CHAPTER-III

MATRICES

2 MARK QUESTIONS

1. Define Square Matrix.

Ans: A square matrix is a matrix in which the number of rows is equal to the number of columns, ie., m=n.

2. What is the Value of Every Diagonal Element of a Skew Matrix?

Ans: Zero.

3. What Are the Possible Orders If a Matrix Has 28 Elements?

Ans: The possible orders are denoted by

1 x 28,

2 x 14,

4 x 7,

7 x 4,

14 x 2,

28 x 1

4.If [2x+y03y4]=[6004], then find the value of x. (All India 2010C)

Answer:

x = 3

5.If [3y−x3−2x7]=[53−27], then find the value of y. (All India 2010C)

Answer:

y = 2

4 MARK QUESTIONS

1: Matrices *A* and *B* will be inverse of each other only if

1. $AB=BA$
2. $AB=0, BA=I$
3. $AB=BA=0$
4. $AB=BA=I$

Answer: We know that if A is a square of order m, and if there exists another square matrix B of the same order m, such that $AB=I$, then B is said to be the inverse of A.

In this case, it is clear that A is the inverse of B.
Thus , matrices A and B will be inverses of each other only if $AB=BA=I$.

2: If a matrix has 24 elements, what are the possible order it can have? What, if it has 13 elements?

Answer: We know that if a matrix is of the order $m \times n$, it has mn elements.
Thus to find all the possible orders of a matrix having 24 elements, we have to find all the ordered pairs of natural numbers whose product is 24.
The ordered pairs are(1,24),(24,1),(2,12),(12,2),(3,8),(8,3),(4,6) and (6,4)
Hence, the possible orders of a matrix having 24 elements are:
$1\times24, 24\times1, 2\times12, 12\times2, 3\times8, 8\times3, 4\times6, 6\times4$
(1,13) and (13,1) are the ordered pairs of natural numbers whose product is 13.
Hence, the possible orders of a matrix having 13 elements are 1×13 and 13×1

3: If $n=p$, then the order of the matrix $7X-5Z$ is:

1. $p\times2$
2. $2\times n$
3. $n\times3$
4. $p\times n$

Answer: In this, order of $X=2\times n$

and order of $Z=2\times p$

Therefore, $n=p$

Hence order of $7X-5Z=2\times n$.

Thus option (B) is correct.

4: If A,B are symmetric matrices of same order, then $AB-BA$ is a ,
A. Skew symmetric matrix

1. **Symmetric matrix**
2. **Zero matrix**
3. **Identity matrix**

Answer: Given, A and B are symmetric matrices, therefore, we have:
$A'=A$ and $B'=B$..........(i)
Consider
$(AB-BA)'=(AB)'-(BA)', [\because (A-B)'=A'-B']$
$=B'A'-A'B', [\because (AB)'=B'A']$

$=BA-AB$ [by (i)]

$=-(AB-BA)$
$\therefore (AB-BA)'=-(AB-BA)$
Thus, $(AB-BA)$ is a skew-symmetric matrix.

5.Write the number of all possible matrices of order 2×2 with each entry 1, 2 or 3.

Answer:

We know that, a matrix of order 2×2 has 4 entries. Since, each entry has 3 choices, namely 1, 2 or 3, therefore number of required matrices

$3^4 = 3 \times 3 \times 3 \times 3 = 81$.

7 MARK QUESTIONS

1..If 3A – B = [5101] and B = [4235] then find the value of matrix A. (Delhi 2019)

Answer:

Given, $3A - B = \begin{bmatrix} 5 & 0 \\ 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$

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

$$\Rightarrow \quad 3A = \begin{bmatrix} 5 & 0 \\ 1 & 1 \end{bmatrix} + \begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$$

$$\Rightarrow \quad 3A = \begin{bmatrix} 5+4 & 0+3 \\ 1+2 & 1+5 \end{bmatrix}$$

$$\Rightarrow \quad 3A = \begin{bmatrix} 9 & 3 \\ 3 & 6 \end{bmatrix}$$

$$\Rightarrow \quad A = \frac{1}{3}\begin{bmatrix} 9 & 3 \\ 3 & 6 \end{bmatrix}$$

