

TECHNICAL UNIVERSITY OF KENYA

FACULTY OF APPLIED SCIENCES AND TECHNOLOGY

SCHOOL OF COMPUTING & INFORMATION TECHNOLOGY

END OF SEMESTER EXAMINATION SERIES

FIRST SEMESTER EXAMINATION 2018/2019

THIRD YEAR EXAMINATIONS FOR THE DEGREE OF

BACHELOR OF TECHNOLOGY IN INFORMATION TECHNOLOGY

BACHELOR OF TECHNOLOGY IN COMPUTER TECHNOLOGY

BACHELOR OF TECHNOLOGY IN COMMUNICATION AND COMPUTER NETWORKS

**ECSI/ECII/ECCI 3102: LINEAR ALGEBRA**

TIME: 2 Hours

**Instructions to candidates:**

This paper consists of FIVE Questions.

Answer Question ONE [30 Marks] and any other TWO Questions [20 Marks Each].

Write your college number on the answer sheet.

This paper consists of 4 printed pages

**Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.**

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**QUESTION ONE (30 MARKS) COMPULSORY**

1. Differentiate between a vector and a scalar giving at least two examples of each.

(4 marks)

1. Differentiate between an orthogonal matrix and a symmetric matrix. (4 marks)
2. Evaluate AB where:

 and  (3 marks)

1. Given that  find:
2.  (2 marks)
3.  (3 marks)
4. Find all the eigen values and eigen vectors of the matrix

 (8 marks)

1. Find x, y, z, t where

 (6 marks)

**QUESTION TWO (20 MARKS)**

1. Define a matrix and describe four types of matrices (4 marks)
2. Given that  evaluate  (6 marks)
3. Use Cramer’s rule to solve the system

 (8 marks)

1. Define transpose of a matrix (2 marks)

**QUESTION THREE (20 MARKS)**

1. Use the Gauss-Jordan elimination algorithm, to solve the following system of linear equations.

 (15 marks)

1. Do you need linear algebra in your area of study? Explain (5 marks)

**QUESTION FOUR (20 MARKS)**

1. Define a block matrix/partitioned matrix with the aid of a well-illustrated example

(2 marks)

1. Let , find:
2. All eigen values and corresponding eigen vectors
3. Find matrices P and D such that P is nonsingular and  is diagonal.

(8 marks)

1. Consider the vectors  and  in **R2**. find
2.  with respect to the usual inner product in **R2**
3.  using the usual inner product in **R2** (5 marks)
4. Consider the mapping  defined by . Find:
5. 
6. 
7.  (5 marks)

**QUESTION FIVE (20 MARKS)**

1. Show that  in  and find the angle between the vectors:  and . (10 marks)
2. The acceleration of a particle at any time  is given by:



If the velocity  and displacement  are zero at , find  and  at any time.

(8 marks)

1. State Cayley Hamilton theorem (2 marks)