NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

FACULTY OF HEALTH AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

QUALIFICATION: Bachelor of science in Applied Mathematics and Statistics	
QUALIFICATION CODE: 07BAMS	**LEVEL:** 5
COURSE CODE: LIA502S	**COURSE NAME:** LINEAR ALGEBRA 1
SESSION: January 2019	**PAPER:** THEORY
DURATION: 3 Hours	**MARKS:** 100

SECOND OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER	MR. B.E OBABUEKI
MODERATOR:	DR. O. SHUUNGULA

INSTRUCTIONS

1. Answer ALL the questions in the booklet provided.
2. Show clearly all the steps used in the calculations.
3. All written work must be done in blue or black ink and sketches must be done in pencil.

PERMISSIBLE MATERIALS

1. Non-programmable calculator without a cover.

THIS QUESTION PAPER CONSISTS OF 2 PAGES (Excluding this front page)

Question 1 (15 marks)

Consider the following vectors in R^3:

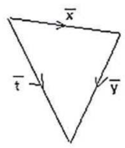
$$x = 2i - 3j + k \,,\; y = i - 2j + 3k \,,\; z = j + 2k$$

1.1 Determine the dot product $x \cdot z$ (2)

1.2 Find the cross product $y \times z$ (4)

1.3 Calculate the angle between x and y (6)

1.4 If the vectors x, y and t make a triangle as shown below, what is vector t? (3)



Question 2 (17 marks)

Consider the following matrices:

$$A = \begin{pmatrix} 1 & 5 & -1 \\ 0 & 3 & -2 \\ 1 & 4 & -3 \end{pmatrix}, \; B = \begin{pmatrix} 0 & 2 & 1 \\ 3 & -2 & 3 \end{pmatrix}, \; C = \begin{pmatrix} 2 & 2 & 1 & -3 \\ 0 & 3 & 0 & -4 \\ 0 & 3 & 0 & -5 \\ 1 & 2 & 3 & -6 \end{pmatrix}$$

2.1 Determine the matrix BA. (3)

2.2 Given that $f(x) = 5x - 2$, find $f(A)$. (4)

2.3 Obtain the determinant of matrix C. (10)

Question 3 (21 marks)

3.1 Use row operations to solve the following system of linear equations:

$$3x - 4y + z + 2t = 0$$
$$-2x + y - 3z - t = 0$$
$$4x - 7y - z + 3t = 0$$
$$x - 3y - 2z + t = 0$$

Use $z = 1$, $t = 2$ for your backward substitution. (13)

3.2 Use Cramer's rule to determine the value of b in the following system of linear equations:

$$a+b+c=2$$
$$2a-b+7c=0 \qquad (8)$$
$$3a+b-2c-5$$

Question 4 (22 marks)

4.1 Let U and W be two subspaces of the vector space V over the field F. Prove that $U \cap W$ is a subspace of V. (11)

4.2 Let $x=(x_1, x_2, x_3)$ and $y=(y_1, y_2, y_3)$ be in R^3 and let a be a real numbers. Show that

$a(x+y)=ax+ay$ (11)

Question 5 (25 marks)

5.1 Use the definition to investigate whether the subset $S=\{(2,-1,3),(-2,3,1),(1,1,2)\}$ of R^3 is linearly dependent or linearly independent. (17)

5.2 Does the set $S=\{(2,0),(-1,2)\}$ span R^2? (8)

END OF PAPER **TOTAL: 100 MARKS**