**EE1004 Assignment 3 – 2023/24 Semester A**

**Solutions**

1. In a co-ordinate system with unit vectors and , a vector . A linear transformation, L1 is applied to it such that the unit vectors and are moved to new vectors , and respectively.

(a) What is the location of the transformed version of vector in the new coordinate system defined by and and the old coordinate system defined by and ?

(15 marks)

Transformed () = L1() = 5 -

i.e, it has same coordinates in the new transformed system. (5 marks)

In terms of the old system, the coordinates of the transformed vector are:

5 - = 5 - = (10 marks)

(b) Find the matrix M1 denoting this linear transformation. What is the position of the origin under this linear transformation?

(10 marks)

(5 marks)

Position of origin is unchanged at since M1.= (5 marks)

(c) Find the inverse of this matrix M1 if it exists.

(15 marks)

det(M1) = -1 🡪 Hence, inverse exists due to non-zero determinant.

A11 = -1

A12 = 1

A21 = 0

A22 = 1 (10 marks)

(5 marks)

2.(a) For which value of x is the following matrix A not invertible?

(15 marks)

For matrix A to be not invertible, det(A) = 0

* 5 – 2x = 0
* x = 2.5

(b) Now, suppose x=1 in the matrix given in part (a). Find the eigen values and eigen vectors of this matrix if they exist.

(25 marks)

For eigen-vector “v” with eigen value λ, (A- λI)v = 0

* det(A – λI) = 0
* det()=0
* (1- λ)(5- λ) – 2 =0
* λ2 -6 λ +3 = 0
* λ = (15 marks)

Finding eigen vectors for

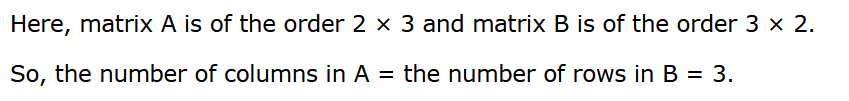
(5 marks)

Finding eigen vectors for

(5 marks)

3. Find the matrix product AB where A and B are given as follows:

(20 marks)



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(5 marks for each entry of the product matrix)