SESSION : 2025-26

DPP
DAILY PRACTICE PRODUCTS

CLASS : XIIth
DATE :

SOLUTIONS

SUBJECT : MATHS
DPP NO. :1

Topic :-MATRICES

2 **(b)**

$\left[\frac{1}{2}(A-A')\right]' = \frac{1}{2}(A-A')' = \frac{1}{2}(A'-A)$

$= -\frac{1}{2}(A-A')$

Hence, it is a skew-symmetric matrix.

3 **(b)**

$\because$ adj $A = \begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$

and $|A| = \begin{vmatrix} 1 & -2 \\ 3 & 4 \end{vmatrix} = 10$

$\therefore A^{-1} = \frac{1}{10}\begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$

5 **(b)**

Let $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$

$\therefore$ adj $A = \begin{bmatrix} 1 & -2 & -2 \\ -1 & 3 & 3 \\ 0 & -4 & -3 \end{bmatrix}^T$

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

6 **(d)**

We have,

$3A^3 + 2A^2 + 5A + I = 0$

$\Rightarrow I = -3A^3 - 2A^2 - 5A$

$\Rightarrow I A^{-1} = (-3A^3 - 2A^2 - 5A)A^{-1}$

$\Rightarrow A^{-1} = -3A^2 - 2A - 5I$

8 **(b)**

The given system of equations are

$x + y + z = 0,$

$2x + 3y + z = 0$ and $x + 2y = 0$

Here, $\begin{vmatrix} 1 & 1 & 1 \\ 2 & 3 & 1 \\ 1 & 2 & 0 \end{vmatrix} = 1(0-2) - 1(0-1) + (4-3)$

$= -2 + 1 + 1 = 0$

$\therefore$ This system has infinite solutions

9 **(c)**

$2X - \begin{bmatrix} 1 & 2 \\ 7 & 4 \end{bmatrix} = \begin{bmatrix} 3 & 2 \\ 0 & -2 \end{bmatrix}$

$\Rightarrow\ 2X = \begin{bmatrix} 3 & 2 \\ 0 & -2 \end{bmatrix} + \begin{bmatrix} 1 & 2 \\ 7 & 4 \end{bmatrix}$

$\Rightarrow\ 2X = \begin{bmatrix} 4 & 4 \\ 7 & 2 \end{bmatrix}$

$\Rightarrow\ X = \begin{bmatrix} 2 & 2 \\ 7/2 & 1 \end{bmatrix}$

11 **(b)**

Given, $A = A', B = B'$

Now, $(AB - BA)' = (AB)' - (BA)'$

$=B'A' - A'B'$

$=BA - AB$

$=-(AB - BA)$

$\therefore AB - BA$ is a skew-symmetric matrix.

13 **(a)**

Given that, p is a non-singular matrix such that

$1 + p + p^2 + \ldots + p^n = O$

$\Rightarrow\ (1 + p)(1 + p + p^2 + \ldots + p^n) = O$

$\Rightarrow\ 1 - p^{n+1} = O$

$\Rightarrow\ p^{n+1} = 1$

$\Rightarrow\ p^n \times p^1 = 1$

$\Rightarrow\ p^n = 1/p$

$\therefore\ p^{-1} = p^n$

14 **(a)**

Given, $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \frac{1}{40}\begin{bmatrix} 5 & 10 & -5 \\ -5 & -2 & 13 \\ 10 & -4 & 6 \end{bmatrix}\begin{bmatrix} 5 \\ 0 \\ 5 \end{bmatrix}$

$= \frac{1}{40}\begin{bmatrix} 25 + 0 - 25 \\ -25 + 0 + 65 \\ 50 + 0 + 30 \end{bmatrix}$

$= \frac{1}{40}\begin{bmatrix} 0 \\ 40 \\ 80 \end{bmatrix}$

$\Rightarrow\ \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$

$\Rightarrow\ x = 0, y = 1, z = 2$

$\therefore\ x + y + z = 0 + 1 + 2 = 3$

15 **(d)**

$\because\ \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} y \\ x \end{bmatrix} = \begin{bmatrix} X \\ Y \end{bmatrix}$

Then, $X = y$ and $Y = x$

$ie,\ \ y = x$

16 **(c)**

Given $\begin{bmatrix}1 & -\tan\theta\\ \tan\theta & 1\end{bmatrix}\begin{bmatrix}1 & \tan\theta\\ -\tan\theta & 1\end{bmatrix}^{-1} = \begin{bmatrix}a & -b\\ b & a\end{bmatrix}$

