



MASENO UNIVERSITY
UNIVERSITY EXAMINATIONS 2015/2016

**FIRST YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE
OF BACHELOR OF ARTS IN ECONOMICS, BACHELOR OF SCIENCE IN
MATHEMATICS AND ECONOMICS WITH INFORMATION
TECHNOLOGY**

MAIN CAMPUS

AEC 104: MATHEMATICS FOR ECONOMISTS II

Date: 22nd April, 2016

Time: 2.30 - 4.30pm

INSTRUCTIONS:

- Answer Question ONE and any other TWO.
- Calculators are allowed in the examination room
- Marks will be awarded to students who demonstrate accuracy and clarity of presentation.



QUESTION ONE

- a) What do you understand by the following
- i. A matrix (2 marks)
 - ii. Comparative statics (2 marks)
 - iii. Input-Output analysis (2 marks)
- b) Outline the assumptions of an input output model (3 marks)
- c) A firm produces two products q_1, q_2 with its profit (π) defined as;
 $\pi = 5q_1 + 3q_2$. If the firm maximizes its profit subject to the following constraints
- $$6q_1 + 2q_2 \leq 36$$
- $$5q_1 + 5q_2 \leq 40$$
- $$2q_1 + 4q_2 \leq 28$$
- $$q_1, q_2 \geq 0$$
- Using the simplex algorithm determine q_1, q_2 that will maximize profit and the optimal profit for the firm. (12 marks)
- d) Given the following three commodity market model. Determine equilibrium prices and quantities (use Cramer's Rule). (9 marks)
- $$Q_{d_1} = 4P_1 + 5P_2 - 2P_3$$
- $$Q_{d_2} = P_1 + P_2 - P_3$$
- $$Q_{d_3} = 9P_1 + 11P_2 - 5P_3$$
- $$Q_{s_1} = 18, Q_{s_2} = 4, Q_{s_3} = 20$$

QUESTION TWO

- a) The input-output coefficients for two industries is given by $A = \begin{bmatrix} 0.6 & 0.2 \\ 0.3 & 0.4 \end{bmatrix}$ and the final demand vector $D = \begin{bmatrix} 30 \\ 40 \end{bmatrix}$.
- i. Determine gross output on industrial basis and the total productivity of the two industries (6 marks)
 - ii. If final demand change by $\Delta D = \begin{bmatrix} 5 \\ 10 \end{bmatrix}$, determine change in gross output (6marks)
- b) Discuss any four economic applications of derivatives. (8 marks)

QUESTION THREE

a) Solve for

i. $\frac{dY}{dX}$ given a function $Y = \frac{X}{\sqrt{(3X^2 + X)}}$ (7 marks)

ii. $\int_1^2 2X^3 (X^n) dX$ (3 marks)

b) What do you understand by Euler's Theorem (4 marks)

c) Determine the consumer surplus for a market price of $P = 4$ given; $P = 5 + Q$ and

$$P = Q^2 + Q + 3 \quad (6 \text{ marks})$$

QUESTION FOUR

a) Distinguish between integrand and integral (2 marks)

b) List any three examples of static equilibrium (3 marks)

c) The Marginal Propensity to Consume (MPC) out of Y is 0.75. Determine the corresponding consumption function if $C=10$ when $Y=0$. (6 marks)

d) Given the following 3×3 matrix A , define the minors with respect to each element and compute the adjoint of the matrix A . (9marks).

$$A = \begin{bmatrix} 4 & 0 & 2 \\ 6 & 1 & 3 \\ -1 & 2 & 5 \end{bmatrix}$$

QUESTION FIVE

An open economy is defined as;

$$Y = C + I + G + X - M$$

$$C = a + b(Y - T)$$

$$T = t_0$$

$$M = m_0 + m_1 Y$$

$$I = I_0$$

$$G = G_0$$

$$X = X_0$$

- i. Define and list endogenous and exogenous variables from the model (8 marks)
- ii. Determine the equilibrium income (\bar{Y}), consumption (\bar{C}) and imports (\bar{M}) (Apply Cramer's rule) (12 marks)