Algebra of Matrices Ex 5.2 Q19(i)

$$3\begin{bmatrix} x & y \\ z & t \end{bmatrix} = \begin{bmatrix} x & 6 \\ -1 & 2t \end{bmatrix} + \begin{bmatrix} 4 & x+y \\ z+t & 3 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 3x & 3y \\ 3z & 3t \end{bmatrix} = \begin{bmatrix} x+4 & 6+x+y \\ -1+z+t & 2t+3 \end{bmatrix}$$

Comparing the corresponding elements of these two matrices, we get:

$3x = x+4$

$\Rightarrow 2x = 4$

$\Rightarrow x = 2$

$3y = 6+x+y$

$\Rightarrow 2y = 6+x = 6+2 = 8$

$\Rightarrow y = 4$

$3t = 2t+3$

$\Rightarrow t = 3$

$3z = -1+z+t$

$\Rightarrow 2z = -1+t = -1+3 = 2$

$\Rightarrow z = 1$

$\therefore x = 2,\ y = 4,\ z = 1,$ and $t = 3$

Algebra of Matrices Ex 5.2 Q19(ii)

$$2\begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & 4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 14 \\ 15 & 14 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 2x & 10 \\ 14 & 2y-6 \end{bmatrix} + \begin{bmatrix} 3 & 4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 14 \\ 15 & 14 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 2x+3 & 14 \\ 15 & 2y-4 \end{bmatrix} = \begin{bmatrix} 7 & 14 \\ 15 & 14 \end{bmatrix}$$

Comparing the corresponding elements from both sides,

$2x+3=7 \Rightarrow 2x=4 \Rightarrow x=2$

$2y-4=14 \Rightarrow 2y=18 \Rightarrow y=9$

Hence, $x = 2,\ y = 9$

Algebra of Matrices Ex 5.2 Q20

Let us solve this problem using simultaneous linear equation and algebra of matrices.

$2X + 3Y = \begin{bmatrix} 2 & 3 \\ 4 & 0 \end{bmatrix}$ ..... (1)

$3X + 2Y = \begin{bmatrix} -2 & 2 \\ 1 & -5 \end{bmatrix}$ .....(2)

multiplying the first equation by 3 and second equation by 2 we get,

$6X + 9Y = 3\begin{bmatrix} 2 & 3 \\ 4 & 0 \end{bmatrix}$.....(3),

$6X + 4Y = 2\begin{bmatrix} -2 & 2 \\ 1 & -5 \end{bmatrix}$.....(4)

Subtracting equation (4) from equation (3) we have,

$5Y = 3\begin{bmatrix} 2 & 3 \\ 4 & 0 \end{bmatrix} - 2\begin{bmatrix} -2 & 2 \\ 1 & -5 \end{bmatrix}$

$\Rightarrow 5Y = \begin{bmatrix} 6 & 9 \\ 12 & 0 \end{bmatrix} - \begin{bmatrix} -4 & 4 \\ 2 & -10 \end{bmatrix}$

$\Rightarrow 5Y = \begin{bmatrix} 10 & 5 \\ 10 & 10 \end{bmatrix}$

$\Rightarrow Y = \frac{1}{5}\begin{bmatrix} 10 & 5 \\ 10 & 10 \end{bmatrix}$

$\Rightarrow Y = \begin{bmatrix} 2 & 1 \\ 2 & 2 \end{bmatrix}$

Similarly, multiplying the equation (1) by 2 and equation (2) by 3 we get,

$4X + 6Y = 2\begin{bmatrix} 2 & 3 \\ 4 & 0 \end{bmatrix}$.....(5),

$9X + 6Y = 3\begin{bmatrix} -2 & 2 \\ 1 & -5 \end{bmatrix}$.....(6)

Subtracting equation (6) from equation (5) we have,

$-5X = 2\begin{bmatrix} 2 & 3 \\ 4 & 0 \end{bmatrix} - 3\begin{bmatrix} -2 & 2 \\ 1 & -5 \end{bmatrix}$

$\Rightarrow -5X = \begin{bmatrix} 4 & 6 \\ 8 & 0 \end{bmatrix} - \begin{bmatrix} -6 & 6 \\ 3 & -15 \end{bmatrix}$

$\Rightarrow -5X = \begin{bmatrix} 10 & 0 \\ 5 & 15 \end{bmatrix}$

$\Rightarrow X = -\frac{1}{5}\begin{bmatrix} 10 & 0 \\ 5 & 15 \end{bmatrix}$

$\Rightarrow X = \begin{bmatrix} -2 & 0 \\ -1 & -3 \end{bmatrix}$

Hence the value of $X = \begin{bmatrix} -2 & 0 \\ -1 & -3 \end{bmatrix}$ and $Y = \begin{bmatrix} 2 & 1 \\ 2 & 2 \end{bmatrix}$.

Algebra of Matrices Ex 5.2 Q21

Let A represent the post allocation matrix for a college, So

$A = \begin{bmatrix} 15 \\ 6 \\ 1 \\ 1 \end{bmatrix}$ Peons, Clerks, Typist, Section officer

The total number of posts of each kind in 30 colleges in given by:

$= 30A$

$= 30\begin{bmatrix} 15 \\ 6 \\ 1 \\ 1 \end{bmatrix}$

$30A = \begin{bmatrix} 450 \\ 90 \\ 30 \\ 30 \end{bmatrix}$ Peons, Clerks, Typists, Section Officers

********** END **********