**KENYA METHODIST UNIVERSITY**

**END OF 1ST TRIMESTER 2018 (FT) EXAMINATION**

**SCHOOL : SCIENCE & TECHNOLOGY**

**DEPARTMENT : PURE AND APPLIED SCIENCES**

**UNIT CODE : MATH 110**

**UNIT TITLE : LINEAR ALGEBRA I**

**TIME : 2 HOURS**

**INSTRUCTIONS**

* ***Answer Question One and any other Two Questions.***

**Question One:**

1. Given that

A = $\left[\begin{matrix}1&2\\3&4\end{matrix}\right]$ and B = $\left[\begin{matrix}1&1\\0&2\end{matrix}\right]$

 Determine C = 2 (B + A) – (2A + 2AB + B) (6marks)

1. Given that

 $\vec{a}$ = $\left(\begin{matrix}3\\2\\7\end{matrix}\right)$ and $\vec{b}$ = $\left(\begin{matrix}2\\4\\-2\end{matrix}\right)$ find

1. $\vec{a}$ . $\vec{b}$ (2marks)
2. $\vec{a}$ $×\vec{b}$ (4marks)
3. Find the distance between the following pair of points P(-3,1,2) and

Q(4,-1,1). (3marks)

1. Determine whether or not the set of vectors (1,2,0), (0,1,-1), (1,1,2) is linearly independent in **IR3** (4marks)
2. Given that **A** = $\left[\begin{matrix}3&5&1\\-2&3&1\\3&5&1\end{matrix}\right]$ Determine $\left|A\right|$**.** (4marks)
3. Prove that the following set is a basis for **IR3** (1,1,1), (1,2,3), (2,-1,1). (4marks)
4. Find the inverse of **B** = $\left[\begin{matrix}3&-1\\-5&2\end{matrix}\right]$ (3marks)

**Question Two**

1. Given that

**A** = $\left[\begin{matrix}2&7&1\\1&4&-1\\1&3&0\end{matrix}\right]$

Find;

i) det **A** (3marks)

ii) Inverse of **A** (6marks)

1. Let **a** = $\left[\begin{matrix}2\\5\\-3\end{matrix}\right]$ **b** = $\left[\begin{matrix}-4\\1\\9\end{matrix}\right]$ and c = $\left[\begin{matrix}4\\0\\2\end{matrix}\right]$ Determine 2**a** – 3**b** +**c** (4marks)
2. Using any method, solve the system of equations: (7marks)

2z + 4y + 6z = 18

4x + 5y + 6z = 24

3x + y – 2z= 4

**Question Three**

1. Express vector $\vec{u}$ = (3,7,-4) in **IR3** as linear combination of vectors

**u**1 = (1,2,3), **u**2  = (2,3,7) and **u**3  = (3,5,6) (5marks)

1. Show that the vectors **v**1 = (1,1,1) , **v**2 = (1,2,3) and **v**3 = (1,5,8) span **IR3**. (6marks)
2. Consider the vectors **p**1 = 1 + x + 4x2 and **p**2 = 1 + 5x + x2 in **P**2. Determine whether **p**1 and **p**2 lie in the span$\left\{1+2x- x^{2}, 3+5x+2x^{2}\right\}$. (9marks)

**Question Four**

a)(i) Define an orthogonal matrix A. (2marks)

ii) Verify that **A** = $\left[\begin{matrix}1&0\\0&-1\end{matrix}\right]$ is an orthogonal matrix. (3marks)

b) Given the following matrix **P** = $\left[\begin{matrix}2&7&1\\1&4&-1\\1&3&0\end{matrix}\right]$

 Find (i) det **P**(3marks)

 (ii) Inverse of **P** ie **P**-1 (6marks)

c) Use Cramer’s Rule to solve the system of equations:

 -x + 2y – 3z = 1

 2x + z = 0

 3x – 4y + 4z = 2 (6marks)