KENYATTA UNIVERSITY

UNIVERSITY EXAMINATIONS 2009/2010

OPEN, DISTANCE AND E-LEARNING EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE AND BACHELOR OF EDUCATION

SMA 202: LINEAR ALGEBRA I

DATE: Wednesday 21st July, 2010 **TIME:** 2.00 p.m – 4.00 p.m

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INSTRUCTIONS:

Answer question ONE and any other TWO questions.

Question One- Compulsory **(30 MARKS)**

a) Given $A = \begin{pmatrix} 1 & 2 \\ 3 & 5 \end{pmatrix}$, $B = \begin{pmatrix} 2 & 1 \\ 1 & 3 \end{pmatrix}$.

Show that $(A B)^T = B^T A^T$ [3 marks]

b) Evaluate i) $\begin{vmatrix} 2 & 3 & 4 \\ 5 & 6 & 7 \\ 8 & 9 & 1 \end{vmatrix}$ [2 marks]

ii) Hence find $\begin{vmatrix} 18 & 21 & 6 \\ 5 & 6 & 7 \\ 8 & 9 & 1 \end{vmatrix}$ [1mark]

c) i) Let $A = \begin{pmatrix} 1 & 2 & 1 \\ 3 & -4 & -2 \\ 5 & 3 & 5 \end{pmatrix}$ Find A^{-1} [6 marks]

ii) Hence solve the given system

$x + 2y + z = 4$

$3x - 4y - 2z = 2$

$5x + 3y + 5z = -1$ [4 marks]

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d) Solve using Crammer's rule

$$2x-5y+2z=7$$
$$x+2y-4z=3$$
$$3x-4y-6z=5$$

[4 marks]

e) Determine k so that the vectors $\underline{u}=(2,3k,-4,1,5)$ and $v=(6,-1,3,7,2k)$ are orthogonal. [3 marks]

f) Write the vector $v=(1,-2,5)$ as a linear combination of the vectors $e_1=(1,1,1)$, $e_2=(1,2,3)$ and $e_3=(2,-1,1)$. [6 marks]

h) Show that the vectors $(1,1,1,1),(0,1,1,1),(0,0,1,1)$ and $(0,0,0,1)$ form a basis for $\Re^4$

[2 marks]

Question Two **(20 marks)**

a) Find the value of λ if the matrix A below is singular

$$A=\begin{bmatrix}\lambda & \lambda \\ 3 & \lambda-2\end{bmatrix}$$

[2 marks]

b) Reduce matrix $A=\begin{bmatrix}1 & -2 & 3 & -1 \\ 2 & -1 & 2 & 2 \\ 3 & 1 & 2 & 3\end{bmatrix}$ to row-reduced echelon form. [6 marks]

c) Use Crammer's rule to solve the system of equations

$$x_1+3x_2+2x_3=3$$
$$2x_1+4x_2+2x_3=8$$
$$x_1+2x_2-x_3=10$$

[6 marks]

d) Using Gauss – Jordon method, solve for x_1, x_2 and x_3

$$2x_1-4x_2+6x_3=20$$
$$3x_1-6x_2+x_3=22$$
$$-2x_1+5x_2-2x_3=-18$$

[6 marks]