$\Rightarrow \begin{bmatrix}1 & -\tan\theta\\ \tan\theta & 1\end{bmatrix}\cdot\dfrac{1}{1+\tan^2\theta}\begin{bmatrix}1 & -\tan\theta\\ \tan\theta & 1\end{bmatrix} = \begin{bmatrix}a & -b\\ b & a\end{bmatrix}$

$\Rightarrow \dfrac{1}{1+\tan^2\theta}\begin{bmatrix}1-\tan^2\theta & -2\tan\theta\\ 2\tan\theta & 1-\tan^2\theta\end{bmatrix} = \begin{bmatrix}a & -b\\ b & a\end{bmatrix}$

$\Rightarrow \begin{bmatrix}\dfrac{1-\tan^2\theta}{1+\tan^2\theta} & \dfrac{2\tan\theta}{1+\tan^2\theta}\\ \dfrac{2\tan\theta}{1+\tan^2\theta} & \dfrac{1-\tan^2\theta}{1+\tan^2\theta}\end{bmatrix} = \begin{bmatrix}a & -b\\ b & a\end{bmatrix}$

$\Rightarrow \begin{bmatrix}\cos 2\theta & -\sin 2\theta\\ \sin 2\theta & \cos 2\theta\end{bmatrix} = \begin{bmatrix}a & -b\\ b & a\end{bmatrix}$

$\Rightarrow \quad a = \cos 2\theta, \quad b = \sin 2\theta$

17 **(d)**

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

$\therefore\ B = \begin{bmatrix}C_{11} & C_{12} & C_{13}\\ C_{21} & C_{22} & C_{23}\\ C_{31} & C_{32} & C_{33}\end{bmatrix} = \begin{bmatrix}-3 & -6 & -6\\ 6 & 3 & -6\\ 6 & -6 & 3\end{bmatrix}$

$\Rightarrow\ \text{adj}\,A = (B)' = \begin{bmatrix}-3 & 6 & 6\\ -6 & 3 & -6\\ -6 & -6 & 3\end{bmatrix}$

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

18 **(d)** Given equations are

$px + y + z = 0, x + qy + z = 0, x + y + rz = 0$

Since, the system have a non-zero solution, then

$\begin{bmatrix}p & 1 & 1\\ 1 & q & 1\\ 1 & 1 & r\end{bmatrix} = 0$

Applying $C_2 \to C_2 - C_1$and $C_3 \to C_3 - C_2$

$\Rightarrow \begin{vmatrix}p & 1-p & 0\\ 1 & q-1 & 1-q\\ 1 & 0 & r-1\end{vmatrix} = 0$

$\Rightarrow (1-p)(1-q)(1-r)\begin{vmatrix}\dfrac{p}{1-p} & 1 & 0\\ \dfrac{1}{1-q} & -1 & 1\\ \dfrac{1}{1-r} & 0 & -1\end{vmatrix} = 0$

$\Rightarrow (1-p)(1-q)(1-r)$

$\left[\dfrac{p}{1-p}(1) - 1\left(-\dfrac{1}{1-q} - \dfrac{1}{1-r}\right)\right] = 0$

Since, $p, q, r \neq 1$

$$\therefore \frac{p}{1-p}+\frac{1}{1-q}+\frac{1}{1-r}=0$$

$$\Rightarrow \quad \frac{1}{1-p}-1+\frac{1}{1-q}+\frac{1}{1-r}=0$$

$$\Rightarrow \frac{1}{1-p}+\frac{1}{1-q}+\frac{1}{1-r}=0$$

19 **(b)** Given, $AB=I \Rightarrow B=A^{-1}$

Now, $A^{-1}=\frac{\text{adj } A}{|A|}$

$$=\frac{\begin{bmatrix} 1 & -\tan\frac{\theta}{2} \\ \tan\frac{\theta}{2} & 1 \end{bmatrix}}{1+\tan^2\frac{\theta}{2}}$$

$$=\frac{A^T}{\sec^2\frac{\theta}{2}}=\cos^2\frac{\theta}{2}A^T$$

20 **(d)**

Given equations are $3x+y+2z=3$ ...(i) $2x-3y-z=-3$ ...(ii)

and $x+2y+z=4$ ...(iii)

