PARISHRAM 2026

MATHS

MATRICES

DPP: 6

Q1 If $\begin{bmatrix} 2x & 3 \end{bmatrix}\begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix}\begin{bmatrix} x \\ 8 \end{bmatrix} = 0,$ then the value of x will be:

(A) $0, \frac{23}{2}$

(B) 0

(C) $-\frac{23}{2}$

(D) $0, -\frac{23}{2}$

Q2 Find the value of x and y that satisfy the equations $\begin{bmatrix} 3 & -2 \\ 3 & 0 \\ 2 & 4 \end{bmatrix}\begin{bmatrix} y & y \\ x & x \end{bmatrix} = \begin{bmatrix} 3 & 3 \\ 3y & 3y \\ 10 & 10 \end{bmatrix}$

(A) $x = \frac{-3}{2}, y = 2$

(B) $x = 2, y = -\frac{3}{2}$

(C) $x = \frac{3}{2}, y = 2$

(D) $x = \frac{3}{2}, y = -2$

Q3 If $F(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$, then the correct option is:

(A) F(x) F(y) = F(x) + F(y)

(B) F(x) F(y) = F(x) – F(y)

(C) F(x) F(y) = F(x – y)

(D) F(x) F(y) = F(x + y)

Q4 If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$, then $A^3 - 6A^2 + 7A + 2I$ is a

(A) Scalar Matrix

(B) Diagonal Matrix

(C) Null Matrix

(D) Identity Matrix

Q5 Which option represents the matrix $B = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrix.

(A) $\begin{bmatrix} 2 & -1 & -1 \\ -5 & 2 & 1 \\ -\frac{3}{2} & 1 & -7 \end{bmatrix} + \begin{bmatrix} 0 & -\frac{1}{2} & 7 \\ 2 & 0 & 3 \\ 5 & -3 & 0 \end{bmatrix}$

(B) $\begin{bmatrix} 2 & -\frac{3}{2} & -\frac{3}{2} \\ -\frac{3}{2} & 3 & 1 \\ -\frac{3}{2} & 1 & -3 \end{bmatrix} + \begin{bmatrix} 0 & -\frac{1}{2} & -\frac{5}{2} \\ \frac{1}{2} & 0 & 3 \\ \frac{5}{2} & -3 & 0 \end{bmatrix}$

(C) $\begin{bmatrix} 2 & -\frac{3}{2} & 7 \\ -2 & 3 & 5 \\ -2 & 7 & -3 \end{bmatrix} + \begin{bmatrix} 0 & -1 & -5 \\ \frac{1}{2} & 1 & 3 \\ 5 & -1 & 1 \end{bmatrix}$

(D) $\begin{bmatrix} 5 & -3 & -3 \\ 6 & 3 & 2 \\ -1 & 1 & -4 \end{bmatrix} + \begin{bmatrix} 1 & -1 & -3 \\ 2 & 1 & 3 \\ 2 & -3 & 1 \end{bmatrix}$

Q6 Assertion: If A is a symmetric matrix, then B’AB is also symmetric.

Reason: (ABC)’ = C’B’A’

(A) Both assertion and reason are correct and reason is the correct explanation for assertion.

(B) Both assertion and reason are correct but Reason is not the correct explanation for assertion.

(C) Assertion is correct but reason is incorrect.

(D) Assertion is incorrect and reason is correct.

Q7 $A = \begin{bmatrix} 3 & a & -1 \\ 2 & 5 & c \\ b & 8 & 2 \end{bmatrix}$ is symmetric and

$B = \begin{bmatrix} d & 3 & a \\ b-a & e & -2b-c \\ -2 & 6 & -f \end{bmatrix}$ is

skew-symmetric, then the value of AB is:

(A) $\begin{bmatrix} -4 & 3 & -6 \\ -31 & 54 & -26 \\ -28 & 9 & 50 \end{bmatrix}$

(B) $\begin{bmatrix} -4 & 3 & -6 \\ 31 & 54 & -26 \\ -28 & 9 & 50 \end{bmatrix}$

(C) $\begin{bmatrix} -4 & 3 & -6 \\ -31 & 54 & -26 \\ -28 & 9 & -50 \end{bmatrix}$

