ASSINGMENT
CH-3 (MATRICES)
– By Sajal Sir

– Maths fear ???
let's clear !!!

Important MCQ's :→

1. If A is a square matrix such that $A^2 = A$, then $(I + A)^3 - 7A$ is equal to :→

(a) I (b) O (c) I − A (d) I + A

2. If $A = [a_{ij}]$ is a square matrix of order 2 such that $a_{ij} = 1$, when $i \neq j$ and $a_{ij} = 0$, when $i = j$, then A^2 is,

(a) $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 0 \\ 1 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$

3. Total number of possible matrices of order 3×3 with each entry 2 or 0 is :→

(a) 9 (b) 27 (c) 81 (d) 512

4. If A and B are two matrices of the order 3×m and 3×n, respectively, and m = n, then the order of matrix (5A − 2B) is :→

(a) m×3 (b) 3×3 (c) m×n (d) 3×n

5. If $\begin{bmatrix} 2p+q & p-2q \\ 5r-s & 4r+3s \end{bmatrix} = \begin{bmatrix} 4 & -3 \\ 11 & 24 \end{bmatrix}$, then the value of $p + q - 2r = ?$

(a) 8 (b) 10 (c) 4 (d) −8

6. The matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ is

(a) Identity Matrix (b) Symmetric Matrix (c) Skew symm. Matrix (d) None

7. For any two matrices A and B, we have :→

(a) AB = BA (b) AB ≠ BA (c) AB = O (d) None

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8. If A and B are symmetric matrices of the same order, then $(AB' - BA')$ is a :→

(a) Skew symm. Matrix (b) Null Matrix (c) Symm. Matrix (d) None

9. If A is a skew-symmetric Matrix, then A^2 is a

(a) Skew. symm. (b) Symm. (c) Null matrix (d) Cannot be determined

10. If $A = \begin{bmatrix} 0 & 2 \\ 3 & -4 \end{bmatrix}$ and $kA = \begin{bmatrix} 0 & 3a \\ 2b & 2 \end{bmatrix}$, then the values of k, a and b respectively are :→

(a) $-6, -12, -18$ (b) $-6, -4, -9$ (c) $-6, 4, 9$ (d) $-6, 12, 18$

11. If A is square matrix such that $A^2 = A$ then $(I + A)^3 +$ [illegible]A is :→

(a) 0 (b) I (c) $1/A$ (d) A^2

12. If $\begin{bmatrix} 4 & x+2 \\ 2x-3 & x+1 \end{bmatrix}$ is symmetric matrix then x is :→

(a) 0 (b) 3 (c) 2 (d) 5

13. If $\begin{bmatrix} x-y & 2 \\ x & 5 \end{bmatrix} = \begin{bmatrix} 2 & 2 \\ 3 & 5 \end{bmatrix}$, then the value of y :→

(a) 1 (b) 3 (c) 2 (d) 5

14. If A is an $m \times n$ matrix such that AB and BA are both defined, then B is a :→

(a) $m \times n$ matrix (b) $n \times m$ (c) $m \times n$ (d) $m \times m$

15. If $A^2 - A + I = O$, then the inverse of A is :→

(a) $I - A$ (b) $A - I$ (c) A (d) $A + I$

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16. Find a matrix X such that $2A + B + X = 0$, where $A = \begin{bmatrix} -1 & 2 \\ 3 & 4 \end{bmatrix}$ and, $B = \begin{bmatrix} 3 & -2 \\ 1 & 5 \end{bmatrix}$.

17. Solve the matrix equation $\begin{bmatrix} x^2 \\ y^2 \end{bmatrix} - 3\begin{bmatrix} x \\ 2y \end{bmatrix} = \begin{bmatrix} -2 \\ 9 \end{bmatrix}$

18. Find the value of λ, a non-zero scalar, if

$$\lambda \begin{bmatrix} 1 & 0 & 2 \\ 3 & 4 & 5 \end{bmatrix} + 2\begin{bmatrix} 1 & 2 & 3 \\ -1 & -3 & 2 \end{bmatrix} = \begin{bmatrix} 4 & 4 & 10 \\ 4 & 2 & 14 \end{bmatrix}$$

19. If $A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 1 \\ 1 & 0 \end{bmatrix}$,

Prove that $(A+B)^2 \neq A^2 + 2AB + B^2$.

20. If $A = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}$, $B = \begin{bmatrix} a & 1 \\ b & -1 \end{bmatrix}$ and $(A+B)^2 = A^2 + B^2$,

Find a and b.

21. If $A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$, find x and y such that $(xI + yA)^2 = A$.

22. If $A = \begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then find k so that

$$A^2 = 8A + kI.$$

23. If $\begin{bmatrix} 2 & -1 \\ 1 & 0 \\ -3 & 4 \end{bmatrix} A = \begin{bmatrix} -1 & -8 & -10 \\ 1 & -2 & -5 \\ 9 & 22 & 15 \end{bmatrix}$, find A.

