



*(University of Choice)*

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

**MAIN CAMPUS**

**UNIVERSITY MAIN EXAMINATIONS**

**2021/2022 ACADEMIC YEAR**

**FIRST year SECOND semester examination**

**FOR THE DEGREE  
OF  
BACHELOR OF COMMERCE**

**COURSE CODE: BCB 102**

**COURSE TITLE: BUSINESS MATHEMATICS**

**DATE: FRIDAY, 22<sup>ND</sup> APRIL 2022**

**TIME: 3:00 – 5:00PM**

---

**INSTRUCTIONS TO CANDIDATES**

*Answer question **ONE** and any other **TWO** questions*

**TIME: 2 HOURS**

### QUESTION ONE

- a) Write brief explanatory notes the following business mathematics concept;
- Column vector and Row vector (2 mark)
  - Transpose Matrix (2 marks)
- b) Differentiate the following equations stating the rule applicable.

i)  $Y = (2x + 4x^2)^7$  (2 marks)

ii)  $Y = \frac{2x^3 + 4x}{3x^5}$  (2 marks)

iii)  $Y = (3x^2 + x)(4x^3 + 3)$  (2 marks)

- c) Integrate the following functions

i)  $Y = \frac{1}{5}x^6 + 5x^3 + 10x^2$  (2 marks)

- d) Given below is the Top care's Inc total cost and price function:

$$\text{Total cost (TC)} = 9Q^2 - 600Q + 400$$

$$\text{Price (P)} = 300 - Q$$

### Required

- How many units should Top care's Inc produce in order to break-even (3marks)
  - Determine the price per unit produced (2 marks)
  - What is the possible profit realized by Top care's Inc, is it maximum or minimum (4 marks)
- e) A hypothetical two sector economy has the following input-output technological matrix.

$$\begin{bmatrix} 0.5 & 0.2 \\ 0.1 & 0.8 \end{bmatrix}$$

Suppose the final demand for a particular planning period is estimated as Khs 7,500 for sector P and Ksh 3,600 for sector Q.

- Determine the level of output required for each sector so that both intermediate demand and final demand is satisfied (8 marks).

- ii) Distribute the output among the users (2 marks).

### QUESTION TWO

An investment costs 500,000 and has no residual at the end of its economic life. Its string of cash flows before depreciation and taxation from the first year through the fifth year is as follows

Year	Returns
1	120,000
2	175,000
3	236,000
4	330,000
5	432,000

Assume 30% tax rate and depreciation is given as \$100, 000 on a straight line basis. Required rate of return is 12%.

#### Required

- Compute the Net Present Value. (6 marks)
- Compute the internal rate of return (8 marks)
- Advise the management on the viability of the above investment (2 marks)
- Compute the payback period of the investment (4 marks)

### QUESTION THREE

- a) From the following matrices:

$$C = \begin{bmatrix} 6 & 4 & 8 \\ 4 & 5 & 7 \\ 8 & 9 & 2 \end{bmatrix} \quad D = \begin{bmatrix} 6 & 8 \\ 3 & 4 \\ 9 & 2 \end{bmatrix} \quad E = 5 \begin{bmatrix} 1 & 2 \\ 9 & 5 & 4 \end{bmatrix}$$

- Get inverse of C (14 Mks)
- C x D (4 Mks)
- C x E (2 Mks)

### QUESTION FOUR

- Firms A, B and C supplied 10, 30, and 50 truckloads of stones and 20, 15 and 16 truckloads of sand respectively to a contractor. If the cost of stones and sand are Sh.4200 and Sh.2000 per truck load respectively. Find the total amount paid by contractor to each of these firms using matrix method. (6 mks)
- Find the market equilibrium price and quantity if the demand equation is given by  $p-3q=22$  and the supply equation  $q^2+2p+4q=100$ . Where p is the price and Q is the quantity of the commodity. Find the total revenue and market equilibrium price. (8 mks)
- A finance manager wants to make an investment in business whose cost is \$4 million. The cost is expected to remain constant in nominal terms. He can save \$60,000 annually to realize his target. How long should he wait if his savings earned an interest rate of 12%? (6 Mks)

### QUESTION FIVE

A consumer survey among 3500 customers performed by Hotel Association of Kenya (HAK) in year 2020 revealed the following switching patterns. Among 1400 consumers of Hilton hotel 470 consumers shifted their loyalty to Villa Rosa Kempinski and 330 consumers shifted their loyalty to Gigiri Lion Villa, the rest remained loyal to Hilton hotel. Among 2000 consumers of Villa Rosa Kempinski 380 consumers shifted their loyalty to Hilton hotel and 440 consumers shifted their loyalty to Gigiri Lion Villa, the rest remained loyal to Villa Rosa Kempinski. Among 1100 consumers of Gigiri Lion Villa 400 consumers shifted their loyalty to Hilton hotel and 120 consumers shifted their loyalty to Villa Rosa Kempinski, the rest remained loyal to Gigiri Lion Villa .

#### Required

- i) Respective market shares two months later **(9mks)**
- ii) Market share in the long-run **( 6 mks)**
- iii) Highlight five applications of a markovian process **(5mks)**