Matrix Theory: Assignment 9

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Abstract—**This document is based on finding eigen values of a symmetric matrix.**

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1 PROBLEM

Which of the following are eigen values of the matrix

$$\mathbf{A} = \begin{pmatrix} 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & 0 \end{pmatrix} \quad ? \tag{1.0.1}$$

1) $+1$
2) -1
3) $+i$
4) $-i$

2 SOLUTION

Here $\mathbf{A}^T = \mathbf{A}$. Therefore matrix $\mathbf{A}$ is a symmetric matrix.

We know that the eigen values of a real symmetric matrix are all real.

Thus, we can eliminate option 3 and 4.

We also know that the sum of eigen values of a matrix is equal to the trace of the matrix.

From (1.0.1), trace of $\mathbf{A}$ = 0, which is only possible if the eigen values are +1 and -1.

Therefore, option 1 and 2 are the correct choices.