Algebra of Matrices Ex 5.1 Q5

Here,

$$A = \left[a_{ij}\right]_{2 \times 2} = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix} \qquad \text{---(i)}$$

(i) $\quad a_{ij} = \dfrac{(i+j)^2}{2}$

$a_{11} = \dfrac{(1+1)^2}{2} = 2, \quad a_{12} = \dfrac{(1+2)^2}{2} = \dfrac{9}{2},$

$a_{21} = \dfrac{(2+1)^2}{2} = \dfrac{9}{2}, \quad a_{22} = \dfrac{(2+2)^2}{2} = 8,$

Using equation (i)

$$A = \begin{bmatrix} 2 & \dfrac{9}{2} \\ \dfrac{9}{2} & 8 \end{bmatrix}$$

(ii) $\quad a_{ij} = \dfrac{(i-j)^2}{2}$

$a_{11} = \dfrac{(1-1)^2}{2} = 0, \quad a_{12} = \dfrac{(1+2)^2}{2} = \dfrac{1}{2},$

$a_{21} = \dfrac{(2-1)^2}{2} = \dfrac{1}{2}, \quad a_{22} = \dfrac{(2-2)^2}{2} = 0,$

Using equation (i)

$$A = \begin{bmatrix} 0 & \dfrac{1}{2} \\ \dfrac{1}{2} & 0 \end{bmatrix}$$

(iii) $a_{ij} = \dfrac{(i - 2j)^2}{2}$

$a_{11} = \dfrac{(1 - 2(1))^2}{2} = \dfrac{1}{2}$, $\quad a_{12} = \dfrac{(1 - 2(2))^2}{2} = \dfrac{9}{2}$,

$a_{21} = \dfrac{(2 - 2(1))^2}{2} = 0$, $\quad a_{22} = \dfrac{(2 - 2(2))^2}{2} = 2$,

Using equation (i)

$$A = \begin{bmatrix} \dfrac{1}{2} & \dfrac{9}{2} \\ 0 & 2 \end{bmatrix}$$

(iv) $a_{ij} = \dfrac{(2i + j)^2}{2}$

$a_{11} = \dfrac{(2(1) + 1)^2}{2} = \dfrac{9}{2}$, $\quad a_{12} = \dfrac{(1(1) + 2)^2}{2} = 8$,

$a_{21} = \dfrac{(2(2) + 2)^2}{2} = \dfrac{25}{2}$, $\quad a_{22} = \dfrac{(2(2) + 2)^2}{2} = 18$

Using equation (i)

$$A = \begin{bmatrix} \dfrac{9}{2} & 8 \\ \dfrac{25}{2} & 18 \end{bmatrix}$$

(v) $a_{ij} = \dfrac{(|2i - 3j|)^2}{2}$

$a_{11} = \dfrac{|2(1) - 3(1)|}{2} = \dfrac{1}{2}$, $\quad a_{12} = \dfrac{|2(1) - 3(2)|}{2} = 2$

$a_{21} = \dfrac{|2(2) - 3(1)|}{2} = \dfrac{1}{2}$, $\quad a_{22} = \dfrac{|2(2) - 3(2)|}{2} = 1$

Using equation (i)

$$A = \begin{bmatrix} \dfrac{1}{2} & 2 \\ \dfrac{1}{2} & 1 \end{bmatrix}$$

Algebra of Matrices Ex 5.1 Q6

Here, $A = \left(a_{ij}\right)_{3 \times 4} = \begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \end{bmatrix}$ $\qquad ---(i)$

(i) $a_{ij} = i + j$

$a_{11} = 1 + 1 = 2$, $a_{12} = 1 + 2 = 3$, $a_{13} = 1 + 3 = 4$, $a_{14} = 1 + 4 = 5$

$a_{21} = 2 + 1 = 3$, $a_{22} = 2 + 2 = 4$, $a_{23} = 2 + 3 = 5$, $a_{24} = 2 + 4 = 6$

$a_{31} = 3 + 1 = 4$, $a_{32} = 3 + 2 = 5$, $a_{33} = 3 + 3 = 6$, $a_{34} = 3 + 4 = 7$

Using equation (i)

