

1<sup>st</sup> SEM. 2017/2018



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UNIVERSITY OF SWAZILAND

RESIT 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 QUESTIONS  
2. EACH QUESTION CARRIES 25 MARKS

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BY THE CHIEF INVIGILATOR

**Question 1. ( 25 marks)**

1.1 Given the input-output matrix

$$A = \begin{bmatrix} 0.1 & 0.1 \\ 0.4 & 0.5 \end{bmatrix} \text{ and demand vector } D = \begin{bmatrix} 30 \\ 20 \end{bmatrix}$$

Find the production vector that will enable the economy to meet the demands?

1.2 . 1. A multiproduct firm is faced with the following cost function and a production constraint. The production constrains is stipulated in terms of production quota.

$$\text{Cost function : } C = 2Q_1 + 4Q_2 - Q_1Q_2 + 10$$

$$\text{Production quota: } Q_1 + Q_2 = 16$$

- a) Set up a constrained cost minimization problem from the information given.
- b) Construct the corresponding Lagrangian function.
- c) Determine the critical values of  $Q_1$  and  $Q_2$ .
- d) Confirm that the critical values present a minimum

**Question 2. ( 25 marks)**

2.1 Given  $Q = 30 - 3p + 0.02y$  , where Q is quantity demanded, p is price, and y is income, and given  $p = 60$  and  $y = 1000$

- Find the
- a) price elasticity of demand.
  - b) income elasticity of demand

2.2 The owner of a café has found that the relationship among the daily demand for ice- cream and the prices charged for ice – cream(i) and cool drinks (c) is expressed by means of the equation  $D = 2000 - 2.5i + 0.39c$ ,

where D is measured in liters, i in cents per liter and c in cents per can.

Calculate the partial derivatives  $\frac{\partial D}{\partial i}$  and  $\frac{\partial D}{\partial c}$  . Explain the meaning of these derivatives.

**Question 3. ( 25 marks)**

3.1 Find MPK and MPL for the following production function

$Q = 16K^{1/2}L^{1/4}$  and determine whether or not the function is characterized with diminishing returns to factor inputs.

3.2 Calculate the definite integrals.

a)  $\int_0^1 5^x dx$

b)  $\int_1^2 x(x^2 + 6) dx$

**Question 4. ( 25 marks)**

4.1 An analysis of the financial statements of a coal mine, indicates that when x tons of coal are extracted a day, the income and cost ( E) of the mine are respectively;

$I(x) = 300x - 2x^2$

$C(x) = x^2 - 2x + 500.$

The mine is taxed at a rate of 30% on its gross profit.

- Determine a. the value of x which maximize the income.
- b. the gross profit and the value of x which maximizes it.
- c. the net profit and the value of x which maximizes it.

4.2 Consider the following demand function for good a

$Q_a = 200 - 4p_a - 2p_r + 0.2y$

Where  $Q_a$ = Quantity of good a in demand.

$p_a$  = price of good a.

$P_r$  = price of some related goods r.

Y = consumer income.

Given  $p_a = 20$  ,  $p_r = 24$  ,  $y = 2000$ ,

Find the following elasticity and interpret your results.

- a) Own price elasticity of demand
- b) Cross-price elasticity of demand
- c) Income elasticity of demand