Assignment 2

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Download latex-tikz codes from

https://github.com/KBVijayVarma/EE3900/tree/
main/Assignment_2

Download python code from

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PROBLEM (MATRIX/Q.2.22(I))

Express the following matrix as the sum of a symmetric and a skew symmetric matrix $\begin{pmatrix} 3 & 5 \\ 1 & 1 \end{pmatrix}$

SOLUTION

Let the given Matrix be

$$\mathbf{A} = \begin{pmatrix} 3 & 5 \\ 1 & 1 \end{pmatrix} \quad (0.0.1)$$

Transposing the above matrix gives,

$$\mathbf{A}^\top = \begin{pmatrix} 3 & 1 \\ 5 & 1 \end{pmatrix} \quad (0.0.2)$$

Now, for Symmetric and Skew Symmetric Matrix,

$$\mathbf{B} = \frac{\mathbf{A} + \mathbf{A}^\top}{2} = \begin{pmatrix} 3 & 3 \\ 3 & 1 \end{pmatrix} \quad (0.0.3)$$

$$= \mathbf{B}^\top \quad (0.0.4)$$

Also,

$$\mathbf{C} = \frac{\mathbf{A} - \mathbf{A}^\top}{2} = \begin{pmatrix} 0 & 2 \\ -2 & 0 \end{pmatrix} \quad (0.0.5)$$

$$= -\mathbf{C}^\top \quad (0.0.6)$$

Hence, $\mathbf{B}$ is a Symmetric Matrix and $\mathbf{C}$ is a Skew Symmetric Matrix and $\mathbf{B} + \mathbf{C} = \mathbf{A}$.

$$\therefore \begin{pmatrix} 3 & 5 \\ 1 & 1 \end{pmatrix} = \begin{pmatrix} 3 & 3 \\ 3 & 1 \end{pmatrix} + \begin{pmatrix} 0 & 2 \\ -2 & 0 \end{pmatrix} \quad (0.0.7)$$