$A = \begin{bmatrix} 2 & 3 & 4 & 5 \\ 3 & 4 & 5 & 6 \\ 4 & 5 & 6 & 7 \end{bmatrix}$

(ii) $a_{ij} = i - j$

$a_{11} = 1 - 1 = 0$, $a_{12} = 1 - 2 = -1$, $a_{13} = 1 - 3 = -2$, $a_{14} = 1 - 4 = -3$

$a_{21} = 2 - 1 = 1$, $a_{22} = 2 - 2 = 0$, $a_{23} = 2 - 3 = -1$, $a_{24} = 2 - 4 = -2$

$a_{31} = 3 - 1 = 2$, $a_{32} = 3 - 2 = 1$, $a_{33} = 3 - 3 = 0$, $a_{34} = 3 - 4 = -1$

Using equation (i)

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

(iii) $a_{ij} = 2i$

$a_{11} = 2(1) = 2$, $a_{12} = 2(1) = 2$, $a_{13} = 2(1) = 2$, $a_{14} = 2(1) = 2$

$a_{21} = 2(2) = 4$, $a_{22} = 2(2) = 4$, $a_{23} = 2(2) = 4$, $a_{24} = 2(2) = 4$

$a_{31} = 2(3) = 6$, $a_{32} = 2(3) = 6$, $a_{33} = 2(3) = 6$, $a_{34} = 2(3) = 6$

Using Equation (i),

$A = \begin{bmatrix} 2 & 2 & 2 & 2 \\ 4 & 4 & 4 & 4 \\ 6 & 6 & 6 & 6 \end{bmatrix}$

(iv) $a_{ij} = j$

$a_{11} = 1$, $a_{12} = 2$, $a_{13} = 3$, $a_{14} = 4$

$a_{21} = 1$, $a_{22} = 2$, $a_{13} = 3$, $a_{14} = 4$

$a_{31} = 1$, $a_{32} = 2$, $a_{33} = 3$, $a_{34} = 4$

Using Equation (i),

$A = \begin{bmatrix} 1 & 2 & 3 & 4 \\ 1 & 2 & 3 & 4 \\ 1 & 2 & 3 & 4 \end{bmatrix}$

Algebra of Matrices Ex 5.1 Q7

Here,

$$A = \left[a_{ij}\right]_{4 \times 3} = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \\ a_{41} & a_{42} & a_{43} \end{bmatrix}$$

(a) $a_{ij} = 2i + \dfrac{i}{j}$

$a_{11} = 2(1) + \dfrac{1}{1} = 3, \ a_{12} = 2(1) + \dfrac{1}{2} = \dfrac{5}{2}, \ a_{13} = 2(1) + \dfrac{1}{3} = \dfrac{7}{3}$

$a_{21} = 2(2) + \dfrac{2}{1} = 6, \ a_{22} = 2(2) + \dfrac{2}{2} = 5, \ a_{23} = 2(2) + \dfrac{2}{3} = \dfrac{14}{3}$

$a_{31} = 2(3) + \dfrac{3}{1} = 9, \ a_{32} = 2(3) + \dfrac{3}{2} = \dfrac{15}{2}, \ a_{33} = 2(3) + \dfrac{3}{3} = 7$

$a_{41} = 2(4) + \dfrac{4}{1} = 12, \ a_{42} = 2(4) + \dfrac{4}{2} = 10, \ a_{43} = 2(4) + \dfrac{4}{3} = \dfrac{28}{3}$

Using equation (i),

$$A = \begin{bmatrix} 3 & \dfrac{5}{2} & \dfrac{7}{3} \\ 6 & 5 & \dfrac{14}{3} \\ 9 & \dfrac{15}{2} & 7 \\ 12 & 10 & \dfrac{28}{3} \end{bmatrix}$$

(c) $a_{ij} = i$

$a_{11} = 1$, $a_{12} = 1$, $a_{13} = 1$,

$a_{21} = 2$, $a_{22} = 2$, $a_{23} = 2$

$a_{31} = 3$, $a_{32} = 3$, $a_{33} = 3$

$a_{41} = 4$, $a_{42} = 4$, $a_{43} = 4$

Using equation (i)

$$A = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 2 & 2 \\ 3 & 3 & 3 \\ 4 & 4 & 4 \end{bmatrix}$$

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