MAASAI MARA UNIVERSITY

REGULAR UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR
FIRST YEAR FIRST SEMESTER

SCHOOL OF BUSINESS AND ECONOMICS
MSc. ECONOMICS/ MSc. AGRICULTURAL ECONOMICS

COURSE CODE: ECO 8103

COURSE TITLE: MATHEMATICS FOR ECONOMISTS

DATE: 3RD FEBRUARY 2023 **TIME: 1430-1730HRS**

INSTRUCTIONS TO CANDIDATES

1. Answer **QUESTION ONE AND ANY FOUR** questions
2. This paper consists of **THREE** printed pages. Please turn over.

QUESTION ONE (20 MARKS)

a) Let the IS equation be:

$$\boldsymbol{Y = \frac{A}{1-b} - \frac{g}{1-b}i}$$

Where **(1-b)** is the marginal propensity to save, g is the investment sensitivity to interest rates, $\boldsymbol{A}$ is an eggregate of exogenous variables.

Let the LM equation be:

$$\boldsymbol{Y = \frac{M_0}{k} + \frac{l}{k}i}$$

Where $\boldsymbol{k}$ and $\boldsymbol{l}$ are income and interest sensitivity of money demand, respectively, and $\boldsymbol{M_0}$ is real money balances.

If ***b=0.8, g=100, A=254, k=0.25, l=400 and*** $\boldsymbol{M_0=190}$

i) Write the IS-LM system in matrix form **(1 mark)**

ii) Solve for Y and *i* by matrix inversion **(5 Marks)**

b) Explain the economic meaning of the Hawkins-Simon Condition.

(3 marks)

c) Solve the integrals **(6 Marks)**

i) $\boldsymbol{\int_3^{10} \frac{1}{4} x^8 dx}$

ii) $\boldsymbol{\int \frac{2}{x^4} dx}$

f) Explain matrix inverse and the five properties of matrix inverses.

(5 marks)

QUESTION TWO (20 MARKS)

a) The demand and supply functions of a two commodity-market model are as follows:

$$\boldsymbol{Qd_1 = 180 - 3P_1 + 2P_2}$$

$$\boldsymbol{Qs_1 = -2 + 54P_1}$$

$$\boldsymbol{Qd_2 = 122 + P_1 - 2P_2}$$

$$\boldsymbol{Qs_2 = -72 + 7P_2}$$

Find the market clearing values for both markets using fractions rather than decimals **(5 marks)**

b) Find the solution of the equation system using Cramer's Rule: **(6 marks)**

$$77X_1 - X_2 - X_3 = 0$$

$$10.5X_1 - 2X_2 + X_3 = 8$$

$$6.8X_1 + 3X_2 - 2X_3 = 7$$

c) Discuss the charateristics of matrix determinants **(5 marks)**

d) Find Y* and C* from the following: **(4 Marks)**

$$Y = C + I_0 + G_0$$

$$C = 25 + 6Y^{\frac{1}{3}}$$

$$I_0 = 18$$

$$G_0 = 48$$

QUESTION THREE (20 MARKS)

a) Consider a game where, for a fixed amount of money paid in advance, you can throw a die and collect KES 1500, if an odd number shows up, or KES 2500 if the number is even.

i. By use of diagrams explain the player's possible attitudes towards risk. **(4 marks)**

ii. Calculate the expected value of the payoff **(2 Marks)**

b) Discuss **five** rules of logarithms **(10 marks)**

c) Discuss the limitations of dynamic analysis **(4 marks)**

QUESTION FOUR (20 MARKS)

a) Given the input matrix and the final demand vector; find the solution output levels. **(10 Marks)**

$$A = \begin{bmatrix} 0.06 & 0.25 & 0.34 \\ 0.33 & 0.40 & 0.12 \\ 0.19 & 0.38 & 0.89 \end{bmatrix} \quad d = \begin{bmatrix} 1800 \\ 200 \\ 900 \end{bmatrix}$$

b) The demand curves of a price discriminating monopolist are defined by the following functions in two markets:

$$Q_1 = 17.5 - \frac{1}{4}P_1$$

$$Q_2 = 85 - 3P_2$$

If the monopolist's Total Cost Function is given as:

TC=70+9Q

i. Determine the selling prices and quantities of Q in the two markets. **(5marks)**

ii. What is the firm'sprofit? **(5 Marks)**

QUESTION FIVE (20 MARKS)

a) A farm faces the production function $Q = 18K^{0.4}L^{06}$. It can buy inputs K and L for KES 600 and KES 450 respectively. The firm's output is constrained at Q=77,000. Find the Least Cost Combination of K and L. **(6 Marks)**

b) Assume that the rate of investment is described by the function $I(t) = 12t^{4/3}$ and that $K(0) = 25$:

i. Find the time path of capital stock K. **(3 marks)**

ii. Find the amount of capital accumulation during the time intervals (0,1) and (1,3) respectively. **(3 marks)**

c) Highlight any three premises of the Solow Growth model. **(3 Marks)**

d) Discuss the rules of differentiation **(5 marks)**

QUESTION SIX (20 MARKS)

a) Discuss the assumptions and the solution of the Domar Growth Model **(9 marks)**

b) London Distillers Ltd are in possession of a particular consignment of wine, which they can either sell at the present time (*t=o)* at a sum of KES *K,* or else store for some length of time and sell at a higher value. The growing value (*V*) of the wine takes the following function of time;

$$V = Ke^{\sqrt{t}}$$

Assuming that the interest rate on the continous-compounding basis is *r*, where the present value of V can be expressed as; $(\boldsymbol{A}(\boldsymbol{t}) = \boldsymbol{V}\boldsymbol{e}^{-\boldsymbol{r}\boldsymbol{t}})$.

i. Find the value of V at $t=0$ **(1 mark)**

ii. What is the optimum storage time for KWAL Distillers? **(6 marks)**

iii. Assuming that $r=0.675$, then what is the number of years that KWAL Distillers will store the wine to maximize on V? **(4 Marks)**

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