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

2.Find the value of x – y, if (Delhi 2019)
2[103x]+[y102]=[5168]

Answer:

Given that,

$$2\begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$$

$$\Rightarrow \quad \begin{bmatrix} 2 & 6 \\ 0 & 2x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$$

$$\Rightarrow \quad \begin{bmatrix} 2+y & 6+0 \\ 0+1 & 2x+2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$$

Here, both matrices are equal, so we equate the corresponding elements,
2 + y = 5 and 2x + 2 = 8

$\Rightarrow y = 3$ and $2x = 6 \Rightarrow x = 3$
Therefore, $x - y = 3 - 3 = 0$

3.If A is a square matrix such that $A^2 = I$, then find the simplified value of $(A - I)^3 + (A + I)^3 - 7A$. (Delhi 2016)

Answer:

Given, $A^2 = 7$ .... (i)

Now, $(A - I)^3 + (A + I)^3 - 7A$

$= (A^3 - 3A^2I + 3AI^2 - I) + (A^3 + 3A^2I + 3AI^2 + I^3) - 7A$

$= A^3 - 3A^2 + 3AI - I + A^3 + 3A^2 + 3AI + I - 7A$

$[\because A^2I = A^2$ and $I^3 = I^3 = I]$

$= 2A^3 + 6AI - 7A = 2A^2 A + 6A - 7A$ $[\because AI = A]$

$= 2IA - A$ [from Eq. (1)]

$= 2A - A = A$ $[\because IA = A]$

4.If [2 1 3] ⎡⎣⎢−1−10011−101⎤⎦⎥⎡⎣⎢10−1⎤⎦⎥ = A, then write the order of matrix A.

Answer:

We have, $A = [2\ \ 1\ \ 3]\begin{bmatrix} -1 & 0 & -1 \\ -1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}\begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$

$= [-2-1\ \ \ 1+3\ \ -2+3]\begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix} = [-3\ \ 4\ \ 1]\begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$

$= [-3 - 1] = [-4]_{1 \times 1}$

$\therefore$ Order of matrix A is 1×1.

5.Let A = [23−14], B = [5724], C = [2358], find a matrix D such that CD − AB = 0.

Answer:

Given, $A=\begin{bmatrix}2 & -1\\ 3 & 4\end{bmatrix}$, $B=\begin{bmatrix}5 & 2\\ 7 & 4\end{bmatrix}$, $C=\begin{bmatrix}2 & 5\\ 3 & 8\end{bmatrix}$

Let matrix $D=\begin{bmatrix}x & y\\ z & w\end{bmatrix}$

According to the questions, $CD-AB=0$

$$\begin{bmatrix}2 & 5\\ 3 & 8\end{bmatrix}\begin{bmatrix}x & y\\ z & w\end{bmatrix}-\begin{bmatrix}2 & -1\\ 3 & 4\end{bmatrix}\begin{bmatrix}5 & 2\\ 7 & 4\end{bmatrix}=0$$

$$\Rightarrow \begin{bmatrix}2x+5z & 2y+5w\\ 3x+8z & 3y+8w\end{bmatrix}-\begin{bmatrix}10-7 & 4-4\\ 15+28 & 6+16\end{bmatrix}=0$$

$$\Rightarrow \begin{bmatrix}2x+5z & 2y+5w\\ 3x+8z & 3y+8w\end{bmatrix}=\begin{bmatrix}3 & 0\\ 43 & 22\end{bmatrix}$$

On equating corresponding elements both sides,
we get

$$2x+5z=3,\ 3x+8z=43$$

and $2y+5w=0,\ 3y+8w=22$

After solving, we get

$$x=-191,\ y=-110,\ z=77 \text{ and } w=44$$

$$\therefore \quad D=\begin{bmatrix}x & y\\ z & w\end{bmatrix}=\begin{bmatrix}-191 & -110\\ 77 & 44\end{bmatrix}$$