(D) None of these

Q8 If $A = \begin{bmatrix} 0 & -1 & 2 \\ 2 & -2 & 0 \end{bmatrix}, B = \begin{bmatrix} 0 & 1 \\ 1 & 0 \\ 1 & 1 \end{bmatrix}$ and

M = AB, then M^{-1} is equal to-

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

(B) $\begin{bmatrix} 1/3 & 1/3 \\ -1/3 & 1/6 \end{bmatrix}$

(C) $\begin{bmatrix} 1/3 & -1/3 \\ 1/3 & 1/6 \end{bmatrix}$

(D) $\begin{bmatrix} 1/3 & -1/3 \\ -1/3 & 1/6 \end{bmatrix}$

Q9 What is the inverse of the matrix

$A = \begin{pmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$?

(A) $\begin{pmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$

(B) $\begin{pmatrix} \cos\theta & 0 & -\sin\theta \\ 0 & 1 & 0 \\ \sin\theta & 0 & \cos\theta \end{pmatrix}$

(C) $\begin{pmatrix} 1 & 0 & 0 \\ 0 & \cos\theta & -\sin\theta \\ 0 & \sin\theta & \cos\theta \end{pmatrix}$

(D) $\begin{pmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$

Q10 If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}$ is a matrix satisfying

$AA^T = 9I_3$, then the values of a and b,

respectively are:

(A) a = 2, b = 1

(B) a = 2 ,b = – 1

(C) a = – 2, b = 1

(D) a = – 2, b = – 1

Answer Key

Q1	D
Q2	C
Q3	A
Q4	C
Q5	B
Q6	A
Q7	C
Q8	C
Q9	A
Q10	D

Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:

We have $\begin{bmatrix} 2x & 3 \end{bmatrix}\begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix}\begin{bmatrix} x \\ 8 \end{bmatrix} = 0$

$\Rightarrow \begin{bmatrix} 2x-9 & 4x \end{bmatrix}\begin{bmatrix} x \\ 8 \end{bmatrix} = 0$

or $\left[2x^2 - 9 + 32x\right] = [0]$

$\Rightarrow 2x^2 + 23x = 0$

or $x(2x+23) = 0$

$\Rightarrow x = 0, x = \frac{-23}{2}$

Video Solution:

Q2 Text Solution:

$$\begin{bmatrix} 3y-2x & 3y-2x \\ 3y & 3y \\ 2y+4x & 2y+4x \end{bmatrix} = \begin{bmatrix} 3 & 3 \\ 3y & 3y \\ 10 & 10 \end{bmatrix}$$

3y – 2x = 3 and 2y + 4x = 10 Solving these Equations we get

$$\begin{aligned} 6y - 4x &= 6 \\ 2y + 4x &= 10 \\ \hline \boxed{8y \quad = 16} \end{aligned}$$

$\Rightarrow y = 2, x = \frac{3}{2}$

Video Solution:

Q3 Text Solution:

$$F(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}, F(y) = \begin{bmatrix} \cos y & -\sin y & 0 \\ \sin y & \cos y & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$F(x+y)$

$$= \begin{bmatrix} \cos(x+y) & -\sin(x+y) & 0 \\ \sin(x+y) & \cos(x+y) & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$F(x)F(y)$

$$= \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}\begin{bmatrix} \cos y & -\sin y & 0 \\ \sin y & \cos y & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} \cos x\cos y - \sin x\sin y + 0 & -\cos x\sin y - \sin y\cos y + 0 & 0 \\ \sin x\cos y + \cos x\sin y + 0 & -\sin x\sin y + \cos x\cos y + 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$$

$$= \begin{bmatrix} \cos(x+y) & -\sin(x+y) & 0 \\ \sin(x+y) & \cos(x+y) & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$= F(x+y)$

$\therefore F(x)F(y) = F(x+y)$

Video Solution:

