

U26



(The University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

MAIN

**UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR
FIRST YEAR FIRST SEMESTER EXAMINATIONS
FOR THE DEGREE
OF
BACHELOR OF COMMERCE**

COURSE CODE: BCB 102

COURSE TITLE: BUSINESS MATHEMATICS

DATE: TUESDAY, 6TH /12/2022 TIME: 3:00 – 5:00PM

INSTRUCTIONS TO CANDIDATES

- Attempt question One and any other two questions
TIME: 2 Hours

This Paper Consists of 3 Printed Pages. Please Turn Over

QUESTION ONE

a) Write brief explanatory notes the following business mathematics concept;

i) Closed input-output model (2 mks)

ii) Using a function describe a 3rd degree polynomial (2 mks)

iii) Determine the linear function that goes through the following points (4 mks)

X	4	10
Y	10	34

b) Find the inverse of the following matrix (12 mks)

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

Hence solve the following system of linear simultaneous equation using matrices

$$X + 2y + 3z = 3$$

$$2x + 4y + 5z = 4$$

$$3x + 5y + 6z = 8$$

c) Differentiate the following equations stating the rule applicable.

i) $Y = (2x + 9)^8$ (3 mks)

ii) $Y = \frac{4x^3 + 2}{2x^6}$ (3 mks)

iii) $Y = (x^2 + 3x)(6x^3 + 2)$ (2 mks)

d) Integrate the following functions

i) $Y = \frac{2}{4}x^6 + 5x^3 + 2$ (2 mks)

QUESTION TWO

a) A customer deposits ksh250 every 3 months into a building society account that pays interest at a rate of 8% per annum convertible quarterly (i.e. compounded every 3 months). How much money will be in the account at the end of 10 years? (4 marks)

b) A business manager wants to make an investment in a project whose cost is \$4 million. The cost is expected to remain constant in nominal terms. He can save \$80,000 annually to fulfill his desire. How long should he wait if his savings earned an interest rate of 12%? (5 mks)

c) Given below is the company's total cost and price function:

$$\text{Total cost (TC)} = 18Q^2 - 1600Q + 800$$

$$\text{Price (P)} = 2200 - Q$$

Required

- i) How many units should the firm produce in order to break-even (3mks)
- ii) Determine the price per unit produced (2 mks)
- iii) What is the possible profit realized by the manufacturer (4 mks)
- iv) Determine the nature of cost and profit (whether maximum or minimum) (2 mks)

QUESTION THREE

a) Define the following terms as used in Markovian analysis:

- i) Transition probability matrix (2 mks)
- ii) Equilibrium state (2 mks)

b) A consumer survey among 1800 consumers performed by Cocacola Company during the month of February 2014 revealed the following switching patterns among 600 users of Fanta brand, 100 consumers shifted their loyalty to Krest brand and 200 consumers shifted their loyalty to Stoney brand, the rest remained loyal to brand. Among 600 users of Krest 250 consumers shifted their loyalty to Fanta brand, 150 consumers shifted to Stoney brand while the rest remained steadfast to Krest. Among 600 users of Stoney brand 300 consumers shifted their loyalty to Fanta and 50 consumers migrated to Krest brand while the rest were hard-core royals to Stoney brand.

Required

- i) Transition matrix representing the above switching patterns (2mks)
- ii) Respective market shares two months later (8 mks)
- iii) Market share in the longrun (6mks)

QUESTION FOUR

- a) Find the market equilibrium price and quantity if the demand equation is given by $2p-6q=44$ and the supply equation $q^2+4p+4q=120$ where p is the price and q is the quantity of the commodity. Find the total revenue and market equilibrium price (8 mks)
- b) For a markovian process to apply several requirements must be satisfied, describe four such requirements (6 mks)
- c) Firms A, B and C supplied 40,35, and 25 truckloads of stones and 10, 5 and 8 truckloads of sand respectively to a contractor. If the cost of stones and sand are Sh.1,400 and Sh.800 per truck load respectively. Find the total amount paid by contractor to each of these firms using matrix method. (6 mks)

QUESTION FIVE

- a) An investment costs £80000 and has a scrap value of £20, 000. Its string of income before depreciation and taxation from the first year through the fifth year is as follows

Year	Returns
1	40,000
2	35,000
3	36,000
4	40,000
5	46,000

Assume 30% tax rate and depreciation is given as £10, 000 on a straight line basis. Required rate of return is 12%.

Required

- i) Compute the internal rate of return (12 mks)
- ii) Compute the payback period (3 mks)
- iii) Advice the management on the viability of the above investment based on the above criteria. (2mks)
- b) Matrix addition is commutative but matrix subtraction is not, comment! (3 mks)