



# TECHNICAL UNIVERSITY OF MOMBASA

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SCHOOL OF BUSINESS

DEPARTMENT OF MANAGEMENT SCIENCE

**UNIVERSITY EXAMINATION FOR:**

BACHELOR OF BUSINESS AND OFFICE MANAGEMENT, BACHELOR OF  
BUSINESS INFORMATION TECHNOLOGY, BACHELOR OF COMMERCE,  
BACHELOR IN BUSINESS ADMINISTRATION.

BMS 4102: MANAGEMENT MATHEMATICS II

END OF SEMESTER EXAMINATION

**SERIES: APRIL 2016**

**TIME: 2 HOURS**

**DATE: 20 MAY 2016**

## Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.

**Do not write on the question paper.**

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## **Question ONE**

a) The value of a particular asset is estimated by the function  $V = 240,000 e^{-0.04t}$  where  $V$  is the value of the asset and  $t$  is the age of the asset, measured in years.

- i. What is the value of the asset expected to be when the asset is 4 years old? (3 marks)
- ii. Determine the general expressions for the instantaneous rate of change in the value of the asset. (3 marks)

b) Find the derivatives of the following functions using appropriate rules of differentiation.

i.  $y = 6x^2 + 5x + 7$  (2 marks)

ii.  $y = \frac{6x^3 - 4}{1 - x^2}$  (3 marks)

c) Discuss three assumptions of Linear Programming. (6 marks)

d) Integrate the following functions:

(i)  $\int (x^2 + 3x)dx$  (2 marks)

(ii)  $\int_2^6 (3x^2 - 2)dx$  (2 marks)

(iii)  $\int_2^{10} 0.5e^{0.025x} dx$  (3 marks)

e) Using suitable examples, explain the meaning of the following terms as used in matrix algebra.

(i) Transpose of a matrix (2 marks)

(ii) Identity matrix (2 marks)

(iii) The minor of an element (2 marks)

### Question TWO

A company wants to determine the most profitable mix of its products. Currently, it manufactures two products, that is, Neem and Beta. It has 3 machines A, B and C. Neem requires 2 minutes of machine A, 3 minutes of machine B and 1 minute of machine C. Beta requires 3 minutes of machine A, 2 minutes of machine B and 1 minute of machine C. The capacity available is 1500 minutes, 1500 minutes and 600 minutes, for machine A, B and C respectively. The profit per unit of Neem and Beta is Ksh.10 and Ksh.12 respectively.

#### Required:

(i) Formulate a linear programming model. (6 marks)

(ii) Using graphical Method, determine the company's most profitable mix. (9 marks)

(iii) Calculate the number of minutes that are not used for each machine. (5 marks)

### QUESTION 3

a) Differentiate the following functions with respect to  $x$ .

i.  $y = (4x^3 - 3x)^6$  (4 marks)

ii.  $y = \frac{4 \sin 5x}{5x^4}$  (6 marks)

b) Integrate the following functions.

i.  $3 \int \sin 5x \sin 3x \, dx$  (5 marks)

ii.  $\int \frac{2x+3}{(x-2)^2} \, dx$  (5 marks)

#### **QUESTION 4**

(a) i) If  $A = \begin{pmatrix} 2 & -3 \\ 4 & 5 \end{pmatrix}$  and  $B = \begin{pmatrix} 1 & 3 \\ 7 & 4 \end{pmatrix}$  find the product  $AB$ .

(2Marks)

(ii) Find product  $AB$  for matrices  $A$  and  $B$

$$A = \begin{bmatrix} 1 & 0 & 2 & 3 \\ 2 & -1 & 0 & 3 \\ 3 & 2 & -2 & 0 \end{bmatrix} \text{ and } B = \begin{bmatrix} 2 & 1 \\ 0 & 2 \\ 1 & 4 \\ 2 & 0 \end{bmatrix}$$

(3marks)

b) Given the determinant of the matrix is zero, find the value of  $k$ .

$$\begin{vmatrix} 1 & k+1 & 1 \\ 2k & 5 & -3 \\ 3 & 7 & 1 \end{vmatrix} = 0$$

(6 marks)

c. Solve the following system of linear equation using Cramer's formula.

$$x + y + z = 4$$

$$2x - 3y + 4z = 33$$

$$3x - 2y - 2z = 2$$

(9 marks)

### Question Five

(a) For the function  $f(x) = -2x^2 + 3x - 10$  :

(i) Determine the derivative of the function using the first principles method. (5 marks)

(ii) Determine the instantaneous rate of change in  $f(x)$  at  $x = 5$ . (1 mark)

(iii) Determine where on the function the slope equals 0. (2marks)

(b) A Company manufactures and sells  $q$  computers per month. The monthly demand function is  $P = 95 - 0.05q$  where  $P$  is price per computer. The monthly total cost function is  $C = 700 + 35q$ .

#### Required:

(i) Derive the total revenue function. (2 marks)

(ii) Find the profit function in terms of  $q$ . (3 marks)

(iii) How many computers should be produced to maximize the monthly profit?(5marks)

(iv) What is the maximum monthly profit? (2 marks)