Let $A=\begin{bmatrix} 3 & 1 & 2 \\ 2 & -3 & -1 \\ 1 & 2 & 1 \end{bmatrix}$, $B=\begin{bmatrix} 3 \\ -3 \\ 4 \end{bmatrix}$, $X=\begin{bmatrix} x \\ y \\ z \end{bmatrix}$

$$\therefore \ |A|=\begin{vmatrix} 3 & 1 & 2 \\ 2 & -3 & -1 \\ 1 & 2 & 1 \end{vmatrix}$$

$$=3\begin{vmatrix} -3 & -1 \\ 2 & 1 \end{vmatrix}-1\begin{vmatrix} 2 & -1 \\ 1 & 1 \end{vmatrix}+2\begin{vmatrix} 2 & -3 \\ 1 & 2 \end{vmatrix}$$

$$=3(-3+2)-1(2+1)+2(4+3)$$

$$=-3-3+14=8$$

$$\text{adj.} A=\begin{bmatrix} -1 & -3 & 7 \\ 3 & 1 & -5 \\ 5 & 7 & -11 \end{bmatrix}^T$$

$$=\begin{vmatrix} -1 & 3 & 5 \\ -3 & 1 & 7 \\ 7 & -5 & -11 \end{vmatrix}$$

$$\therefore \ A^{-1}=\frac{1}{|A|}\text{adj } A=\frac{1}{8}\begin{bmatrix} -1 & 3 & 5 \\ -3 & 1 & 7 \\ 7 & -5 & -11 \end{bmatrix}$$

Now, $X=A^{-1}B$

$$=\frac{1}{8}\begin{bmatrix} -1 & 3 & 5 \\ -3 & 1 & 7 \\ 7 & -5 & -11 \end{bmatrix}\begin{bmatrix} 3 \\ -3 \\ 4 \end{bmatrix}$$

$$=\frac{1}{8}\begin{bmatrix} -3-9+20 \\ -9-3+28 \\ 21+15-44 \end{bmatrix}=\frac{1}{8}\begin{bmatrix} 8 \\ 16 \\ -8 \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} x \\ y \\ z \end{bmatrix}=\begin{bmatrix} 1 \\ 2 \\ -1 \end{bmatrix}$$

$\Rightarrow \quad x = 1, y = 2, z = -1$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	B	B	B	A	B	D	B	B	C	B
Q.	11	12	13	14	15	16	17	18	19	20
A.	B	A	A	A	D	C	D	D	B	D

SESSION : 2025-26

DPP

DAILY PRACTICE PROBLEMS

CLASS : XIIth
DATE :

SOLUTIONS

SUBJECT : MATHS
DPP NO. :2

Topic :-MATRICES

1 **(a)**

$A^2 = 2A - I$

$\therefore \quad A^2 A = 2AA - IA$

$= 2A^2 - A = 2(2A - I) - A$

$\Rightarrow \quad A^3 = 3A - 2I$

$\Rightarrow \quad A^3 . A = 3AA - 2IA = 3(2A - I) - 2A$

$\Rightarrow \quad A^4 = 4A - 3I$

Similarly, $A^n = nA - (n - I)I$

2 **(d)**

$\det(M_r) = \begin{bmatrix} r & r-1 \\ r-1 & r \end{bmatrix} = 2r - 1$

$\sum_{r=1}^{2007} \det(M_r) = 2\sum_{r=1}^{2007} r - 2007$

$= 2 \times \dfrac{2007 \times 2008}{2} - 2007 = (2007)^2$

3 **(a)**

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

$\therefore \quad |A| = \begin{vmatrix} 0 & 1 & -1 \\ -1 & 0 & 2 \\ 1 & -2 & 0 \end{vmatrix}$

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

$= 0 + 2 - 2 = 0$

$\Rightarrow |A| = 0$

Now, $(\text{adj } A)B = \begin{bmatrix} 4 & 2 & 2 \\ 2 & 1 & 1 \\ 2 & 1 & -1 \end{bmatrix}\begin{bmatrix} 1 \\ -2 \\ 3 \end{bmatrix}$

$= \begin{bmatrix} 4 - 4 + 6 \\ 2 - 2 + 3 \\ 2 - 2 - 3 \end{bmatrix} = \begin{bmatrix} 6 \\ 3 \\ -3 \end{bmatrix} \neq O$