$\boxed{\text{Good}}$

24. Let $A = \begin{bmatrix} 2 & 3 \\ -1 & 2 \end{bmatrix}$ and $f(x) = x^2 - 4x + 7$. Show that $f(A) = 0$

Use this result to find A^5.

25. There are two families A and B. There are 4 men, 6 women and 2 children in family A and 2 men, 2 women and 4 children in family B. The recommended daily allowance for calories is:
Man → 2400, woman → 1900, child → 1800 and for proteins is:
Man → 55 gm, woman → 45 gm, child → 33 gm.
Represent the above information by matrices. Using matrix multiplication, calculate the total requirement of calories and proteins for each of the two families.

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26. Use matrix multiplication to divide ₹30,000 in two parts such that the total annual interest at 9% on the first part and 11% on the second part amounts ₹3060.

27. If $A = \begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$, find k such that $A^2 - 8A + kI = O$.

28. Find the value of x for which the matrix product

$$I = \begin{bmatrix} 2 & 0 & 7 \\ 0 & 1 & 0 \\ 1 & -2 & 1 \end{bmatrix} \begin{bmatrix} -x & 14x & 7x \\ 0 & 1 & 0 \\ x & -4x & -2x \end{bmatrix}$$

is equal to an identity matrix.

29. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, then prove that $A^2 - 4A - 5I = O$

old is gold

30. Three shopkeepers A, B and C go to a store to buy stationary. A purchases 12 dozen notebooks, 5 dozen pens and 6 dozens pencils. B purchases 10 dozen notebooks, 6 dozen pens and 7 dozen pencils. C purchases 11 dozen notebooks, 13 dozen pens, and 8 dozen pencils. A notebook costs 40 paise, a pen costs ₹1.25 and a pencil costs 35 paise. Use Matrix multiplication to calculate each individual's bill.

31. The cooperative stores of a particular school has 10 dozen physics books, 8 dozen chemistry books and 5 dozen mathematics books. Their selling prices are ₹8.30, ₹3.45 and ₹4.50 each respectively. Find the total amount the store will recieve from selling all the items.

32. In a legislative assembly election, a political group hired a public relations firm to promote its candidates in three ways : telephone, house calls and letters. The cost per contact (in paise) is given matrix A as

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$$\begin{array}{cl} \text{Cost per contact} & \\ A = \begin{bmatrix} 40 \\ 100 \\ 50 \end{bmatrix} & \begin{array}{l} \text{Telephone} \\ \text{House call} \\ \text{Letter} \end{array} \end{array}$$

The number of contacts of each type made in two cities X and Y is given in matrix B as :→

$$\begin{array}{cl} \begin{array}{ccc} \text{Telephone} & \text{House call} & \text{Letter} \end{array} & \\ B = \begin{bmatrix} 1000 & 500 & 5000 \\ 3000 & 1000 & 10000 \end{bmatrix} & \begin{array}{l} \rightarrow X \\ \rightarrow Y \end{array} \end{array}$$

Find the total amount spent by the group in the two cities X and Y.

33. If $A = \begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix}$ and $B = \begin{bmatrix} -2 & -1 & -4 \end{bmatrix}$,

verify that $(AB)^T = B^T A^T$.

34. If $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$, then find the values of θ satisfying the equation $A^T + A = I_2$.

35. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}$ is a matrix satisfying $AA^T = 9I_3$,

then find the values of a and b.

36. Let $A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 1 & 3 \\ 1 & 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \\ 0 & 1 & 1 \end{bmatrix}$. Find A^T, B^T

and verify that :→

(i) $(A+B)^T = A^T + B^T$ (ii) $(2A)^T = 2A^T$

37. If $A^T = \begin{bmatrix} 3 & 4 \\ -1 & 2 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 & 1 \\ 1 & 2 & 3 \end{bmatrix}$ find $A^T - B^T$.

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38. Express the Matrix $A = \begin{bmatrix} 3 & 2 & 3 \\ 4 & 5 & 3 \\ 2 & 4 & 5 \end{bmatrix}$ as the sum of a symmetric and a skew-symmetric matrix.

39. If the Matrix $A = \begin{bmatrix} 5 & 2 & x \\ y & z & -3 \\ 4 & t & -7 \end{bmatrix}$ is a symmetric matrix, find x, y, z and t.

40. Let $A = \begin{bmatrix} 3 & 2 & 7 \\ 1 & 4 & 3 \\ -2 & 5 & 8 \end{bmatrix}$. Find matrices X and Y such that $X + Y = A$, where X is a symmetric and Y is a skew-symmetric matrix.

41. Express the Matrix $A = \begin{bmatrix} 4 & 2 & -1 \\ 3 & 5 & 7 \\ 1 & -2 & 1 \end{bmatrix}$ as the sum of a symmetric and a skew-symmetric matrix.