KABARAK UNIVERSITY

UNIVERSITY EXAMINATIONS

2010/2011 ACADEMIC YEAR

FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE

COURSE CODE: MATH 211

COURSE TITLE: LINEAR ALGEBRA I

STREAM: SESSION I

DAY: FRIDAY

TIME: 2.00 – 4.00 P.M.

DATE: 26/11/2010

INSTRUCTIONS:

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

PLEASE TURNOVER

QUESTION ONE (30 MARKS)

a) For the following matrices, find

$$A=\begin{bmatrix}2 & 2 & 4\\ -3 & 0 & -1\\ 2 & 1 & 2\end{bmatrix} \qquad B=\begin{bmatrix}2 & 0 & 0\\ 1 & -4 & 3\\ -1 & 3 & 2\end{bmatrix}$$

i) 3A (2 marks)

ii) 3A – B (4 marks)

b) Find the inverse of the following matrix and show that $AA^{-1} = A^{-1}A=I$

$$A=\begin{bmatrix}1 & 4\\ -1 & -3\end{bmatrix}$$ (7 marks)

c) Given **u**=(12,-4,16) and **v**=(8,0,4) compute each of the following

u x **v** and **v** x **u** (7 marks)

d) Find the angle between the vectors p = 12i + 18j + 24k and q = 24i – 12j + 12k (6 marks)

e) Let A be an invertible matrix. Show that $\det(A^{-1}) = \dfrac{1}{\det(A)}$ (4 *marks*)

QUESTION TWO (20 MARKS)

Using Gaussian Elimination and proceeding using Gauss Jordan Elimination, solve the following system of equations

$$x-2y+3z=9$$
$$-x+3y=-4$$
$$2x-5y+5z=17$$

QUESTION THREE (20 MARKS)

a) Determine if the following sets of vectors will span R^3

i) $V_1 = (2,0,1)$, $v_2 = (-1,3,4)$ and $v_3 = (1,1,-2)$ (4 marks)

ii) $V_1 = (1,2,-1)$, $v_2 = (3,-1,1)$ and $v_3 = (-3,8,-5)$ (4 marks)

b) Find the rank of $A = \begin{bmatrix} 3 & 9 & 2 \\ 1 & 5 & 6 \\ 2 & 7 & 4 \end{bmatrix}$ (6 marks)

c) Given u = (-4, 6, 2,-2) and v = (14, 2,-8,-4) verify the cauchy-schwarz inequality and the triangular inequality (6 marks)

QUESTION FOUR(20 MARKS)

a) Given u=(9,-3,12) and v=(6,0,3) compute each of the following

i) u x v and v x u (5 marks)

ii) u x u (2 marks)

iii) u.(u x v) and v.(u x v) (4 marks)

iv) Angle between u and v (4 marks)

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

$V_1 = (2, 2,-2, 4)$, $v_2 = (4,-4, 0, 4)$ and $v_3 = (4,-16, 6,-2)$ (4 marks)

QUESTION FIVE (20 MARKS)

Find the inverse of the following matrix using determinant method

$3x_1 + 2x_2 - x_3 = 4$

$2x_1 - x_2 + 2x_3 = 10$

$x_1 - 3x_2 - 4x_3 = 5$