Q4 Text Solution:

$$A^2 = AA = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}\begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$$

$$= \begin{bmatrix} 1+0+4 & 0+0+0 & 2+0+6 \\ 0+0+2 & 0+4+0 & 0+2+3 \\ 2+0+6 & 0+0+0 & 4+0+9 \end{bmatrix}$$

$$=\begin{bmatrix}5&0&8\\2&4&5\\8&0&13\end{bmatrix}$$

Now $A^3 = A^2\ A$

$$=\begin{bmatrix}5&0&8\\2&4&5\\8&0&13\end{bmatrix}\begin{bmatrix}1&0&2\\0&2&1\\2&0&3\end{bmatrix}$$

$$=\begin{bmatrix}5+0+16&0+0+0&10+0+24\\2+0+10&0+8+0&4+4+15\\8+0+26&0+0+0&16+0+39\end{bmatrix}$$

$$=\begin{bmatrix}21&0&34\\12&8&23\\34&0&55\end{bmatrix}$$

$$\therefore A^3-6A^2+7A+2I$$

$$=\begin{bmatrix}21&0&34\\12&8&23\\34&0&55\end{bmatrix}-6\begin{bmatrix}5&0&8\\2&4&5\\8&0&13\end{bmatrix}$$

$$+7\begin{bmatrix}1&0&2\\0&2&1\\2&0&3\end{bmatrix}+2\begin{bmatrix}1&0&0\\0&1&0\\0&0&1\end{bmatrix}$$

$$=$$

$$\begin{bmatrix}21-30+7+2&0+0+0+0&34-48+14+0\\12-12+0+0&8-24+14+2&23-30+7+0\\34-48+14+0&0-0+0&55-78+21+2\end{bmatrix}=\begin{bmatrix}0&0&0\\0&0&0\\0&0&0\end{bmatrix}$$

$$=\begin{bmatrix}21-30+7+2&0+0+0+0&34-48+14+0\\12-12+0+0&8-24+14+2&23-30+7+0\\34-48+14+0&0-0+0&55-78+21+2\end{bmatrix}$$

$$=\begin{bmatrix}0&0&0\\0&0&0\\0&0&0\end{bmatrix}$$

Video Solution:

Q5 Text Solution:

Here

$$B'=\begin{bmatrix}2&-1&1\\-2&3&-2\\-4&4&-3\end{bmatrix}$$

Let

$$P=\frac{1}{2}\left(B+B'\right)=\frac{1}{2}\begin{bmatrix}4&-3&-3\\-3&6&2\\-3&2&-6\end{bmatrix}$$

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

Now $P'=\begin{bmatrix}2&\frac{-3}{2}&\frac{-3}{2}\\\frac{-3}{2}&3&1\\\frac{-3}{2}&1&-3\end{bmatrix}=P$

Thus $P=\frac{1}{2}(B+B')$ is a symmetric matrix.

Also, let

$$Q=\frac{1}{2}\left(B-B'\right)=\frac{1}{2}\begin{bmatrix}0&-1&-5\\1&0&6\\5&-6&0\end{bmatrix}$$

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

Then $Q'=\begin{bmatrix}0&\frac{1}{2}&\frac{5}{3}\\\frac{-1}{2}&0&-3\\\frac{-5}{2}&3&0\end{bmatrix}=-Q$

Thus $Q=\frac{1}{2}(B-B')$ is a skew symmetric matrix.

Now

$$P+Q=\begin{bmatrix}2&\frac{-3}{2}&\frac{-3}{2}\\\frac{-3}{2}&3&1\\\frac{-3}{2}&1&-3\end{bmatrix}$$

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

Thus, B is represented as the sum of a symmetric and a skew symmetric matrix.

Video Solution:

Q6 Text Solution:

For three matrices A, B an C, if ABC is define then (ABC)’ = C’B’A’.

