UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

PROGRAMME: BSC. IN AGRICULTURAL ECONOMICS AND AGRIBUSINESS
MANAGEMENT YEAR II

COURSE CODE: AEM 203

TITLE OF PAPER: **MATHEMATICS FOR ECONOMISTS**

TIME ALLOWED: 2: 00 HOURS

INSTRUCTION: 1. ANSWER ALL +**FOUR** QUESTIONS.
2. EACH QUESTION CARRIES 25 POINTS

DO NOT OPEN THIS PAPER UNTIL PERMISSION HAS BEEN GRANTED BY THE
CHIEF INVIGILATOR

QUESTION 1.   (25 points)

1.1 Evaluate the following determinant using the Laplace expansion

$$A = \begin{vmatrix} 1 & 3 & 1 \\ 1 & 2 & 4 \\ -1 & 2 & 6 \end{vmatrix}$$ (6 points)

1.2 Explain Leontief input-output model in Economics?   (6 points)

1.3 A company has two inter-acting branches,A_1 and A_2 .Branch A_1 consumes E0.5of its own output and E0.3 of A_2 output for every E1 it produces. Branch A_2 consumes E0.6 of A_1 output and E0.4 of its own output per E1 of output. The company wants to know how much each branch should produce per month in order to meet exactly a monthly external demand of E 50,000 for A_1 product and E 20,000 for A_2 product.
Construct the consumption matrix and determine the production schedule for the above external demand.   (**13 points**)

QUESTION 2.   (25 points)

2.1 Find f_x and f_z from the following (8 POINTS

(a) $f(x,z) = x^2 + 5xz \ - z^2$

(b) $f(x,z) = (x^2 - 3z)(x - 2)$

(c) $f(x,z) = \frac{2x-3z}{x+z}$

(d) $f(x,z) = 5z^4 - \ln(x^2)$

2.2 Consider the Utility function: $U(x,y) = xy$. Find the MRS using the total differentials method   (8 points)

2.3. Using the Implicit function rule , find the MRS of $U(y,x) = x^{1/2}y^{1/2}$ (9 points)

124

QUESTION 3. **(25 points)**

3.1 A firm's production is given as $q = x_1 x_2$.

Assume that both prices for production factors x_1 and x_2 are 1. The firm minimizes cost subject to the equation giving output according to the production function.
   a. Find the minimum achievable level of cost, C^*, as a function of q.
   b. If $C^* = 4$, what exogenous value of q resulted in this value for C^*?
   c. Determine dx_1^*/dq, dx_2^*/dq and their signs **(15 points)**

3.2 Max U= $x_1 x_2$ subject to $P_1 x_1 + p_2 x_2 = M$.
 x_1, x_2

Find the optimal choices **(10 points)**

QUESTION 4. **(25 points)**

4.1 . Find the Elasticity of demand for the demand function $Q = \dfrac{k}{p^n}$ where k and n are positive constants. Does the elasticity depend on price in this case? How do you know? **(15 points)**

4.2 Use the Lagrange –multiplier method to find the stationery value of Z and use the bordered Hessian to determine if the stationary value of Z is a maximum or a minimum.
 $Z = 3x - y - xy$, subject to $x + y = 8$. **(10 points)**