

ASSIGNMENT 2

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Download all python codes from

<https://github.com/harithar1234/EE3900-Haritha/blob/main/ASSIGNMENT2/assignment2.py>

QUESTION

Matrices 2.20

For the matrix $\mathbf{A} = \begin{pmatrix} 1 & 5 \\ 6 & 7 \end{pmatrix}$, verify that

- (i) $(\mathbf{A} + \mathbf{A}^T)$ is a symmetric matrix
- (ii) $(\mathbf{A} - \mathbf{A}^T)$ is a skew symmetric matrix

SOLUTION

Given,

$$\mathbf{A} = \begin{pmatrix} 1 & 5 \\ 6 & 7 \end{pmatrix} \quad (0.0.1)$$

Transposing the matrix,

$$\mathbf{A}^T = \begin{pmatrix} 1 & 6 \\ 5 & 7 \end{pmatrix} \quad (0.0.2)$$

i) Using (0.0.1) and (0.0.2) we get,

$$(\mathbf{A} + \mathbf{A}^T) = \begin{pmatrix} 1 & 5 \\ 6 & 7 \end{pmatrix} + \begin{pmatrix} 1 & 6 \\ 5 & 7 \end{pmatrix} \quad (0.0.3)$$

$$(\mathbf{A} + \mathbf{A}^T) = \begin{pmatrix} 2 & 11 \\ 11 & 14 \end{pmatrix} \quad (0.0.4)$$

Using (0.0.4) we get,

$$(\mathbf{A} + \mathbf{A}^T)^T = \begin{pmatrix} 2 & 11 \\ 11 & 14 \end{pmatrix} \quad (0.0.5)$$

Using (0.0.4) and (0.0.5) we get,

$$(\mathbf{A} + \mathbf{A}^T)^T = (\mathbf{A} + \mathbf{A}^T) \quad (0.0.6)$$

$\therefore (\mathbf{A} + \mathbf{A}^T)$ is symmetric matrix.

ii) Using (0.0.1) and (0.0.2) we get,

$$(\mathbf{A} - \mathbf{A}^T) = \begin{pmatrix} 1 & 5 \\ 6 & 7 \end{pmatrix} - \begin{pmatrix} 1 & 6 \\ 5 & 7 \end{pmatrix} \quad (0.0.7)$$

$$(\mathbf{A} - \mathbf{A}^T) = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix} \quad (0.0.8)$$

Using (0.0.8) we get,

$$(\mathbf{A} - \mathbf{A}^T)^T = \begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix} \quad (0.0.9)$$

Using (0.0.8) and (0.0.9) we get,

$$(\mathbf{A} - \mathbf{A}^T)^T = -(\mathbf{A} - \mathbf{A}^T) \quad (0.0.10)$$

$\therefore (\mathbf{A} - \mathbf{A}^T)$ is skew symmetric matrix.