



**PAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

FACULTY OF MANAGEMENT SCIENCES

DEPARTMENT OF ECONOMICS, ACCOUNTING AND FINANCE

QUALIFICATION: BACHELOR OF ECONOMICS	
QUALIFICATION CODE: 12BECO	LEVEL: 7
COURSE CODE: MEC712S	COURSE NAME: MATHEMATICAL ECONOMICS
SESSION: DECEMBER 2025	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 100

SECOND OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER(S)	MR EDEN TATE SHIPANGA
MODERATOR:	MR. GEBHARD LUCKY SHIGWEDHA

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 microeconomic model.

$$\begin{aligned} Q_d &= D(P, Y_0) & [D_P < 0; D_{Y_0} > 0] \\ Q_s &= D(P, T_0) & [S_P > 0; S_{T_0} < 0] \end{aligned}$$

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 2 [25 Marks]

1. Solve the following system of equations using Cramer's rule (15)

a)

$$\begin{aligned} 8X_1 - X_2 &= 16 \\ 2X_2 + 5X_3 &= 5 \\ 2X_1 - 3X_3 &= 7 \end{aligned}$$

b)

$$\begin{aligned} 7X_1 - 3X_2 - 3X_3 &= 7 \\ 2X_1 + 4X_2 + 3X_3 &= 0 \\ -2X_2 - X_3 &= 2 \end{aligned}$$

2. Use Jacobian determinants to test the existence of functional dependence between the paired functions.

a)

$$\begin{aligned} y_1 &= 3x_1^2 + x_2 \\ y_2 &= 9x_1^4 + 6x_1^2(x_2 + 4) + x_2(x_2 + 8) + 12 \end{aligned} \quad (5)$$

b)

$$\begin{aligned} y_1 &= 3x_1^2 + 2x_2^2 \\ y_2 &= 5x_1 + 1 \end{aligned} \quad (5)$$

Question 3 [25 Marks]

1. In a three-industry economy, it is known that industry I uses 20 cents of its own product, 10 cents of commodity III and 60 cents of commodity II to produce a dollar's worth of commodity I. Industry II uses 10 cents of its own product, 30 cents of commodity III and 50 cents of commodity I to produce a dollar's worth of commodity II. While industry III uses none of its own product and commodity I, but uses 20 cents of commodity II in producing a dollar's worth of commodity III. The open sector demands N\$ 2,000 billion of commodity I, N\$ 500 billion of commodity II and 1500 billion of commodity III.

- a) Write out the input matrix, and the specific systems of equations for this economy. (5)
 b) Find the new output level when final demands increase by 10%, 40% and 20%, respectively. (15)
 c) Work out the required primary input for this economy (5)

Question 4 [25 Marks]

1. Maximize profits using Kuhn-Tucker conditions, $\pi = 64x - 2x^2 + 96y - 4y^2 - 13$ Subject to the production constraint $x + y \leq 36$ (15)
 2. Given $y = x_1^2 + 6x_2^2 + 3x_3^2 - 2x_1x_2 - 4x_2x_3$ use the Discriminants to determine whether quadratic function is positive or negative definite: (10)

TOTAL MARKS: 100