Foundation

PARISHRAM 2025

Mathematics

DPP: 3

Matrices

Q1 If $A=\begin{bmatrix}1 & -5\\ 2 & -6\\ -8 & 7\end{bmatrix}$, then transpose of A is equal to

(A) $\begin{bmatrix}1 & 2 & -8\\ -5 & -6 & 7\end{bmatrix}$

(B) $\begin{bmatrix}1 & -2 & 8\\ 5 & 6 & 7\end{bmatrix}$

(C) $\begin{bmatrix}5 & 6 & 7\\ 1 & 2 & 8\end{bmatrix}$

(D) $\begin{bmatrix}2 & -6 & 8\\ 7 & 5 & 1\end{bmatrix}$

Q2 $(XYZ)'$ is equal to (where A' denotes transpose of A)

(A) $X'Y'Z'$

(B) $Z'X'Y'$

(C) $Y'X'Z'$

(D) None of these

Q3 A square matrix is said to be symmetric if A' is equal to

(A) $-A$ (B) A

(C) A^2 (D) I

Q4 A square matrix is said to be skew symmetric if A' is equal to

(A) $-A$ (B) A

(C) A^2 (D) I

Q5 Choose the incorrect option:

(A) $(A')'=A$

(B) $(kA)'=kA'$

(C) $(A+B)'=A'+B'$

(D) $(AB)'=A'B'$

Q6 Every square matrix can be uniquely expressed as the

(A) sum of symmetric and skew symmetric matrices

(B) sum of symmetric and identity matrices

(C) difference of symmetric and skew symmetric matrix

(D) difference of identity and null matrices

Q7 If a matrix $A=\begin{bmatrix}2 & 3\\ -1 & 6\end{bmatrix}$ can be represented as the sum of a symmetric matrix B and a skew symmetric matrix C, then matrix B is equal to

(A) $\begin{bmatrix}2 & 1\\ 1 & 6\end{bmatrix}$

(B) $\begin{bmatrix}2 & 1\\ -1 & 4\end{bmatrix}$

(C) $\begin{bmatrix}0 & 2\\ -2 & 0\end{bmatrix}$

(D) $\begin{bmatrix}1 & -2\\ -2 & 3\end{bmatrix}$

Q8 If a matrix $C=\begin{bmatrix}1 & 3 & -2\\ 2 & -4 & 1\\ 0 & 3 & 2\end{bmatrix}$ can be represented as the sum of a symmetric matrix P and a skew symmetric matrix Q, then matrix Q is equal to

(A) $\begin{bmatrix}0 & 1/2 & -1\\ 2 & -4 & 1\\ 0 & 2 & 3\end{bmatrix}$

(B) $\begin{bmatrix}1 & 1/2 & -1\\ -1/2 & 0 & -1\\ 1 & -1 & 0\end{bmatrix}$

(C) $\begin{bmatrix} 0 & 1/2 & -1 \\ -1/2 & 0 & -1 \\ 1 & 1 & 0 \end{bmatrix}$

(D) None of these

Q9 If A and B are symmetric matrix of same order, then $AB + BA$ is

(A) Skew symmetric matrix

(B) Symmetric matrix

(C) Diagonal matrix

(D) None of these

Q10 For a square matrix A, the product AA' is always

(A) Symmetric matrix

(B) Skew symmetric matrix

(C) Identity matrix

(D) None of these

Q11 For any square matrix A with real number entries, then $A + A'$ is a

(A) symmetric matrix

(B) skew symmetric matrix

(C) identity matrix

(D) null matrix

Q12 For any matrix A with real number entries, then $A - A'$ is a

(A) symmetric matrix

(B) skew symmetric matrix

(C) identity matrix

(D) null matrix

Q13 If A is symmetric, the $A^n, n \in N$ will be

(A) symmetric matrix

(B) identity matrix

(C) skew symmetric matrix

(D) null matrix

Q14 If A is a skew symmetric matrix, then A^n will be (where n is an odd natural number)

(A) symmetric matrix

(B) skew symmetric matrix

(C) both symmetric and skew-symmetric matrix

(D) none of these

Q15 Which of the following is correct.

(A) If B is the inverse of A then A is also the inverse of B.

(B) Inverse of square matrix is unique if it exists.

(C) If A and B are invertible matrices of the same order, then $(AB)^{-1} = B^{-1}A^{-1}$

(D) All of these

Q16 If $A = \begin{bmatrix} 5 & -6 & 7 \\ a & 7 & -1 \\ b & c & 2 \end{bmatrix}$, is a symmetric matrix then find the value of $a + b + c$.

Q17 If $A = \begin{bmatrix} 0 & a & b \\ 7 & 0 & c \\ -1 & -6 & 0 \end{bmatrix}$ is skew symmetric matrix then find the value of abc.

Q18 Express the matrix $B = \begin{bmatrix} -1 & 2 & 1 \\ 0 & 3 & 2 \\ 4 & -1 & 1 \end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrix.

Q19 Express the following matrix as a sum of a symmetric and skew - symmetric matrices and verify your result:

$$\begin{bmatrix} 3 & -2 & -4 \\ 3 & -2 & -5 \\ -1 & 1 & 2 \end{bmatrix}$$

Q20 If $A = \begin{bmatrix} 1 & 3 & 2 \\ 2 & 0 & -1 \\ 1 & 2 & 3 \end{bmatrix}$, then show that $A^3 - 4A^2 - 3A + 11I = O$, Hence find A^{-1}.

Answer Key

Q1 (A)

Q2 (D)

Q3 (B)

Q4 (A)

Q5 (D)

Q6 (A)

Q7 (A)

Q8 (C)

Q9 (B)

Q10 (A)

Q11 (A)

Q12 (B)

Q13 (A)

Q14 (B)

Q15 (D)

Q16 0

Q17 -42

Q18

$$Symmetric = \begin{bmatrix} -1 & 1 & \frac{5}{2} \\ 1 & 3 & \frac{1}{2} \\ \frac{5}{2} & \frac{1}{2} & 1 \end{bmatrix}$$

$$Skew\ symmetric = \begin{bmatrix} 0 & 1 & -\frac{3}{2} \\ -1 & 0 & \frac{3}{2} \\ \frac{3}{2} & -\frac{3}{2} & 0 \end{bmatrix}$$

Q19

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

Q20

$$A^{-1} = -\frac{1}{11}\left(A^2 - 4A - 3I\right)$$

$$= -\frac{1}{11}\begin{bmatrix} 2 & -5 & -3 \\ -7 & 1 & 5 \\ 4 & 1 & -6 \end{bmatrix}$$