ASSIGNMENT 1

CS21BTECH11020

1 Problem 6b (2018)

1.1. If $\mathbf{A} = \begin{pmatrix} 2 & 3 \\ 5 & 7 \end{pmatrix}$, $\mathbf{B} = \begin{pmatrix} 0 & 4 \\ -1 & 7 \end{pmatrix}$ and $\mathbf{C} = \begin{pmatrix} 1 & 0 \\ -1 & 4 \end{pmatrix}$, Find $\mathbf{AC} + \mathbf{B^2} - 10\mathbf{C}$.
Solution: We have,

$$\mathbf{A} = \begin{pmatrix} 2 & 3 \\ 5 & 7 \end{pmatrix} \tag{1.1.1}$$

$$\mathbf{B} = \begin{pmatrix} 0 & 4 \\ -1 & 7 \end{pmatrix} \tag{1.1.2}$$

$$\mathbf{C} = \begin{pmatrix} 1 & 0 \\ -1 & 4 \end{pmatrix} \tag{1.1.3}$$

Since we know the identities ,

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} w & x \\ y & z \end{pmatrix} = \begin{pmatrix} aw+by & ax+bz \\ cw+dy & cx+dz \end{pmatrix} \tag{1.1.4}$$

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix} \pm \begin{pmatrix} w & x \\ y & z \end{pmatrix} = \begin{pmatrix} a \pm w & b \pm x \\ c \pm y & d \pm z \end{pmatrix} \tag{1.1.5}$$

Using Identity (1.1.4), we have

$$\mathbf{AC} = \begin{pmatrix} 2 & 3 \\ 5 & 7 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ -1 & 4 \end{pmatrix} \tag{1.1.6}$$

$$= \begin{pmatrix} 2-3 & 0+12 \\ 5-7 & 0+28 \end{pmatrix} \tag{1.1.7}$$

$$\mathbf{AC} = \begin{pmatrix} -1 & 12 \\ -2 & 28 \end{pmatrix} \tag{1.1.8}$$

$$\mathbf{B^2} = \mathbf{BB} = \begin{pmatrix} 0 & 4 \\ -1 & 7 \end{pmatrix} \begin{pmatrix} 0 & 4 \\ -1 & 7 \end{pmatrix} \tag{1.1.9}$$

$$= \begin{pmatrix} 0-4 & 0+28 \\ 0-7 & -4+49 \end{pmatrix} \tag{1.1.10}$$

$$\mathbf{B^2} = \begin{pmatrix} -4 & 28 \\ -7 & 45 \end{pmatrix} \tag{1.1.11}$$

and,

$$10\mathbf{C} = 10(\mathbf{I})\mathbf{C} = \begin{pmatrix} 10 & 0 \\ 0 & 10 \end{pmatrix} \begin{pmatrix} 1 & 0 \\ -1 & 4 \end{pmatrix} \tag{1.1.12}$$

$$= \begin{pmatrix} 10+0 & 0+0 \\ 0-10 & 0+40 \end{pmatrix} \tag{1.1.13}$$

$$10\mathbf{C} = \begin{pmatrix} 10 & 0 \\ -10 & 40 \end{pmatrix} \tag{1.1.14}$$

Using Identity (1.1.5) and values from (1.1.8), (1.1.11) and (1.1.14), We have
$\mathbf{AC} + \mathbf{B^2} - 10\mathbf{C} =$

$$\begin{pmatrix} -1 & 12 \\ -2 & 28 \end{pmatrix} + \begin{pmatrix} -4 & 28 \\ -7 & 45 \end{pmatrix} - \begin{pmatrix} 10 & 0 \\ -10 & 40 \end{pmatrix} \tag{1.1.15}$$

$$\boxed{\mathbf{AC} + \mathbf{B^2} - 10\mathbf{C} = \begin{pmatrix} \mathbf{-15} & \mathbf{40} \\ \mathbf{1} & \mathbf{33} \end{pmatrix}} \tag{1.1.16}$$