KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2009/2010 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE

COURSE CODE: **MATH 211**

COURSE TITLE: **LINEAR ALGEBRA I**

STREAM: **SESSION III**

DAY: **FRIDAY**

TIME: **2.00 – 4.00 P.M.**

DATE: **09/04/2010**

INSTRUCTIONS:

1. Answer question **ONE** and any other **TWO** questions
2. Begin each question on a separate page
3. Show your workings clearly and neatly.

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

a) Solve the following system of equation by row-reduction

$4x + 2y = 6$
$2x - 8y = -14$ (8 marks)

b) Given the matrices $A=\begin{bmatrix} 0 & 4 \\ 3 & -2 \\ -1 & 1 \end{bmatrix}$ $B=\begin{bmatrix} 3 & 1 \\ -7 & 0 \\ 6 & -1 \end{bmatrix}$ $C=\begin{bmatrix} 2 & 3 \\ -2 & 5 \\ 10 & -6 \end{bmatrix}$

Compute 3A + 2B – 1/2C (5 marks)

c) Determine the angle between the following vectors

i) **a** = (18,-4) and **b** = (8,36) (5marks)

ii) **u = (6,-2,12) v = (8,4,0)** (5 marks)

d) Determine if the given set is a subspace of the given vector space

i) Let W be the set of all points, (p,q), from R^2 in which $p \geq 0$. Is this a subspace of R^2 (3 marks)

ii) Let W be the set of all points, $(0, x_1, x_2)$, from R^3 in which $x \geq 0$. Is this a subspace of R^3 (4 marks)

QUESTION TWO (20 MARKS)

a) Compute the inverse of the following matrix using the determinant method

$$A = \begin{bmatrix} 8 & 4 & 2 \\ -4 & -12 & 6 \\ -14 & 10 & 0 \end{bmatrix}$$ (15 marks)

b) Compute the norms of the given vectors

i) v= (-5,3,9) (3 marks)

ii)j=(0,1,0) (2 marks)

QUESTION THREE (20 MARKS)

a) Suppose that the set V is the set of positive real numbers(i.e x>0) with addition and scalar multiplication defined as follows, $x + y = xy$ and $cx=x^c$

Show that this set under this addition and scalar multication is a vector space (14 marks)

b) Find the values of x for which $\left|\begin{pmatrix} 1 & x & x^2 \\ 1 & 1 & 1 \\ 4 & 5 & 0 \end{pmatrix}\right| = 0$ (6 marks)

QUESTION FOUR (20 MARKS)

a) Use Gaussian Elimination and Gauss-Jordan Elimination to solve the following system of linear equations.

$$\begin{aligned} x_1 + 2x_2 + x_3 &= 6 \\ 2x_1 + 3x_2 + 4x_3 &= 12 \\ 3x_1 + x_2 + x_3 &= 7 \end{aligned}$$

(12 marks)

b) Determine if each of the following sets of vectors are linearly independent or linearly dependent

i) $v_1 = (6,2)$ and $v_2 = (-4,4)$ (4 marks)

ii) $v_1 = (12,-8)$ and $v_2 = (-9,6)$ (4 marks)

QUESTION FIVE (20 MARKS)

a) Solve the following system of equation using cramer's rule

$$\begin{aligned} x_1 + x_2 - x_3 &= 4 \\ 2x_1 + x_3 &= 1 \\ x_1 + 2x_2 &= 2 \end{aligned}$$

(10 marks)

b) Determine a basis and dimension for the null space of

$$A = \begin{bmatrix} 7 & 2 & -2 & -4 & 3 \\ -3 & -3 & 0 & 2 & 1 \\ 4 & -1 & -8 & 0 & 20 \end{bmatrix}$$

(10 marks)