TECHNICAL UNIVERSITY OF MOMBASA

Faculty of Applied & Health Sciences

DEPARTMENT OF MATHEMATICS & PHYSICS

UNIVERSITY EXAMINATION FOR DEGREE OF:

BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING

AMA 2279: LINEAR BOOLEAN ALGEBRA

END OF SEMESTER EXAMINATION
SERIES: DECEMBER 2014
TIME ALLOWED: 2 HOURS

Instructions to Candidates:
You should have the following for this examination
- *Mathematical tables*
- *Scientific Calculator*

This paper consist of **FOUR** questions
Answer question **ONE (COMPULSORY)** and any other **TWO** questions
Maximum marks for each part of a question are as shown
This paper consists of **THREE** printed pages

Question One (Compulsory)

a) Given that $\vec{v} = (v_1, v_2, v_3)$ and $\vec{w} = (w_1, w_2, w_3)$ show that $\vec{v} \times \vec{w} = -\vec{w} \times \vec{v}$ **(4 marks)**

b) Find the equation of the plane P containing the points (2, 1, 3), (1, -1, 2) and (3, 2, 1) **(5 marks)**

c) Construct the truth tables for $\sim(p \wedge q)$ and $\sim(p \leftrightarrow q)$ **(4 marks)**

d) Define the term Augmented matrix **(2 marks)**

e) Convert $(98.1)_{10}$ to binary. **(4 marks)**

$$\begin{vmatrix} 7 & 2 & 3 \\ 4 & 1 & 5 \\ 2 & 0 & 3 \end{vmatrix}$$

f) Evaluate **(3 marks)**

$\vec{u}\times\left(\vec{v}\times\vec{w}\right)$ $\quad \vec{u}=(1,2,4),\ \vec{v}=(2,2,0) \quad \vec{w}=(1,3,0)$

g) Find for and **(4 marks)**

$\vec{u}=(2,1,3) \quad \vec{v}=(-1,3,2) \quad \vec{w}=(1,1,-2)$

h) Find the volume of a parallel piped with adjacent sides and

(4 marks)

Question Two

a) Apply the Gaus Jordan Method to solve the following system of equations:

$$2x_1+2x_2+6x_3=4$$
$$2x_1+x_2+7x_3=6$$
$$-2x_1-6x_2-7x_3=-1$$

(10 marks)

$$B=\begin{pmatrix} 1 & 1 & 1 \\ 2 & 3 & 4 \\ 5 & 8 & 9 \end{pmatrix}$$

b) Given find:

(i) det (B) **(2 marks)**

(ii) Adj (B) **(6 marks)**

(iii) B-1 using Adj (B) **(2 marks)**

Question Three

$$\cos\theta \frac{\vec{r}\cdot\vec{w}}{\left\|\vec{r}\right\|.\left\|\vec{w}\right\|}$$

θ $\quad \vec{v}=(v_1,v_2,v_3)$

a) (i) Show that where is the angle between the two vectors and

$\vec{w}=(w_1,w_2,w_3)$

(5 marks)

$\vec{v}=(2,1,-1) \quad (3,4,1)$

(ii) Find the angle between the vectors and **(3 marks)**

b) (i) Find the distance d from (2, 4, -5) to the plane 5x – 3y +x -10 = 0 **(3 marks)**

$5x-3y+z-1=0 \quad 2x+4y-z+3=0$

(ii) Find the line of intersection L of the planes and

(5 marks)

c) Determine the truth of the following statements:

(i) Mombasa in Kenya and 2 + 4 = 7

(ii) x = 2 is a solution of $x^2 = 4$ or 5<8 **(2 marks)**

Question Four

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

a) Find the inverse of the matrix by Row reduction **(8 marks)**

b) Define the following terms:

(i) Non-homogeneous system **(2 marks)**

(ii) Homogenous system **(2 marks)**

c) Find the solution of the following system of equation:

$$x_1 + 2x_2 + 2x_3 + 3x_4 = 0$$
$$2x_1 + 4x_2 + x_3 + 3x_4 = 0$$
$$3x_1 + 6x_2 + x_3 + 4x_4 = 0$$

(8 marks)

Question Five

a) Find the Eigen values associated with the matrix

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

(6 marks)

b) Find the truth table of $(p \to q) \wedge (q \to r) \to (p \to r)$ **(6 marks)**

c) Find the cofactor matrix of $\begin{pmatrix} 1 & 0 & 2 \\ 2 & 1 & 0 \\ 1 & 1 & 1 \end{pmatrix}$ **(8 marks)**