

**W1-2-60-1-6**

**JOMO KENYATTA UNIVERSITY OF AGRICULTURE AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS 2014/2015**

**EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN ACTURIAL SCIENCE**

**SMA 2306: LINEAR ALGEBRA II**

**DATE:DECEMBER 2014 TIME: 2 HOURS**

**Instructions: Attempt question one and any other two questions.**

**QUESTION ONE (30 MARKS)**

a. Use a counter – example to show that V the set of ordered pairs of real numbers: V={ab:ab∈ℝ} is not a vector space over ℝ with respect to the following operations of addition and scalar multiplication.

 (a, b)+(c, d)=(c,d) and K (a,b) = (ka, kb) (4 marks)

b. Find a formula for the linear mapping F:ℝ3→ℝ3 whose image is generated by the set of vectors {4,5,6), (7,8,9)} (5 marks)

c. Find the standard matrix representation of the linear operator T on ℝ3 such that

 T(x,yz)=(4x-3y+4z, 5x-y+2z, 5x+7y) (5 marks)

d. Define a linear mapping F:ℝ2→ℝ2 by f(x,y)=(x+y,x+y). Find a basis and the dimension of

 i. Its image u, and

 ii. Its kernel W. (7 marks)

e. i. Define the linear operator T on ℝ2 by T(x,y)=(2x+y, 4x-y) compute the matrix representation of T relative to the basis {g1=(1,1) g2=(-1 0)}

 (5 marks)

 ii. Compute the eigen values of the matrix.

  (4 marks)

**QUESTION TWO (20 MARKS)**

a. Find:

 i. The determinant det (A)

 ii. ad; (A)

 iii. A-1

 where A= (10 marks)

b. Determine whether the matrix

 A= is a zero of the polynomial P(x)=x3+2x2-4x+3 (10 marks)

**QUESTION THREE (20 MARKS)**

a. Let F:ℝ3→ℝ2 be the linear mapping defined by F(x,y, z)=(3x-2y+4z, x-5y+3z). Find the matrix of F relative to the bases of R3 and R2:

 {f, =(1,1,1) f2=(1,1,0), f3=(1,0,0)} {g=(1,3) g2=(2, 5)} (10 marks)

b. Let

 A=

 i. Find the eigen values

 ii. The base for the eigen space.

 iii. A non- singular matrix P, such that D=P-1 AP is diagonal. (10 marks)

**QUESTION FOUR (20 MARKS)**

a. i. State Cayley – Hamilton theorem.

 ii. Find the characteristic polynomial of the matrix.

 A= and hence

 iii. Verify Cayley Hamiton theorem for matrix A. (10 marks)

b. Determine which properties of a vector space are not satisfied by

 i. W- the set of natural numbers.

 ii. Z- the set of integers. (10 marks)