$\therefore$ This system of equation is inconsistent, so it has no solution

5 **(c)**

Given, $D = \text{diag}\,(d_1, d_2, d_3, \ldots, d_n)$
$\Rightarrow \quad D^{-1} = \text{diag}(d_1^{-1}, d_2^{-1}, \ldots, d_n^{-1})$
6 **(a)**
We have,
$a = \begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$
$\Rightarrow A^n = \begin{bmatrix} 1 & na \\ 0 & 1 \end{bmatrix}$ [Using PMI]
$\Rightarrow \frac{1}{n} A^n = \begin{bmatrix} \frac{1}{n} & a \\ 0 & \frac{1}{n} \end{bmatrix} \Rightarrow \lim_{n\to\infty} \frac{1}{2} A^n = \begin{bmatrix} 0 & a \\ 0 & 0 \end{bmatrix}$
7 **(d)**
The given system of equations are
$2x + y - 5 = 0$ ...(i)
$x - 2y + 1 = 0$ ...(ii)
and $2x - 14y - a = 0$ ...(iii)
This system is consistent.
$\therefore \begin{bmatrix} 2 & 1 & -5 \\ 1 & -2 & 1 \\ 2 & -14 & -a \end{bmatrix} = 0$
$\Rightarrow 2(2a + 14) — 1(-a - 2) - 5(-14 + 4) = 0$
$\Rightarrow 4a + 28 + a + 2 + 50 = 0$
$\Rightarrow 5a = -80 \quad \Rightarrow \quad a = -16$
8 **(d)**
The system of given equations has no solution, if $\begin{vmatrix} \alpha & 1 & 1 \\ 1 & \alpha & 1 \\ 1 & 1 & \alpha \end{vmatrix} = 0$
Applying $C_1 \to C_1 + C_2 + C_3$ and taking common $(\alpha + 2)$from C_1, we get
$(\alpha + 2) \begin{vmatrix} 1 & 1 & 1 \\ 1 & \alpha & 1 \\ 1 & 1 & \alpha \end{vmatrix} = 0$
Applying $R_2 \to R_2 - R_1, R_3 \to R_3 - R_1$
$\Rightarrow \quad (\alpha + 2) \begin{vmatrix} 1 & 1 & 1 \\ 0 & a-1 & 0 \\ 0 & 0 & a-1 \end{vmatrix} = 0$
$\Rightarrow \quad (\alpha + 2)(\alpha - 1)^2 = 0$
$\Rightarrow \quad \alpha = 1, -2$
But α =1 makes given three equations same. So, the system of equation have infinite solution. So, answer is $\alpha = -2$ for which the system of equations has no solution
10 **(b)**
Given, $A = \begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix}$
$\therefore \quad A^2 = \begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix} \begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix}$
$\Rightarrow \quad \begin{bmatrix} x^2 + 1 & x \\ x & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$\Rightarrow \quad x^2 + 1 = 1, x = 0$

$\Rightarrow \quad x = 0$

11 **(a)**

Given that, $A^{-1} = \lambda$ (adj A)

On comparing with $A^{-1} = \frac{1}{|A|\text{adj}} A$ we get

$\lambda = \frac{1}{|A|}$

Now, $|A| = \begin{vmatrix} 0 & 3 \\ 2 & 0 \end{vmatrix} = 0 - 6 = -6$

$\Rightarrow \lambda = -\frac{1}{6}$

12 **(d)**

$a_{11}C_{11} + a_{12}C_{12} + a_{13}C_{13} + a_{14}C_{14} = |A|$

13 **(d)**

Given equation are $x + y + z = 6, x + 2y + 3z = 10$ and $x + 2y + \lambda z = 10$

Since, it is consistent.

$\therefore \begin{vmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 2 & \lambda \end{vmatrix} = 0$

$\Rightarrow \quad 1(2\lambda - 6) - 1(\lambda - 3) + 1(2 - 2) = 0$

$\Rightarrow \quad \lambda - 3 = 0 \quad \Rightarrow \quad \lambda = 3$

14 **(b)**

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

$\therefore \quad A^4 = 2A.2A = 4A^2 = 4 \times 2A = 2^3 A$

Similarly, $\quad A^8 = 2^7 A$

$\Rightarrow \quad A^{100} = 2^{99} A$

15 **(d)**

Let $A = \begin{bmatrix} \cos 2\theta & -\sin 2\theta \\ \sin 2\theta & \cos 2\theta \end{bmatrix}$

