NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Faculty of Health and Applied Sciences

Department of Mathematics and Statistics

QUALIFICATION: Bachelor of Science Mathematics and Statistics	
QUALIFICATION CODE: 07BAMS, 07BOSC.	LEVEL: 5
COURSE: LINEAR ALGEBRA 1	COURSE CODE: LIA502S
DATE: JUNE 2019	SESSION: SEMESTER 1 2019
DURATION: 180 minutes	MARKS: 93

FIRST OPPORTUNITY QUESTION PAPER	
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THIS QUESTION PAPER CONSISTS OF 2__ PAGES
(Including this front page)

INSTRUCTIONS

1. Answer ALL the questions.
2. Write clearly and neatly.
3. Number the answers clearly.

QUESTION 1 (24 marks)

1.1 If $u = (1, -3, 4)$ and $v = (3, 4, 7)$ are vectors in R^3. Find

1.1.1 θ, of the angle between u and v. [4]

1.1.2 proj(u,v) , of u unto v [5]

1.1.3 d(u,v), the distance between u and v [5]

1.2 Suppose $u = 3i + 5j - 2k$ and $v = 4i - 8j + 7k$ Find:

1.2.1 the vector 3*u* +5 *v* [3]

1.2.2 the scalar $u \cdot v$ [3]

1.2.3 the value of $\left\|\frac{1}{u}\right\| \|v\|$ [4]

QUESTION 2 (25 marks)

2.1 Express

$v = (1, -2, 5)$ in R^3 as a linear combination of the vectors
$u_1 = (1,1,1),\ u_2 = (1,2,3),\ u_3 = (2,-1,1)$ [10]

2.2 Express the polynomial $v = t^2 + 4t - 3$ in **P**(t) as a linear combination of the polynomials $p_1 = t^2 - 2t + 5,\ p_2 = 2t^2 - 3t,\ p_3 = t + 1$. [15]

QUESTION 3 (12 marks)

If $A = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 1 & 2 \\ 1 & 2 & 4 \end{bmatrix}$ Find $A^{-1} = \begin{bmatrix} x_1 & x_2 & x_3 \\ y_1 & y_2 & y_3 \\ z_1 & z_2 & z_3 \end{bmatrix}$ [12]

by using the product $AA^{-1} = I$ as an identity.

QUESTION 4 (22 marks)

4.1 Find x, y, z ,t where $3\begin{bmatrix} x & y \\ z & t \end{bmatrix} = \begin{bmatrix} x & 6 \\ -1 & 2t \end{bmatrix} + \begin{bmatrix} 4 & x+y \\ z+t & 3 \end{bmatrix}$ [10]

4.2 Solve the following system using its augmented matrix M. [12]

$$x + 2y - z = 3$$
$$x + 3y + z = 5$$
$$3x + 8y + 4z = 17$$

QUESTION 5 (10 marks)

Use the definition to investigate whether the polynomials $p_1(t) = 2t^2 + 3t + 4$, $p_2(t) = t^2 - 3t$ and $p_3(t) = 4t - 5$ are linearly dependent or linearly independent. [10]

END OF EXAMINATION