



TECHNICAL UNIVERSITY OF MOMBASA

SCHOOL OF BUSINESS

UNIVERSITY EXAMINATIONS FOR DEGREE IN BACHELOR OF BUSINESS
ADMINISTRATION, BACHELOR OF COMMERCE, AND BACHELOR OF BUSINESS
AND INFORMATION TECHNOLOGY

BMS 4102: MANAGEMENT MATHEMATICS II

SERIES APRIL 2022

TIME: 2 HOURS

ANSWER QUESTION ONE AND ANY OTHER TWO

QUESTION ONE

- a. A manufacturer produces two products I and II. Each unit of product I requires 4 units of material A and 3 units of material B, while each unit of product II requires 2 units of material A and 6 units of material B. In any one month there are 240 units of material A and 360 units of material B. The two products give a contribution of shs.70 and shs.80 respectively. The manufacturer wishes to establish the monthly products on mix that will maximize contribution.

Required;

- i. Formulate a linear programming model to solve this problem (4marks)
- ii. Use graphical method to determine a production plan that will maximize contribution (8marks)

- b. Differentiate the following functions with respect to x

i. $y = 3x^3 - 2x^2 + x - 4$

ii. $Y = \frac{\cos x}{x^3}$

iii. $y = x^2 \cos^2 x$

(9 marks)

c. Integrate the following functions

i. $(5 - 6x)^2 dx$

ii. $4 \cos (1-2x) dx$

(9 marks)

QUESTION TWO

- a) Two students were discussing the relationship between average cost and total cost. One student said that since average cost is obtained by dividing the cost function by the number of units Q, it follows that the derivative of the average cost is the same as marginal cost, since the derivative of Q is 1.

Required: Comment on this analysis.

- b) Gatheru and Kabiru have recently started to give business advise to their clients. Acting as consultants, they have estimated the demand curve of a clients firm to be;

$$AR=200-8Q$$

Where AR is average revenue in millions of shillings and Q is the output in units.

Investigation of the client firm's cost profile shows that marginal cost (MC) is given by:

$$MC=Q^2-28Q+211(\text{In million shillings})$$

Further investigations have shown that the firm's cost when not producing output is sh.10 million.

Required:

- i) The equation of total cost
- ii) The equation of total revenue
- iii) An expression for profit.
- iv) The level of output that maximizes profit
- v) The equation of marginal revenue.

QUESTION THREE

- a) Two firms A and B in Nairobi Industrial area make glue. The cost functions for making glue for the two firms are as follows:

Firm A - $C = 0.2x + 200$

Firm B - $C = 0.6x + 50$

Where x – is litres of glue produced in '000'.

Required:

By drawing a graph of these functions, show whose firm's costs increase more rapidly.

b) On the study of costs and revenue for production of biro pens by a small company ACO Ltd, the following expressions were determined. Before production starts a set-up cost of Sh.1500 existed.

$$AR = 600 - 0.5q \quad \text{Average revenue}$$

$$MC = 140 - 8q + 0.15q^2 \quad \text{Marginal cost}$$

Required:

- i) The expression for profit.
- ii) At what quantity q is profit maximized.
- iii) Is this quantity q also the point that revenue is maximized?

QUESTION FOUR

a. Solve the following equation

$$\frac{6}{x-2y} - \frac{15}{x+y} = 0.5$$

$$\frac{12}{x-2y} + \frac{9}{x+y} = -0.4$$

(5 marks)

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 using Cramer's rule

$$x + y + z = 4$$

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

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

(9 marks)

QUESTION FIVE

a. Integrate the following functions

$$i. \int_1^2 4e^{2x} dx$$

(5 marks)

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

(6 marks)

b. Explain using graphical illustration on how the following situations arises in the context of Linear Programming: multiple solutions, unbounded solution and degenerate constraint

(9 marks)