

**St. Mary's School, Dwarka**  
**Holiday Homework**  
**Class XII**  
**Subject: Mathematics**  
**Week 4**  
**Worksheet 4**

**(Matrices)**

**Q 1 to 20 carry 2 marks each**

Q1 If a matrix has 8 elements, what are the possible orders it can have? What if it has 5 elements?

Q2 Construct a  $4 \times 3$  matrix whose elements are

$$(i) a_{ij} = 2i + \frac{i}{j} \quad (ii) a_{ij} = \frac{i-j}{i+j} \quad (iii) a_{ij} = i$$

Q3 If  $A = \begin{bmatrix} x-y & z \\ 2x-y & \omega \end{bmatrix} = \begin{bmatrix} -1 & 4 \\ 0 & 5 \end{bmatrix}$  find  $x, y, z, \omega$ .

Q4 Find a matrix  $X$  such that  $2A + B + X = O$ , where

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

Q5 If  $A = \begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix}, B = \begin{bmatrix} 0 & 4 \\ -1 & 7 \end{bmatrix}$ , find  $3A^2 - 2B + I$

Q6 If  $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$  and  $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$ , find the values of  $\alpha$  for which  $A^2 = B$ .

Q7 Let  $A = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} 5 & 2 \\ 7 & 4 \end{bmatrix}, C = \begin{bmatrix} 2 & 5 \\ 3 & 8 \end{bmatrix}$

Find a matrix  $D$  such that  $CD - AB = O$ .

Q8 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  $t$ .

Q9 . If  $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$  satisfies  $A^4 = \lambda A$ , then write the value of  $\lambda$ .

Q10 If  $S = [S_{ij}]$  is a scalar matrix such that  $s_{ij} = k$  and  $A$  is a square matrix of the same order, then  $AS = SA$  ?

- (a)  $A^k$  (b)  $k + A$  (c)  $kA$  (d)  $kS$

Q11 If  $A$  is a square matrix such that  $A^2 = A$ , then  $(I + A)^3 - 7A$  is equal to

- (a)  $A$  (b)  $I - A$  (c)  $I$  (d)  $3A$

Q12 If  $\begin{bmatrix} 1 & -1 & x \end{bmatrix} \begin{bmatrix} 0 & 1 & -1 \\ 2 & 1 & 3 \\ 1 & 1 & 1 \end{bmatrix} \begin{bmatrix} 0 \\ 1 \\ 1 \end{bmatrix} = 0$ , find  $x$ .

Q13 If  $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$  and  $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ , then find  $\lambda$  so that  $A^2 = 5A + \lambda I$ .

Q14 If  $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ , prove that  $A^n = \begin{bmatrix} 1 & n \\ 0 & 1 \end{bmatrix}$  for all positive integers  $n$ .

Q15 If  $A = \begin{bmatrix} \cos \theta & i \sin \theta \\ i \sin \theta & \cos \theta \end{bmatrix}$ , then prove by principle of mathematical induction that

$$A^n = \begin{bmatrix} \cos n\theta & i \sin n\theta \\ i \sin n\theta & \cos n\theta \end{bmatrix} \text{ for all } n \in \mathbb{N}.$$

Q16 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  $b$ .

Q17 If  $A = \begin{bmatrix} \cos \theta & \sin \theta \\ \sin \theta & \cos \theta \end{bmatrix}$ , then find the values of  $\theta$  satisfying the equation  $A^T + A = I_2$ .

Q18 Find the values of  $x, y, z$  if the matrix  $A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$  satisfy the equation  $A^T A = I_3$ .

Q19

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.

Q20 Let A and B be symmetric matrices of the same order. Then, show that

(i)  $A + B$  is a symmetric matrix

(ii)  $AB - BA$  is a skew-symmetric matrix

(iii)  $AB + BA$  is a symmetric matrix

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### Project -1

Make a project on Matrices and their applications ( ex- coding and decoding, cryptography).

### Project -2

Learn how to use Microsoft, Excel for addition, subtraction, and transpose of matrices. Make a soft copy of the same and paste screenshot of the output on the file along with project.

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