\widehat{\boldsymbol{\beta}}$. [2 marks]
e) Find the standard error for $\widehat{\boldsymbol{\beta}}$. [2 marks]
f) Test the overall significance of the regression model. [2 marks]