PARISHRAM 2025

Mathematics

DPP: 6

Matrices

Q1 Simplify: $\tan\theta\begin{bmatrix}\sec\theta & \tan\theta\\ \tan\theta & -\sec\theta\end{bmatrix}+\sec\theta\begin{bmatrix}-\tan\theta & -\sec\theta\\ -\sec\theta & \tan\theta\end{bmatrix}$

(A) $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

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

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

(D) $\begin{bmatrix}0 & -1\\ -1 & 0\end{bmatrix}$

Q2 If $A=\begin{bmatrix}\alpha & 0\\ 1 & 1\end{bmatrix}$ and $B=\begin{bmatrix}1 & 0\\ 5 & 1\end{bmatrix}$, then the value of α for which $\mathrm{A}^2=\mathrm{B}$, is

(A) 1 (B) -1

(C) 4 (D) no real values

Q3 If $A=\begin{bmatrix}\cos\theta & \sin\theta\\ -\sin\theta & \cos\theta\end{bmatrix}$, then $A^2=I$ is true for

(A) $\theta=0$

(B) $\frac{\pi}{4}$

(C) $\theta=\frac{\pi}{2}$

(D) None of these

Q4 If $A=\begin{bmatrix}4 & x+2\\ 2x-3 & x+1\end{bmatrix}$ is symmetric, then $x=$

(A) 3 (B) 5

(C) 2 (D) 4

Q5 What must be the matrix X, If $2X+\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}=\begin{bmatrix}3 & 8\\ 7 & 2\end{bmatrix}$?

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

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

(C) $\begin{bmatrix}2 & 6\\ 4 & -2\end{bmatrix}$

(D) $\begin{bmatrix}2 & -6\\ 4 & -2\end{bmatrix}$

Q6 If $A^2-A+I=0$, then the inverse of A is

(A) $I-A$

(B) $A-I$

(C) A

(D) $A+I$

Q7 $\cos\theta\begin{bmatrix}\cos\theta & \sin\theta\\ -\sin\theta & \cos\theta\end{bmatrix}+\sin\theta\begin{bmatrix}\sin\theta & -\cos\theta\\ \cos\theta & \sin\theta\end{bmatrix}$ is equal to

(A) $\begin{bmatrix}0 & 0\\ 0 & 0\end{bmatrix}$

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

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

(D) $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

Q8 If A is a symmetric matrix and B is a skew-symmetric matrix such that $A+B=\begin{bmatrix}2 & 3\\ 5 & -1\end{bmatrix}$, then AB is equal to

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

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

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

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

Q9

If for the matrix $\mathrm{A}=\begin{bmatrix}1 & -\alpha \\ \alpha & \beta\end{bmatrix}, \mathrm{AA}^{\mathrm{T}}=\mathrm{I}_2$, then the value of $\alpha^2+\beta^2$ is:

(A) 3 (B) 2

(C) 1 (D) 4

Q10 If $A=\begin{bmatrix}1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b\end{bmatrix}$ is a matrix satisfying the equation $\mathrm{AA}^{\mathrm{T}}=9I$, where I is 3×3 identity matrix, then the ordered pair (a,b) is equal to:

(A) $(2,1)$ (B) $(-2,-1)$

(C) $(2,-1)$ (D) $(-2,1)$

Q11 If $\mathrm{A}=\begin{bmatrix}1 & 2 & x \\ 3 & -1 & 2\end{bmatrix}$ and $\mathrm{B}=\begin{bmatrix}y \\ x \\ 1\end{bmatrix}$ be such that $\mathrm{AB}=\begin{bmatrix}6 \\ 8\end{bmatrix}$, then

(A) $y=2x$ (B) $y=-2x$

(C) $y=x$ (D) $y=-x$

Q12 If $A=\begin{bmatrix}2 & -1 \\ 1 & 2\end{bmatrix}$, then $A^2+2A-3I$ is equal:

(A) $\begin{bmatrix}4 & -6 \\ 6 & 4\end{bmatrix}$

(B) 0

(C) $\begin{bmatrix}-6 & 2 \\ -2 & 6\end{bmatrix}$

(D) $5\mathrm{I}$

Q13 If $A=\begin{bmatrix}1 & 0 & 0 \\ 0 & 1 & 0 \\ a & b & -1\end{bmatrix}$ then A^2 is equal to:

(A) 0

(B) $-\mathrm{A}$

(C) I

(D) $2\ \mathrm{A}$

Q14 If matrix $A=\begin{bmatrix}0 & 2 \\ 0 & 0\end{bmatrix}$ and $f(x)=1+x+x^2+x^4+x^8+x^{16}$, then $f(A)$ is equal to

(A) $\begin{bmatrix}1 & 2 \\ 0 & 1\end{bmatrix}$

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

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

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

Q15 Matrices ***A*** and ***B*** will be inverse of each other if

(A) ***AB*** = ***BA*** (B) ***AB*** = ***BA*** = ***O***

(C) ***AB*** = ***O, BA*** = ***I*** (D) ***AB*** = ***BA*** = ***I***

Q16 Find the matrix X if $X+Y=\begin{bmatrix}1 & -2 \\ 3 & 4\end{bmatrix}$ and

$$X-Y=\begin{bmatrix}7 & 8 \\ 9 & -2\end{bmatrix}$$

Q17 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 $CD-AB=O$.

Q18 If $A=\begin{bmatrix}0 & 1 \\ 0 & 0\end{bmatrix}$, prove that $(aI+bA)^n=a^nI+n\cdot a^{n-1}bA$, where I is a unit matrix of order 2 and n is a positive integer.

Q19 If $A=\begin{bmatrix}1 & -2 & -3 \\ -4 & 2 & 5\end{bmatrix}$ and $B=\begin{bmatrix}2 & 3 \\ 4 & 5 \\ 2 & 1\end{bmatrix}$ then find the product AB and BA.

Q20 To raise money for an orphanage, students of three schools A, B and C organized an exhibition in their locality, where they sold paper-bags, scrap-books and pastel-sheets made by them using recycled paper, at the rate of Rs. 20, Rs. 15 and Rs. 5 per unit respectively. School A sold 25 paper-bags, 12 scrap-books and 34 pastel sheets. School B sold 22 paper-bags, 15 scrap-books and 28 pastel-sheets while school C sold 26 paper-bags, 18 scrap-books and 36 pastel-sheets. Using matrices, find the total amount raised by each school.

Answer Key

Q1 (D)

Q2 (D)

Q3 (A)

Q4 (B)

Q5 (A)

Q6 (A)

Q7 (D)

Q8 (B)

Q9 (C)

Q10 (B)

Q11 (A)

Q12 (A)

Q13 (C)

Q14 (A)

Q15 (D)

Q16 $X = \begin{bmatrix} 4 & 3 \\ 6 & 1 \end{bmatrix}$

Q17 $D = \begin{bmatrix} -191 & -110 \\ 77 & 44 \end{bmatrix}$

Q18 **Check the solution**

Q19 $AB = \begin{bmatrix} -12 & -10 \\ 10 & 3 \end{bmatrix}$, $BA = \begin{bmatrix} -10 & 2 & 9 \\ -16 & 2 & 13 \\ -2 & -2 & -1 \end{bmatrix}$

Q20 Amount raised by School ***A*** = Rs. 850
Amount raised by School ***B*** = Rs. 805
Amount raised by School ***C*** = Rs. 970