KABARAK   **UNIVERSITY**

UNIVERSITY EXAMINATIONS
2009/2010 ACADEMIC YEAR
FOR THE DEGREE OF BACHELOR OF COMPUTER

SCIENCE

COURSE CODE: MATH 211

COURSE TITLE: **LINEAR ALGEBRA I**

STREAM: **Y2S1**

DAY: **WEDNESDAY**

TIME: **9.00 – 11.00 A.M.**

DATE: **09/12/2009**

INSTRUCTIONS:

- Answer question **ONE** and any other **TWO** questions
- Begin each question on a separate page
- Show your workings clearly

PLEASE TURN OVER

QUESTION ONE (30 MARKS)

a) Define null space   **(2 marks)**

b) Determine the null space of the following matrices

   i) $\begin{bmatrix} 2 & 0 \\ -4 & 10 \end{bmatrix}$ **(4 marks)**   ii) $\begin{bmatrix} 1 & -7 \\ -3 & 21 \end{bmatrix}$ **(4 marks)**

c) Evaluate each of the following for the given matrix

$$A = \begin{pmatrix} -7 & 3 \\ 5 & 1 \end{pmatrix}$$

   i) A^2 **(3 marks)**   ii) p(A) where $p(x) = -6x^3 + 10x - 9$ **(5 marks)**

d)   Given the following vectors compute the indicated quantity

   a = (4,-6) b = (-3,-7) **c** = (-1,5) **u** = (1,-2,6) **v** = (0,4,-1) **w**= (9,2,-3)

   i)   **−w**   **(2 marks)**
   ii)   **a + b**   **(2 marks)**
   iii)   **a −c**   **(2 marks)**

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

   i)   Let W be the set of all points, (x,y), from R^2 in which $x \geq 0$. 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 **(3marks)**

QUESTION TWO (20 MARKS)

a) Determine the angle between the following vectors

   i)   **a** = (9,-2) and **b** = (4,18)   **(5marks)**

   ii)   **u** = (3,-1,6)   **v** = (4,2,0)   **(5 marks)**

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

$-2x_1+x_2-x_3=4$

$x_1+2x_2+3x_3=13$ **(10 marks)**

$3x_1 +x_3\quad =-1$

QUESTION THREE (20 MARKS)

a) Solve the following using row-operations method

$2x + y = 800$

$x + 3y = 1150$ **(10 marks)**

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

    i) $v_1 = (3,1)$ and $v_2 = (-2,2)$ **(5 marks)**

    ii) $v_1 = (12,-8)$ and $v_2 = (-9,6)$ **(5 marks)**

QUESTION FOUR (20 MARKS)

Compute the inverse of the following matrix using the determinant method

$$A = \begin{bmatrix} 4 & 2 & 1 \\ -2 & -6 & 3 \\ -7 & 5 & 0 \end{bmatrix}$$

QUESTION FIVE (20 MARKS)

a) Determine if each of the sets of vectors will be a basis for R^3

    i) $v1 =(1,-1,1)$ $v2 = (0,1,2)$ and $v3 = (3,0,-1)$ **(5 marks)**

    ii) $v1 = (1,0,0)$ $v2 = (0,1,0)$ and $v3 = (0,0,1)$ **(5 marks)**

b) Given u=(3,-1,4) and v=(2,0,1) compute each of the following

    i)   uxv and vxu **(7 marks)**

    ii)   uxu **(3 marks)**