



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:

$$3x = x + 4$$

$$\Rightarrow 2x = 4$$

$$\Rightarrow x = 2$$

$$3y = 6 + x + y$$

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

$$\Rightarrow y = 4$$

$$3t = 2t + 3$$

$$\Rightarrow t = 3$$

$$3z = -1 + z + t$$

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

$$\Rightarrow z = 1$$

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

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.

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

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

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

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

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

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,

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

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

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

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

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

$$\begin{aligned} &= 30A \\ &= 30 \begin{bmatrix} 15 \\ 6 \\ 1 \\ 1 \end{bmatrix} \\ 30A &= \begin{bmatrix} 450 \\ 90 \\ 30 \\ 30 \end{bmatrix} \begin{matrix} \text{Peons} \\ \text{Clerks} \\ \text{Typists} \\ \text{Section Officers} \end{matrix} \end{aligned}$$

\*\*\*\*\* END \*\*\*\*\*