Given that A is symmetric A’ = A

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

Video Solution:

Q7 Text Solution:

A is symmetric

$$\Rightarrow A^T = A$$

$$\Rightarrow \begin{bmatrix} 3 & 2 & b \\ a & 5 & 8 \\ -1 & c & 2 \end{bmatrix} = \begin{bmatrix} 3 & a & -1 \\ 2 & 5 & c \\ b & 8 & 2 \end{bmatrix}$$

$$\Rightarrow a = 2,\ b = -1,\ c = 8$$

B is skew-symmetric

$$\Rightarrow B^T = -B$$

$$\Rightarrow \begin{bmatrix} d & b-a & -2 \\ 3 & e & 6 \\ a & -2b-c & -f \end{bmatrix}$$

$$= \begin{bmatrix} -d & -3 & -a \\ a-b & -e & 2b+c \\ 2 & -6 & f \end{bmatrix}$$

$$\Rightarrow d = -d,\ f = -f \text{ and } e = -e$$

$$\Rightarrow d = f = 0$$

$$\text{So } A = \begin{bmatrix} 3 & 2 & -1 \\ 2 & 5 & 8 \\ -1 & 8 & 2 \end{bmatrix} \text{ and } B$$

$$= \begin{bmatrix} 0 & 3 & 2 \\ -3 & 0 & -6 \\ -2 & 6 & 0 \end{bmatrix}$$

$$\Rightarrow AB = \begin{bmatrix} 3 & 2 & -1 \\ 2 & 5 & 8 \\ -1 & 8 & 2 \end{bmatrix}$$

$$\begin{bmatrix} 0 & 3 & 2 \\ -3 & 0 & -6 \\ -2 & 6 & 0 \end{bmatrix} =$$

$$\begin{bmatrix} -4 & 3 & -6 \\ -31 & 54 & -26 \\ -28 & 9 & -50 \end{bmatrix}$$

Video Solution:

Q8 Text Solution:

$$M = \begin{bmatrix} 0 & -1 & 2 \\ 2 & -2 & 0 \end{bmatrix} \begin{bmatrix} 0 & 1 \\ 1 & 0 \\ 1 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 2 \\ -2 & 2 \end{bmatrix}$$

$$\left|M\right| = 6, \operatorname{adj} M = \begin{bmatrix} 2 & -2 \\ 2 & 1 \end{bmatrix}$$

$$\therefore \quad M^{-1} = \frac{1}{6}\begin{bmatrix} 2 & -2 \\ 2 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1/3 & -1/3 \\ 1/3 & 1/6 \end{bmatrix}$$

Video Solution:

Q9 Text Solution:

$$A = \begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

We know, $\mathbf{AA^{-1}} = \mathbf{I}$

Let us take first option (a) as A^{-1}

$$\begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} \cos^2\theta + \sin^2\theta & -\sin\theta\cos\theta + \cos\theta\sin\theta & 0 \\ -\sin\theta\cos\theta + \cos\theta\sin\theta & \sin^2\theta + \cos^2\theta & 0 \\ & 0 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = I$$

Video Solution:

Q10 Text Solution:

$$A = \begin{bmatrix} 1 & 2 & 4 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix} \Rightarrow A^T$$

$$= \begin{bmatrix} 1 & 2 & a \\ 2 & 1 & 2 \\ 4 & -2 & b \end{bmatrix}$$

$$\therefore AA^T = 9I_3$$

$$\Rightarrow \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix} \begin{bmatrix} 1 & 2 & a \\ 2 & 1 & 2 \\ 2 & -2 & b \end{bmatrix}$$

$$= 9\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 9 & 0 & a+2b+4 \\ 0 & 9 & 2a+2-2b \\ a+2b+4 & 2a+2-2b & a^2+4+b^2 \end{bmatrix}$$

$$= \begin{bmatrix} 9 & 0 & 0 \\ 0 & 9 & 0 \\ 0 & 0 & 9 \end{bmatrix}$$

$$\Rightarrow a + 2b + 4 = 0, \; 2a + 2 - 2b = 0$$

$$\text{and } a^2 + 4 + b^2 = 9$$

$$\Rightarrow a + 2b + 4 = 0, \; a - b + 1 = 0$$

$$\text{and } a^2 + b^2 = 5$$

Solving a + 2b + 4 = 0 and a – b + 1 = 0, we get a = – 2, b = – 1. Clearly, these values satisfy $a^2 + b^2 = 5$.

Hence, a = – 2 and b = – 1.

Video Solution: