

**CHAPTER 3**

Matrices

**One Mark Questions**

- Q1.a) If  $2\begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$ . Find the value of  $x + y$ . CBSE 2013
- b) If  $\begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix} \begin{bmatrix} 1 & -3 \\ -2 & 4 \end{bmatrix} = \begin{bmatrix} -4 & 6 \\ -9 & x \end{bmatrix}$ . Find the value of  $x$ . CBSE 2012
- c) If  $A = \begin{bmatrix} -2 & 1 \\ 3 & 2 \end{bmatrix}$ ,  $B^T = \begin{bmatrix} -1 & 1 \\ 0 & 2 \end{bmatrix}$ , Find  $(A+B)^T$  Olympiad 2014

Q2. If a matrix has 12 elements, write all possible orders.

Q3. Construct a  $3 \times 2$  matrix  $A$  in which  $a_{ij} = \frac{|i-3j|}{2}$

Q4. Find  $x$  and  $y$  so that  $\begin{bmatrix} 2x+1 & y^2+2 \\ 5 & y^2-5y \end{bmatrix} = \begin{bmatrix} x+3 & 3y \\ 5 & -6 \end{bmatrix}$

Q5. If  $A = \begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$ , Find  $x$  so that  $A^2 = I$

Q6. If  $A = \begin{bmatrix} 0 & 0 \\ 2 & 0 \end{bmatrix}$ . Find  $A^{10}$ .

Q7.  $A = \begin{bmatrix} 4 & 2 \\ 1 & 3 \end{bmatrix}$ ,  $B = \begin{bmatrix} -2 & 1 \\ 3 & 2 \end{bmatrix}$  Find  $X$  such that  $3A - 2B + X = 0$

Q8. If  $A = \begin{bmatrix} -1 & 2 & -5 \end{bmatrix}$  and  $B^T = \begin{bmatrix} 2 & -1 & 7 \end{bmatrix}$ . Write order of  $AB$  and  $BA$ .

Q9. What is the number of all possible matrices of order  $2 \times 3$  with each entry  $-1$  and  $1$ ?

Q10. If  $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \end{bmatrix}$ ,  $2A - B = \begin{bmatrix} 1 & 5 & 3 \\ 5 & 6 & 0 \end{bmatrix}$ . Find  $B$ .

Q11. If  $\begin{bmatrix} 2x & 3 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix} \begin{bmatrix} x \\ 3 \end{bmatrix} = 0$ . Find  $x$ .

Q12. If  $\begin{bmatrix} 3 & x-1 \\ 12x+3 & x+2 \end{bmatrix}$  is symmetric. Find  $x$

Q13. If  $\begin{bmatrix} 0 & -5 & a \\ b & c & 3 \\ 2 & d & 0 \end{bmatrix}$  is skew symmetric, find  $a, b, c$  and  $d$ .

Q14. If  $A = \begin{bmatrix} \tan x & \cot x \\ -\cot x & \tan x \end{bmatrix}$ ,  $0 < x < \frac{\pi}{2}$  and  $A + A' = 2I$ , find  $x$ .

**Four marks questions**

Q15. If  $A = \begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$ . Prove that  $(A - 2I)(A - 3I) = 0$

Q16. If  $A = \begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$ . Find  $x$  and  $y$  so that  $A^2 - xA + yI = 0$

Q17. If  $A = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$  and  $f(x) = x^2 - 4x + 7$ , show that  $f(A) = 0$  and use it to find  $A^3$ .

Q18. If  $A = \begin{bmatrix} 2 & 1 & 3 \\ 4 & 1 & 0 \end{bmatrix}$ ,  $B = \begin{bmatrix} 1 & -1 \\ 0 & 2 \\ 5 & 0 \end{bmatrix}$ . Verify that  $(AB)' = B'A'$ .

Q19. Solve for x and y where  $\begin{bmatrix} x & y \\ 3y & x \end{bmatrix} \begin{bmatrix} 1 \\ 2 \end{bmatrix} = \begin{bmatrix} 3 \\ 5 \end{bmatrix}$

Q20. Find x, If  $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 0 & 1 \\ 1 & 0 & 2 \end{bmatrix} \begin{bmatrix} 0 \\ 2 \\ x \end{bmatrix} = 0$

Q21. Express the following matrices as sum of symmetric and skew symmetric matrices.

i)  $\begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$  ii)  $\begin{bmatrix} 3 & 2 & 5 \\ 4 & 1 & 3 \\ 0 & 6 & 7 \end{bmatrix}$

Q22. Prove by principle of mathematical induction that  $A^n = \begin{bmatrix} a^n & na^{n-1} \\ 0 & a^n \end{bmatrix}$  where  $A = \begin{bmatrix} a & 1 \\ 0 & a \end{bmatrix}$

Q23. Find the inverse of following by elementary transformations

i)  $\begin{bmatrix} 3 & -1 \\ -4 & 2 \end{bmatrix}$  ii)  $\begin{bmatrix} 2 & -2 \\ 4 & 3 \end{bmatrix}$

Q24. Find A such that  $A \begin{bmatrix} 5 & -7 \\ -2 & 3 \end{bmatrix} = \begin{bmatrix} -16 & -6 \\ 7 & 1 \end{bmatrix}$

Q25. If  $\begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix} A + \begin{bmatrix} -5 & 0 \\ 2 & 4 \end{bmatrix} = \begin{bmatrix} 3 & -9 \\ 7 & 1 \end{bmatrix}$ . Find matrix A.

Q26. If  $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$ , then show that  $A^3 - 23A - 40I = 0$

Q27. Three school A, B and C organized a mela for collecting funds for helping the rehabilitation of flood victims. They sold hand made fans, mats and plates from recycled material at a cost of ₹25, ₹100 and ₹50. The number of articles sold are given below

Article \ School	A	B	C
Hand fans	40	25	35
Mats	50	40	50
Plates	20	30	40

Find the funds collected by each school separately by selling above articles. Also find total funds collected for this purpose. Write one value generated by the above purpose.

### Six marks questions

Q28. Using elementary transformations find the inverse of following matrices:

a)  $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 2 & 1 & 1 \end{bmatrix}$       b)  $\begin{bmatrix} 2 & 5 & 3 \\ 3 & 4 & 1 \\ 1 & 6 & 2 \end{bmatrix}$       c)  $\begin{bmatrix} -1 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$  CBSE 2012

Q29. For  $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$ . Show that  $A^3 - 6A^2 + 5A + 11I = 0$ . Hence find  $A^{-1}$

<b>CONTENT</b>	<b>QUESTIONS &amp; EXAMPLES FROM NCERT</b>
Types of matrices	Ex. 3.1 Q 5 , 7.
Operations on matrices	Example 9 (pg.70) , Example 11 (pg. 71) , Ex. 3.2 Q 7,12,13,16,18.
Transpose of a matrix	Ex. 3.3 Q 5 ,9, 12 .
Symmetric and skew symmetric matrices	Misc. Ex. Q 4 ,5 .
Elementary transformations Invertible matrices	Example24(pg.94)
Miscellaneous exercise	Example26 (pg.98) , Q. 6,9,10,11,15