$\therefore \ |A| = \cos^2 2\theta + \sin^2 2\theta = 1$

and adj $A = \begin{bmatrix} \cos 2\theta & \sin 2\theta \\ -\sin 2\theta & \cos 2\theta \end{bmatrix}$

$\therefore \ A^{-1} = \frac{1}{1} \begin{bmatrix} \cos 2\theta & \sin 2\theta \\ -\sin 2\theta & \cos 2\theta \end{bmatrix}$

$= \begin{bmatrix} \cos 2\theta & \sin 2\theta \\ -\sin 2\theta & \cos 2\theta \end{bmatrix}$

18 **(a)**

Give equation can be written as,

$2X = \begin{bmatrix} 3 & 8 \\ 7 & 2 \end{bmatrix} - \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

$\Rightarrow 2X = \begin{bmatrix} 2 & 6 \\ 4 & -2 \end{bmatrix} = 2 \begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}$

$\Rightarrow \quad X = \begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}$

19 **(c)**

We have,

$A\,B = 0$

$\Rightarrow |A\,B| = 0$

$\Rightarrow |A|\,|B| = 0$

$\Rightarrow |A| = 0$ or $|B| = 0$

Let $A = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}, B = \begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$. Then, $A\,B = O$. But $A \neq O, B \neq O$

20 **(b)**

Given, $A = \begin{bmatrix} 1 & -1 & -2 \\ 2 & 1 & 1 \\ 4 & -1 & -2 \end{bmatrix}$

$\therefore\ A^{-1} = \dfrac{1}{3}\begin{bmatrix} -1 & 0 & 1 \\ 8 & 6 & -5 \\ -6 & -3 & 3 \end{bmatrix}$

Now, $A^{-1}D = \frac{1}{3}\begin{bmatrix} -1 & 0 & 1 \\ 8 & 6 & -5 \\ -6 & -3 & 3 \end{bmatrix}\begin{bmatrix} 3 \\ 5 \\ 11 \end{bmatrix} = \frac{1}{3}\begin{bmatrix} 8 \\ -1 \\ 0 \end{bmatrix}$

$\Rightarrow\ \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 8/3 \\ -1/3 \\ 0 \end{bmatrix}$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	A	D	A	A	C	A	D	D	B	B
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	D	D	B	D	C	A	A	C	B

SESSION : 2025-26

DPP
DAILY PRACTICE PRACTICE PROBLEMS

CLASS : XIIth
DATE :

SOLUTIONS

SUBJECT : MATHS
DPP NO. :3

Topic :-MATRICES

2 **(a)**

Given equations are $x - cy - bz = 0$

$cx - y + az = 0$ and $bx + ay - z = 0$

For non-zero solution

$\begin{vmatrix} 1 & -c & -b \\ c & -1 & a \\ b & a & -1 \end{vmatrix} = 0$

$\Rightarrow 1(1 - a^2) + c(-c - ab) - b(ac + b) = 0$

$\Rightarrow \ a^2 + b^2 + c^2 + 2abc = 1$

3 **(b)**

We have,

Det $(I_n) = 1(\neq 0) \Rightarrow$ rank $(I_n) = n$

4 **(a)**

The given matrix A is singular, if

$|A| = \begin{vmatrix} 8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & \lambda \end{vmatrix} = 0$

$\Rightarrow \ 8(7\lambda - 16) + 6(-6\lambda + 8) + 2(24 - 14) = 0$

$\Rightarrow \ 56\lambda - 128 - 36\lambda + 48 + 20 = 0$

$\Rightarrow \ 20\lambda = 60$

$\Rightarrow \ \lambda = 3$

5 **(c)**

Let $B = I + A + A^2 + A^3 \dots \infty$

$\Rightarrow AB = A + A^2 + A^3 + \cdots \infty$

$\Rightarrow B - AB = I$

$\Rightarrow B(I - A) = I$

$\Rightarrow B = (I - A)^{-1}$

$\Rightarrow B = \begin{bmatrix} 0 & -2 \\ -3 & -3 \end{bmatrix}^{-1} = -\frac{1}{6}\begin{bmatrix} -3 & 2 \\ 3 & 0 \end{bmatrix} = \begin{bmatrix} 1/2 & -1/3 \\ -1/2 & 0 \end{bmatrix}$

6 **(a)**

Since A is non-singular matrix

$\therefore |A| \neq 0 \Rightarrow \text{rank}(A) = n$

7 **(b)**

$A^2 = \begin{bmatrix}1 & -2\\4 & 5\end{bmatrix}\begin{bmatrix}1 & -2\\4 & 5\end{bmatrix} = \begin{bmatrix}-7 & -12\\24 & 17\end{bmatrix}$

