



# MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

**UNIVERSITY MAIN EXAMINATIONS**

**2021/2022 ACADEMIC YEAR**

**TRIMESTER EXAMINATIONS**

**FOR  
DIPLOMA IN BUSINESS ADMINISTRATION**

**COURSE CODE: DBA 102**

**COURSE TITLE: QUANTITATIVE METHODS**

**DATE: MONDAY, 25<sup>TH</sup> JULY 2022    TIME: 8:00 – 10:00 AM**

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## **INSTRUCTIONS TO CANDIDATES**

- 1. ANSWER QUESTION ONE AND ANY OTHER TWO QUESTIONS**
- 2. DO NOT WRITE ANYTHING ON THE QUESTION PAPER**

**TIME: 2 HRS**

MMUST observes ZERO tolerance to examination cheating 

This Paper Consists of 3 Printed Pages. Please Turn Over.

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**Instructions: Answer question 1 (compulsory) and any other TWO questions**

**Question 1 (compulsory)**

- a) State any two assumptions when conducting an input-output analysis. (2marks)
- b) State two reasons why individuals prefer having money now rather than later. (2marks)
- c) Distinguish between fixed costs and variable costs (2marks)
- d) Explain the meaning of the following terms as used in financial mathematics; (4marks)
- i. compounding
  - ii. discounting
- e) In set theory, what is the purpose of Venn diagrams? (2marks)
- f) In matrix algebra, what do you understand by matrix addition being commutative? (2marks)
- g) Find the inverse of the following matrix:  $\begin{pmatrix} 2 & -4 \\ -4 & 3 \end{pmatrix}$  (2marks)
- h) Evaluate  $\int_1^5 \left(2q - \frac{1}{3}q^3\right) dq$  (3marks)
- i) How long will sh. 10 000 invested at **10%** compound interest take to double itself? (2marks)
- j) Bayes Theorem states that  $P(H/E) = \frac{P(E/H)P(H)}{P(E)}$   
Assume that the word “offer” occurs in **80%** of the spam messages in your e-mail inbox. Also, assume that “offer” occurs in **10%** of your desired e-mails. If **30%** of the received e-mails are considered as a scam, and you receive a new message which contains “offer”, what is the probability that it is spam? (3marks)
- k) Solve the following pair of simultaneous equations: (4marks)
- $$2x + 5y = 12 \text{ and } x + y = 3$$
- l) Find  $\frac{dy}{dx}$  given that  $y = 2 - x^3 + 3x^2$  (2marks)
- (total 30marks)**

**Question2**

- a) Find the derivative of  $y = 2x^2 + 2$  from first principals (6marks)
- b) The HomeboyzTours Services offers sightseeing tours of Kakamega forest National Park and its environments. One tour, priced at **7 dollars** per person, had an average demand of **1 000** customers per week. When the management of the company decided to lower the tour price to **6 dollars** per person, the weekly demand rose to **1 200** customers. Assume that the demand function is linear.
- Required:**
- i) The price function (8marks)
  - ii) The revenue function (2marks)
  - iii) The tour price that should be charged per person in order to maximize the total revenue each week. (2marks)

- iv) The maximum revenue (2marks)  
*Note: the point (demand, price) is on the demand curve*

(Total 20marks)

**Question 3**

An economy produces only coal and steel. These two commodities serve as intermediate inputs in each other's production. 0.4 tons of steel and 0.7 tons of coal are needed to produce a ton of steel. Similarly, 0.1 tons of steel and 0.6 tons of coal are needed for a ton of coal. No capital inputs are needed. 2 and 5 labor days are required to produce a ton of coal and steel respectively. The economy needs 100 tons of coal and 50 tons of steel.

- i. Write down the technological matrix (5marks)  
 ii. Determine the Leontief inverse (6marks)  
 iii. Calculate the gross output of the two commodities. (6marks)  
 iv. Calculate the total labor days required (3marks)

Note that  $\mathbf{X} = (\mathbf{I} - \mathbf{B})^{-1}\mathbf{D}$  where B is the technological matrix and D is the final demand matrix  
(Total 20marks)

**Question 4**

- a) A lady would like to invest a lumpsum in a Sacco that pays a fixed interest of 12% annually so that the accrued amount will be sh. 6 million after 8 years from present. How much should the lady invest? (5marks)

- b) A bus is purchased on instalment basis from General Motors. The purchase agreement stipulates that sh. 1 000 000 is to be paid on the signing of the purchase contract and five yearly instalments of 500 000 each payable at the end of the first, second, third, fourth and fifth years. If interest is charged at 10% per annum, what would be the cash price? Use the annuity formula:

$$V = \frac{P}{i} \{1 - (1 + i)^{-n}\} \quad (5marks)$$

- c) China Road and Bridge Construction Company (CRBCC) recently submitted a bid to construct a superhighway in Kakamega town at a cost of sh. 5 billion. Crescent construction company is also considering placing in their bid for the same contract. If Crescent bids for the same contract, the chances of the bid being awarded to CRBCC is 0.3. If Crescent doesn't bid, there is a ¾ chance of CRBCC getting the contract. There is a 0.50 chance that Crescent will bid.

- i) What is the probability of CRBCC getting the contract? (5marks)  
 ii) What is the probability that Crescent's bid given CRBCC bid is awarded?

(5marks)

(Total 20 marks)

**Question 5**

A medium sized commercial bank has a clientele of 200 active customers. The bank operates three different types of accounts namely; current account, savings account and fixed deposit account. Information obtained from the bank indicates the following information about their customers:

- 84 operate savings accounts
- 109 operate current accounts
- 106 operate fixed deposit accounts
- 45 operate both savings and current accounts
- 36 operate both savings and fixed deposit accounts
- 43 operate both fixed deposit and current accounts

**Required:**

- a) Present the above information in a Venn diagram **(6marks)**
- b) Find the probability that a customer selected at random operates all the three types of accounts. **(4marks)**
- c) The probability that a customer selected at random operates only two types of accounts **(4marks)**
- d) The marginal cost function of producing q units of a product is given by

$$5 + 16q - 3q^2.$$

The total cost of producing 5 items is sh. 500. Find the total cost function. **(6 marks)**

**(Total 20marks)**