MASINDE MULIRO UNIVERSITY OF SCIENCE AND TECHNOLOGY

(MMUST)

MAIN CAMPUS

UNIVERSITY EXAMINATIONS

2021/2022 ACADEMIC YEAR

FIRST YEAR SECOND SEMESTER EXAMINATION FOR DIPLOMA IN INFORMATION TECHNOLOGY

COURSE CODE: DIT 063

COURSE TITLE: BASIC MATHEMATICS

DATE: 21/04/2022 **TIME: 3:00 – 5:00PM**

INSTRUCTIONS TO CANDIDATES

- Answer questions in section A and any TWO questions in section B.

TIME: **1 HOUR 30 MINUTES**2 Hours

MMUST observes ZERO tolerance to examination cheating

This paper has 3 printed pages PLEASE turn over

SECTION A: Answer all questions (30 Marks)

QUESTION ONE

a) State and define any three types of matrices (6mks)

b) Find the minimum and the maximum values of $9x^3 - 13x^2 + 4x$ (4mks)

c) Use substitution method to solve (3mks)

$$2x + 3y = 4$$

$$4x + 6y = 7$$

d) Integrate $2x + 3x^2 + 80x^5$ (3mks)

e) Find the 11^{th} term of the geometric progression $\frac{1}{3}, \frac{1}{6}, \frac{1}{12}, \ldots$ (5mks)

f) Find the fourth derivative of $f(x) = 12x^6 + 3x + 200$ (3mks)

g) Solve $27x^2 + 40x - 200$ using quadratic formula (3mks)

h) Given that matrix $A = \begin{pmatrix} 2 & 5 & 4 \\ 0 & 1 & 2 \\ 1 & 3 & 0 \end{pmatrix}$ find AA' (3mks)

SECTION B: Answer any two questions (40 marks)

QUESTION TWO

a) Find the integral of $x^2 + 2x - 3$ when $0 < x < 20$ (3mks)

b) Prove that $|A \cup B| = |A| + |B| - |A \cap B|$ (6mks)

c) The volume of the closed cylindrical tank is 11.3 cubic meter. If the total surface area is a minimum, what is its base radius, in m? (11mks)

QUESTION THREE

a) Briefly explain the meaning of a geometric sequence (2mks)

b) The sum of the first three terms of a GP is $-\frac{3}{2}$ and the sum to infinity of the GP is $-\frac{3}{52}$. If the GP has a positive common ratio r. Find r and the first ter. (12mks)

c) Solve the equation and find all the solutions $\text{Cos}\,\theta = Sin^2\theta + 1$ for $0 \leq \Theta \leq 2\pi$ (4mks)

QUESTION FOUR

a) Solve the value of x in the equation $x(x + 2) + 2 = 0$ and illustrate the condition under which the roots are obtained (7mks)

b) Given that set $A = \{1,2,3,4,5\}$, $B = \{4,5,6,7,8\}$ and $C = \{2,4,6,8,10\}$ find;

i. $A' \cap B' \cup C$ (5mks)

ii. Draw the Venn diagram to represent the three Sets (2mks)

d) Find the eigen values and the corresponding eigen vectors of $A = \begin{pmatrix} 2 & 3 \\ 4 & 1 \end{pmatrix}$ (6mks)

QUESTION FIVE

a) Apart from substitution and elimination methods, name and explain other three methods used in solving simultaneous equations (6mks)

b) Given the matrix $A = \begin{pmatrix} 0 & 3 & 5 \\ 5 & 5 & 2 \\ 3 & 4 & 3 \end{pmatrix}$ find A^{-1} hence solve the following system of linear simultaneous equations (14mks)

$3y + 5z = 3$

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

$3x + 4y + 3z = 8$