Strathmore UNIVERSITY

STRATHMORE INSTITUTE

DIPLOMLOMA IN BUSINESS MANAGEMENT

DIPLOMA IN INTERNATIONAL RELATIONS

DIPLOMA IN JOURNALISM AND NEW MEDIA

DIPLOMA IN BUSINESS CREATION AND ENTREPRENEURSHIP

END OF SEMESTER EXAMINATION

DBM 1204/ DIR1202 /DE 1105/ DJNM1202

BUSINESS MATHEMATICS

DATE: Friday, 14th April, 2023 **Time:** 2 Hours

Instructions

1. This examination consists of **FIVE** questions.
2. Answer **Question ONE (COMPULSORY)** and any other **TWO** questions.
3. Do not write on the question paper.

QUESTION ONE [30 MARKS]

a) Identify each of the following types of matrices:

i. $W = \begin{pmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{pmatrix}$

ii. $X = \begin{pmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$

iii. $W = \begin{pmatrix} 4 & 0 & 0 \\ 0 & 8 & 0 \\ 0 & 0 & 2 \end{pmatrix}$

iv. $Z = \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

[4 Marks]

b) Solve the following simultaneous equation:

$$4x + 5y = 11$$
$$10x + 3y = 18$$

[4 Marks]

c) Without using mathematical tables, solve for x in the equation.

$$9^{(2x-1/4)} \times 27^{(x-1/2)} = 729^{(x+1/3)}$$

[4 Marks]

d) Find the sum of all the numbers between 4 and 208 which are exactly divisible by 2.

[5 Marks]

e) There are 30 houses on a street. 16 of the houses have burglar alarm, 22 have a smoke alarm, and 10 houses have both a burglar alarm and smoke alarm.

i. Draw this information on a Venn diagram. **[3 Marks]**

ii. How many houses have a burglar alarm but not a smoke alarm? **[2 Marks]**

iii. How many houses have either a burglar alarm or smoke alarm? **[2 Marks]**

f) Simplify

$$\frac{\log 27 - \frac{1}{2}\log 9}{\log 81 + \frac{1}{2}\log 9}$$

[3 Marks]

g) Determine the mean, mode and median for the following data:

3, 5, 8, 9, 3

[3 Marks]

QUESTION TWO [15 MARKS]

a) List the elements of the following sets

i. $A = \{x : x \in \mathrm{N},\ 3 < x < 6\}$ **[1 Mark]**

ii. $B = \{x : x \in \mathrm{N},\ x^2 + 1 = 10\}$ **[1 Mark]**

iii. $C = \{x : x \in \mathrm{N}, 7 + \mathrm{x} = 4\}$ **[1 Mark]**

b) A slaughter house bought goats and bulls at $Ksh.\ 1,200$ and $Ksh.15{,}000$ each. They paid a total bill of $Ksh.\ 135{,}000$. If they double the number of goats and three bulls less, they would have saved $Ksh.\ 15{,}000$.

i. By using matrix method, determine the number of goats and bulls that were bought. **[8 Marks]**

ii. The slaughter house sold the animals at a profit of 25% per goat and 30% per bull. Determine the amount of profit made. **[4 Marks]**

QUESTION THREE [15 MARKS]

The table below shows the lengths in centimetres of 40 steel rods in a workshop.

Length in cm	$32-34$	$35-37$	$38-40$	$41-43$	$44-46$	$47-49$
Frequency	6	5	10	12	4	3

a) Draw a histogram. **[3 Marks]**

b) Determine the:

i. Mode **[3 Marks]**

ii. Median **[4 Marks]**

iii. Mean **[5 Marks]**

QUESTION FOUR [15 MARKS]

a) Given that $\begin{pmatrix} 2-a & -3 \\ -5 & 6+b \end{pmatrix} = \begin{pmatrix} -2 & -3 \\ -5 & 16 \end{pmatrix}$. Determine the values of a and b.

[2 Marks]

b) Given the matrices $A = \begin{pmatrix} 1 & 0 & 1 \\ 2 & -2 & 1 \\ 1 & 2 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} -2 & 1 & 1 \\ 3 & 0 & 1 \\ 1 & 2 & 1 \end{pmatrix}$, determine $AB - 4A + 3B$.

[6 Marks]

c) Solve the following equation:

$x^2 + 6x + 5 = 0$ **[4 Marks]**

d) Sales for a new magazine are expected to grow according the equation

$S = 200{,}000\left(1 - e^{-0.05t}\right)$, where t is given in weeks.

Calculate the number of magazines sold after 20 weeks. **[3 Marks]**

QUESTION FIVE [15 MARKS]

a) Let $U = \{whole\ numbers\ from\ 1\ to\ 15\}$, $A = \{factors\ of\ 12\}$ and $B = \{even\ numbers\ less\ than\ 15\}$

I. List the elements of A and B. **[2 Marks]**

II. Find:

i. $A \cap B$ **[2 Marks]**

ii. $A \cup B$ **[2 Marks]**

iii. $A - B$ **[2 Marks]**

iv. $n(A^C)$ **[2 Marks]**

b) Solve for x in the equation: $\log(3x+4) - \log(3-x) = 1$ **[5 Marks]**

END