Now, $f\,(A) = A^2 - 3A + 7$

$=\begin{bmatrix}-7 & -12\\24 & 17\end{bmatrix} - 3\begin{bmatrix}1 & -2\\4 & 5\end{bmatrix} + 7\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$

$=\begin{bmatrix}-3 & -6\\12 & 9\end{bmatrix}$

$\therefore f(A) + \begin{bmatrix}3 & 6\\-12 & -9\end{bmatrix} = \begin{bmatrix}-3 & -6\\12 & 9\end{bmatrix} + \begin{bmatrix}3 & 6\\-12 & -9\end{bmatrix} = \begin{bmatrix}0 & 0\\0 & 0\end{bmatrix}$

8 **(a)**

The given system of equations will have a unique solution, if

$\begin{vmatrix}1 & 1 & 1\\2 & 1 & -1\\3 & 2 & k\end{vmatrix} \neq 0 \Rightarrow k \neq 0$

9 **(a)**

Given, $2x + y - z = 7$ ...(i)

$x - 3y + 2z = 1$ ...(ii)

and $x + 4y - 3z = 5$ ...(iii)

From Eqs.(i) and (ii), we get

$5x - y = 15$ ...(iv)

From Eqs. (i) and (iii)

$5x - y = 16$ ...(v)

Eqs. (iv) and (v) shows that they are parallel and solution does not exist.

10 **(d)**

We have,

$X = \begin{bmatrix}3 & -4\\1 & -1\end{bmatrix} \Rightarrow X^2 = \begin{bmatrix}5 & -8\\2 & -3\end{bmatrix}$

Clearly for $n = 2$, the matrices in options (a), (b), (c) do not tally with $\begin{bmatrix}5 & -8\\2 & -3\end{bmatrix}$

12 **(a)**

We have,

$A = [a_{ij}] \;\therefore |k\,A| = k^n|A|$

13 **(b)**

$A^2 = \begin{bmatrix}1 & 0 & 0\\0 & 1 & 0\\a & b & -1\end{bmatrix}\begin{bmatrix}1 & 0 & 0\\0 & 1 & 0\\a & b & -1\end{bmatrix}$

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

14 **(d)**

Given that, $A = \begin{bmatrix}\alpha & 0\\1 & 1\end{bmatrix}$

$\Rightarrow A^2 = \begin{bmatrix}\alpha & 0\\1 & 1\end{bmatrix}\begin{bmatrix}\alpha & 0\\1 & 1\end{bmatrix}$

$= \begin{bmatrix}\alpha^2 + 0 & 0 + 0\\\alpha + 1 & 0 + 1\end{bmatrix}$

$= \begin{bmatrix}\alpha^2 & 0\\\alpha + 1 & 1\end{bmatrix}$

Also, $B = A^2$ (given)

$\Rightarrow \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix} = \begin{bmatrix} \alpha^2 & 0 \\ \alpha+1 & 1 \end{bmatrix}$

Clearly this is not satisfied by any real value of α

15 **(b)**

We have,

$A\,(\text{adj } A) = \begin{bmatrix} 4 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{bmatrix}$

$\Rightarrow |A|\, I = 4\, I \qquad [\because A(\text{adj } A) = |A|\, I]$

$\Rightarrow |A| = 4$

$\Rightarrow |\text{adj } A| = |A|^2 \qquad [|\text{adj } A| = |A|^{n-1}]$

16 **(a)**

Given, $A = \begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix}$

$A^2 = \begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix} \begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix} = \begin{bmatrix} \omega^2 & 0 \\ 0 & \omega^2 \end{bmatrix}$

$\Rightarrow A^3 = \begin{bmatrix} \omega^2 & 0 \\ 0 & \omega^2 \end{bmatrix} \begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix} = \begin{bmatrix} \omega^3 & 0 \\ 0 & \omega^3 \end{bmatrix}$

Similarly, $A^{50} = \begin{bmatrix} \omega^{50} & 0 \\ 0 & \omega^{50} \end{bmatrix}$

$= \begin{bmatrix} (\omega^2)^{16}\omega^2 & 0 \\ 0 & (\omega^3)^{16}\omega^2 \end{bmatrix}$

