NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF MANAGEMENT SCIENCES

DEPARTMENT OF ACCOUNTING, ECONOMICS AND FINANCE

QUALIFICATION: BACHELOR OF ECONOMICS	
QUALIFICATION CODE: 12BECO	**LEVEL:** 7
COURSE CODE: MEC712S	**COURSE NAME**: MATHEMATICAL ECONOMICS
SESSION: JANUARY 2024	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS:** 100

SECOND OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER(S)	**MR EDEN TATE SHIPANGA**
MODERATOR:	**DR R. KAMATI**

INSTRUCTIONS
4. Answer ALL the questions. 5. Write clearly and neatly. 6. Number the answers clearly.

PERMISSIBLE MATERIALS

4. PEN,
5. PENCIL
6. CALCULATOR

THIS QUESTION PAPER CONSISTS OF 2 PAGES (Including this front page)

Question 1 [25 Marks]

Consider the following simple one commodity market model:

$Q = b - aP$ (a, b > 0) [demand]

$Q = -d + cP$ (c, d > 0) [supply]

1. Find the Equilibrium Price P* and Quantity Q*? **(10)**
2. Use partial derivative to find the effect of the parameters (a, b, c and d) on the equilibrium quantity? **(15)**

Question 2 [25 Marks]

Consider the following microeconomic model.

$$Q_d = D(P, Y_0) \qquad [D_P < 0; \quad D_{Y_0} > 0]$$

$$Q_s = D(P, T_0) \qquad [S_P > 0; \quad S_{T_0} < 0]$$

Where Y_0 is income and T_0 is the tax on the commodity.

Analyse the comparative statics of the model to find the effect of change in Income and Tax on the equilibrium Q and P? **(25)**

Question 3 [25 Marks]

Give the input matrix and the final demand vector

$$A = \begin{bmatrix} 0.05 & 0.25 & 0.34 \\ 0.33 & 0.10 & 0.12 \\ 0.19 & 0.38 & 0 \end{bmatrix} \qquad d = \begin{bmatrix} 1800 \\ 200 \\ 900 \end{bmatrix}$$

(a) Explain the economic meaning of the elements 0.33, 0 and 200 **(9)**

(b) Explain the economic meaning (if any) of the third column sum **(3)**

(c) Find the solution output levels by Cramer's rule **(13)**

Question 4 [25 Marks]

1. Optimise the following function, a) find the critical value for the first order condition and b) the high-order Hessian:
   $y = 4x_1^2 - 7x_1 - x_1x_2 + 8x_2^2 - 5x_2 + 2x_2x_3 + 4x_3^2 + 2x_3 - 4x_1x_3$ **(15)**
2. Use discriminants to determine whether each of the following quadratic function is positive or negative definite:
   $y = 5x_1^2 - 6x_1x_2 + 3x_2^2 - 2x_2x_3 + 8x_3^2 - 3x_1x_3$ **(10)**

TOTAL MARKS: 100