![Masinde Muliro University logo]

(University of Choice)

MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY (MMUST)

UNIVERSITY MAIN EXAMINATIONS

2022/2023 ACADEMIC YEAR

END OF FIRST SEMESTER MAIN EXAMINATIONS

FOR
DIPLOMA IN BUSINESS ADMINISTRATION

COURSE CODE: DBA 102

COURSE TITLE: QUANTITATIVE METHODS

DATE: WEDNESDAY, 21ST /12/2022   TIME: 2:00 – 4:00PM

INSTRUCTIONS TO CANDIDATES
    1. ANSWER QUESTION **ONE** AND ANY **OTHER TWO** QUESTIONS
    2. DO NOT WRITE ANYTHING ON THE QUESTION PAPER
TIME: 2 HOURS

This Paper Consists of 4 Printed Pages. Please Turn Over.

Question 1 (compulsory)

a) Use Cramer's rule to solve the following pair of simultaneous equations:

a + b = 7

2a + 3b = 19   **(4marks)**

b) Given that $P = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$ and $Q = \begin{bmatrix} 2 & 3 \\ 4 & 5 \end{bmatrix}$, determine;

   (i) P+Q   **(2marks)**

   (ii) P-Q   **(2marks)**

   (iii) Q^{-1} **(4marks)**

c) Differentiate the following functions with respect to q.

   (i) $Y = 2q^3 - q + 1$ **(2marks)**

   (ii) $Y = 3$ **(2marks)**

   (iii) $Y = k$ (k is constant)   **(2marks)**

d) Distinguish between the following;

(i) Compounding and discounting   **(2marks)**

(ii) Fixed cost and variable cost   **(2marks)**

e) Integrate the following function given that $\frac{dy}{dx}$ is $2x + 1 + 3x^3$ **(2marks)**

f) Evaluate the following definite integral; $\int_0^5 (3x^2 - 1)\, dx$ **(2marks)**

g) Give any two areas where Markov process can be applied in real life   **(4marks)**

                                         (Total 30marks)

Question 2

A retailer must decide whether to build a small or a large facility at a new location. Demand at the location can either be low or high, with probabilities estimated to be **0.4** and **0.6** respectively. if a small facility is built and demand proves to be high, the manager may choose not to expand (payoff = **sh. 223 000**) or to expand (payoff = **sh. 270 000**). If a small facility is built and demand is low, there is no reason to expand and the payoff is **sh. 200 000**. If a large facility is built and demand proves to be low, the choice is to do nothing (payoff = **sh. 40 000**) or to stimulate demand through local advertising. The response to advertising may either be modest or sizable, with their probabilities estimated to be **0.3** and **0.7** respectively. if the response is modest, the payoff is estimated to be only **sh. 20 000**; the payoff grows to **sh. 50 000** if the

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response is sizable. Finally, if a large facility is built and demand turns out to be high, the payoff is **sh. 400 000**.

a) Draw a decision tree representing this problem and evaluate it   **(18marks)**

b) Which alternative has the highest expected payoff?   **(2marks)**

         (Total 20marks)

Question 3

a) A company is considering using Markov theory to analyse brand switching between three different brands of a product. Survey data has been gathered and has been used to estimate the following transition matrix for the probability of moving between brands each month:

To Brand

		A	B	C
	A	0.80	0.10	0.10
From Brand	B	0.03	0.95	0.02
	C	0.20	0.05	0.75

The current (month 1) market shares are 45%, 25%, and 30% for brands 1, 2, and 3 respectively. Find the expected market shares for each brand after two months have elapsed.   **(10marks)**

b) A company manufactures and sells semiconductor devices. The cost per unit (unit cost) depends on the volume of production and includes a fixed part **1000** (sh./ device) and a variable part **2q** (sh./ device), where **q** is the number of units produced per month. The price of the device, in turn, depends on the volume of production according to the function $P = 10\ 000 - q$. The manufacturer wishes to maximize profit. What volume of production should be sold in order for the manufacturer to realize its goal?

         (10marks)

         (Total 20 marks)

Question 4

a) Explain why people prefer having money presently rather than later

(4marks)

b) Today is Albert's 16th birthday. His father has promised to give him sh. 1 million in cash on his 25th birthday. Albert's father wants to know two things

(i) If he decides to make annual payments into a fund after one year, how much will each have to be if the fund pays 8% interest annually? **(4marks)**

(ii) If he decides to invest a lump sum in the account after one and let it compound annually, how much will the lump sum be? **(4marks)**

(iii) If in (ii) above the payments are made at the beginning of the year, how much will be the value of the annuity? (The annuity formula is $P = \frac{A}{i}\left[1 - \frac{1}{(1+i)^n}\right]$)

(4marks)

(iv) How long will it take to double your money if it grows at 12% annually?

(4marks)

(Total 20marks)

Question 5

The revenue function of a product is $R = 28q - q^2$ and the unit variable cost $v = q - 8$ while fixed cost is Sh.64.

Determine the following:

a) Total cost function **(5marks)**

b) Profit function **(5marks)**

c) Output and price for maximum profit. **(5marks)**

d) Show that the output for maximum profit is not necessarily the same as the output for maximum revenue.

(5marks)

(Total 20marks)

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