Assignment-14

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EE20MTECH14015

Abstract—**This assignment deals with linear transformation.**

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https://github.com/satyam463/Assignment−14/blob/
main/Assignment%2014.tex

1 PROBLEM STATEMENT

Let $\mathbf{T}$ be the unique linear operator on C^3 for which

$$\mathbf{T}_{\epsilon_1} = \begin{pmatrix} 1 & 0 & i \end{pmatrix}, \mathbf{T}_{\epsilon_2} = \begin{pmatrix} 0 & 1 & 1 \end{pmatrix}, \mathbf{T}_{\epsilon_3} = \begin{pmatrix} i & 1 & 0 \end{pmatrix}$$

$$(1.0.1)$$

Is $\mathbf{T}$ invertible ?

2 SOLUTION

consider the row reduced matrix

$$\begin{pmatrix} 1 & 0 & i \\ 0 & 1 & 1 \\ i & 1 & 0 \end{pmatrix} \xleftarrow[R_3 \to R_3 - R_2]{R_3 \to R_3 - iR_1} \begin{pmatrix} 1 & 0 & i \\ 0 & 1 & 1 \\ 0 & 0 & 0 \end{pmatrix} \qquad (2.0.1)$$

Therefore the rank = no. of pivot columns = 2 (less than no. of columns).Thus these are not linearly independent. Hence $\mathbf{T}$ is not invertible.