KENYA METHODIST UNIVERSITY

END OF 1^{ST} TRIMESTER 2010 EXAMINATIONS

FACULTY	**:**	**COMPUTING AND INFORMATICS**
DEPARTMENT	**:**	**COMPUTER INFORMATION SYSTEMS**
UNIT CODE	**:**	**BBIT 211**
UNIT TITLE	**:**	**LINEAR ALGEBRA 1**
TIME	**:**	**2 HOURS**

Instructions:

- *Answer question 1 and any other 2 questions.*

Question 1

a) Explain the following terms:

i) Basis

ii) Row equivalent

iii) Row echelon form (6 mks)

b) Use the reduction method to find the inverse of the matrix $A = \begin{bmatrix} 1 & 2 & -4 \\ -1 & -1 & 5 \\ 2 & 7 & 3 \end{bmatrix}$

Hence or otherwise, solve the system of equations.

x + 2y – 4z = -2

x – y + 5z = 5

2x + 7y + 3z = 3 (9 mks)

c) Let T:$R^3 \longrightarrow R^3$ be the mapping defined by

T(x,y,z) = (x+2y+5z, 3x+5y+13z, -2x-y-4z) find;

i) Standard matrix representing t

ii) A basis for the kernel of T

iii) A basis for the image of T (10 mks)

d) Determine whether or not, the vectors (1,1,1), (1,2,3) and (2,-1,1) span vector (1,-2,5) (5 mks)

Question 2

a) Use Cramer's rule to solve the system of equations.

2x+y-3z=1

5x+2y-6z = 5

3x-y-4z=7 (14 mks)

b) State in terms of the rank of a matrix, the conditions under which a system of linear equations $A\underline{x} = \underline{b}$ will have;

i) No solution

ii) Unique solution

iii) Infinitely many solutions (6 mks)

Question 3

a) Determine the value of c for which the set of vectors {(2,3,4), (3,-2,-1), (1,c,3)} is linearly independent. (7 mks)

b) Verify whether matrix; $B = \begin{pmatrix} 1 & 1 & 3 \\ 5 & 5 & 6 \\ -2 & -1 & -3 \end{pmatrix}$ is nilpotent of order 3. (6 mks)

c) Explain the following terms;

i) Rank of a matrix

ii) Linear transformation

iii) Subspace

iv) Linearly independent (7 mks)

Question 4

a) Use the cofactor expansion to find the inverse of the matrix. $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \\ 3 & 2 & 1 \end{bmatrix}$ (15 mks)

b) Given $T:R^2 \rightarrow R^2$ is defined by T(x,y) = (2x+y,x-y). Show that T is a linear transformation. (5 mks)