

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

**JOMO KENYATTA UNIVERSITY**

**OF**

**AGRICULTURE AND TECHNOLOGY**

**UNIVERSITY EXAMINATIONS 2015/2016**

**SECOND YEAR FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE IN INFORMATION TECHNOLOGY**

 **SMA 2201: LINEAR ALGEBRA I**

**DATE: APRIL, 2016 TIME: 2 HOURS**

**INSTRUCTIONS: QUESTION ONE (COMPULSORY) AND ANY OTHER TWO QUESTION**

**QUESTION ONE (COMPULSORY) (30 MARKS)**

1. Find the value of k for which the following system of linear

 equations in consistent: [3 marks]

 x + 2y = 4

 2x - y = 3

 3x + y = k

1. Using Gaussian elimination method to solve the system of

equations: [4 marks]

 x1 + x2 + 2x3 = 2

 x1 + 2x2 + 3x3 = 1

 3x1 + 7x2 + 4x3 = 14

1. Find value of for which the determinant of the matrix below is

equal to zero

 

 [3 marks]

1. Let A =  Find
2. Adjoint A [3 marks]
3. A-1 [2 marks]
4. i) State Cramer’s rule [2 marks]

ii) Use Cramer’s rule to solve the following system of equations:

 2x1 + 8x2 + 6x3 = 20

 4x1 + 2x2 - 2x3 = 2

 3x1 - x2 + x3 = 11

 [6 marks]

1. A line L in R3 passes through the points P(2, -1, 6) and (3, 1, -2).

Determine:

1. Vector equation [2 marks]
2. Parametric equation [2 marks]
3. Symmetric equation [1 mark]
4. Show that the vector v = -7 + 7 + 7 is a linear combination

of a = - + 2 + 4

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and b 5 - 3 +  [2marks]

**QUESTION TWO (20 MARKS)**

1. i) Define the term basis of a vector space V [2 marks]

 ii) Let S = {V1 = (2, -1, 4), V2 = (4, 1, 6)}

 Show that the set S is a basis forR3 [5 marks]

1. Show that is <u, v> =x1y1+ x2y2 + x3y3 where u = (x1, x2, x3)

 and v = (y1, y2, y3) is not an inner product on R3  [4 marks]

1. i) Define the term linear transformation [1 mark]

 ii) Show that T: R2  R3 define by

 T  is linear transformation [6 marks]

1. T is a linear transformation from R3  R2 and

 T  = ; T = ; T = 

 Compute T  [2 marks]

**QUESTION THREE (20 MARKS)**

1. i) Define the term a symmetric matrix. [1 mark]

ii) Find the numbers  and  such that the matrix

  is symmetric [2 marks]

iii) Prove that a symmetric matrix of order two is diagonalizable. [3 marks]

1. State Carley-Hamilton theorem. [2 marks]
2. Use it to verify for the matrix A =  [3 marks]
3. Hence evaluate A-1 [3 marks]
4. Show that the determinant of a second order matrix with

identical rows is zero [2 marks]

1. Find the equation of a plane passing through the points

P(1, 2, 1); Q(-2, 3, -1) and R(1, 0, 4). [4 marks]

**QUESTION FOUR (20 MARKS)**

1. i) Calculate the area of a parallelogram whose consecutive

 vertices are P(1, 3, -2); Q(2, 1, 4) and R (-3, 1, 6) by use

 of method of determinants. [3 marks]

ii) Under what conditions will the determinants be zero? [2 marks]

1. Consider the vectors u =(1,-3, 7) and v= (8, -2, -2) find:
2. u.v [2 marks]
3. angle between them [2 marks]
4. Let V =R3 and S= {(-4, -3, 4); (1, -2, 3); (6, 0, 0)}.

Determine whether S is lineary independent. [2 marks]

1. The matrix A = .

Find:

1. Eigen values of the matrix [4 marks]
2. Eigen vector corresponding to the largest eigen value [3 marks]
3. Let A =  Determine whether or not the matrix A

is diagonalizable. [2 marks]