MACHAKOS UNIVERSITY

University Examinations 2017/2018

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF MATHEMATICS AND STATISTICS

SECOND YEAR FIRST SEMESTER EXAMINATIONS FOR

BACHELOR OF SCIENCE IN MATHEMATICS AND COMPUTER SCIENCE

BACHELOR OF SCIENCE IN STATISTICS AND PROGRAMMING

BACHELOR OF ARTS

BACHELOR OF EDUCATION

SMA 202: LINEAR ALGEBRA II

DATE: 11/12/2017 **TIME: 2.00-4.00 PM**

INSTRUCTIONS

Answer QUESTION ONE and any other TWO QUESTIONS

QUESTION ONE (30 MARKS) (COMPULSORY)

a) Transpose the following matrix

$$\begin{pmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 3 & 4 & 7 \end{pmatrix}$$ (2 marks)

b) Find the determinant of the following matrix

$$A = \begin{pmatrix} 2 & 3 & 6 \\ 1 & 1 & 2 \\ 2 & 3 & 4 \end{pmatrix}$$ (3 marks)

c) Calculate the cross product of the vectors $u = (1,2,3)$ and $v = (-1,1,2)$. (3 marks)

d) Solve the following simultaneous equation using inverse matrix method

$$2x_1 - x_2 = 4$$
$$3x_1 + 2x_2 = 6$$
(3 marks)

e) Solve the following system of equation by elimination method

$$x + y + z = 5$$
$$x + 2y + 3z = 10$$
$$2x + y + z = 6$$
(4 marks)

f) Determine if (1,2,3,1), (2,2,1,) and (-1,2,7,3) is linearly dependent (4 marks)

g) Find the parametric and the symmetric equations of the line passing through the point $(2,3,-4)$ and parallel to the vector $(3,5,-6)$ (5 marks)

h) Find the equation of a plane through $(-1,2,3)$ and perpendicular to

$$2x - 3y + 4z = 1$$
$$3x - 5y + 2z = 3$$
(6 marks)

QUESTION TWO (20 MARKS)

a) Find the angle between the given two vectors

$$a = i + 4j + 8k$$
$$b = 5i + 4j + 3k$$
(5 marks)

b) Find the parametric and symmetric equation of the line passing the point $(1,-3,4)$ and parallel to the vector $(3,5,-6)$ (5 marks)

c) Find the inverse of the following matrices

$$\begin{pmatrix} \cos\theta & \sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$$
(5 marks)

d) Prove that the diagonals of a rhombus are perpendicular. (5 marks)

QUESTION THREE (20 MARKS)

a) Reduce the following matrixes to echelon form and state the rank

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

b) Solve by Crammer's Rule

$$2x+3y-z=1$$
$$3x+5y+2z=8 \qquad \text{(5 marks)}$$
$$x-2y-3z=-1$$

c) Write $E=\begin{pmatrix} 3 & 1 \\ 1 & -1 \end{pmatrix}$ as a linear combination of the matrices

$A=\begin{pmatrix} 1 & 1 \\ 0 & 1 \end{pmatrix}$, $B=\begin{pmatrix} 0 & 0 \\ 1 & 1 \end{pmatrix}$ and $C=\begin{pmatrix} 0 & 2 \\ 0 & -1 \end{pmatrix}$ (5 marks)

d) Find the angle between the following two planes

$2x+y-2z=1$ and $x-2y-2z=2$ (6 marks)

QUESTION FOUR (20 MARKS)

a) If $\begin{vmatrix} y & 5 \\ y & 2y+1 \end{vmatrix}=4$ find y (3 marks)

b) Find the minors and cofactors of each element of matrix A. Also find the $AdjA$

$$A=\begin{pmatrix} 2 & 3 & -4 \\ 0 & -4 & 2 \\ 1 & -1 & 5 \end{pmatrix}$$ (7 marks)

c) Express $W=(-7,7,11)$ as a linear combination of the vectors $V_1=(1,2,1), V_2=(-4,-1,2)$ and $V_3=(-3,1,3)$

(10 marks)

QUESTION FIVE (20 MARKS)

a) Show that the vectors $u=(1,-1,0), v=(1,3,-1)$ and $w=(5,3,-2)$ are linearly dependent.

(5 marks)

b) Find the inverse A given that;

$$A=\begin{pmatrix} 4 & 0 & 1 \\ 2 & 2 & 0 \\ 3 & 1 & 1 \end{pmatrix}$$ (7 marks)

c.) Solve the simultaneous equation using the gauss- Jordan elimination method

$$2x-4y+6z=20$$
$$3x-6y+z=22 \qquad \text{(8 marks)}$$
$$-2x+5y-2z=-18$$