$= \begin{bmatrix} \omega^2 & 0 \\ 0 & \omega^2 \end{bmatrix}$

$= \omega^2 A$

17 **(a)**

We have,

$AB = I_3$

$\Rightarrow \begin{bmatrix} 1 & 2 & x \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & -2 & y \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$\Rightarrow \begin{bmatrix} 1 & 0 & x+y \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$\Rightarrow x + y = 0$

18 **(a)**

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

$\therefore \text{ adj(A)} = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$

19 **(a)**

$\because |A| = 0 - 1(1-9) + 2(1-6)$

$= 8 - 10 = -2 \neq 0$

$\text{adj } (A) = \begin{bmatrix} -1 & 1 & -1 \\ 8 & -6 & 2 \\ -5 & 3 & -1 \end{bmatrix}$

$$\therefore \quad A^{-1} = \frac{1}{-2}\begin{bmatrix} -1 & 1 & -1 \\ 8 & -6 & 2 \\ -5 & 3 & -1 \end{bmatrix} = \begin{bmatrix} 1/2 & -1/2 & 1/2 \\ -4 & 3 & -1 \\ 5/2 & -3/2 & 1/2 \end{bmatrix}$$

20 **(a)**

$|f(\theta)| = 1(\cos^2\theta + \sin^2\theta) = 1$

$$\text{Now, adj}\{f(\theta)\} = \begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

$$\therefore \quad \{f(\theta)\}^{-1} = \begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} = f(-\theta)$$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	B	A	B	A	C	A	B	A	A	D
Q.	11	12	13	14	15	16	17	18	19	20
A.	C	A	B	D	B	A	A	A	A	A

SESSION : 2025-26

DPP

DAILY PRACTICE PROBLEMS

CLASS : XIIth
DATE :

SOLUTIONS

SUBJECT : MATHS
DPP NO. :4

Topic :-MATRICES

1 **(a)**

Given, $x + 4ay + az = 0$ ...(i)

$x + 3by + bz = 0$ ...(ii)

And $x + 2cy + cz = 0$ ...(iii)

For non-trivial solution

$$\begin{vmatrix} 1 & 4a & a \\ 1 & 3b & b \\ 1 & 2c & c \end{vmatrix} = 0$$

Applying $R_2 \to R_2 - R_1, R_3 \to R_3 - R_1$

$$\Rightarrow \begin{vmatrix} 1 & 4a & a \\ 0 & 3b - 4a & b - a \\ 0 & 2c - 4a & c - a \end{vmatrix} = 0$$

$\Rightarrow 1[(3b - 4a)(c - a) - 2(b - a)(c - 2a)] = 0$

$\Rightarrow 3bc - 3ab - 4ac + 4a^2 - 2(bc - 2ab - ac + 2a^2) = 0$

$\Rightarrow \quad bc + ab - 2ac = 0$

$\Rightarrow \quad ab + bc = 2ac$

2 **(d)**

We know that

rank $(A\,B) \leq$ rank(A)

and, rank $(A\,B) \leq$ rank (B)

$\therefore$ rank $(A\,B) \leq \min(\text{rank } A, \text{rank } B)$

3 **(c)**

Let $A = \begin{bmatrix} a_{11} \\ a_{21} \\ \vdots \\ a_{m1} \end{bmatrix}$ and $B = [b_{11}\; b_{12}\; b_{13}\; \cdots b_{1n}]$ be two non-zero column and row matrices respectively

We have, $A\,B = \begin{bmatrix} a_{11}\,b_{11} & a_{11}\,b_{12} & a_{11}\,b_{13} & \cdots a_{11}\,b_{1\,n} \\ a_{21}\,b_{11} & a_{21}\,b_{12} & a_{21}\,b_{13} & a_{21}\,b_{1\,n} \\ \vdots & \vdots & \vdots & \vdots \\ a_{m1}\,b_{11} & a_{m1}\,b_{12} & a_{m1}\,b_{13} & a_{m1}\,b_{1\,n} \end{bmatrix}$

Since A and B are non-zero matrices. Therefore, the matrix AB will also be a non-zero matrix. The matrix AB will have at least one non-zero element obtained by multiplying corresponding non-zero elements of A and B. All the two-rowed minors of A obviously vanish. But, A is a non-zero matrix. Hence, rank $(A = 1)$

4 **(c)**

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

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

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

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

5 **(a)**

If A is any square matrix, then

$AA^{-1} = I$ and $A^{-1}I = A^{-1}$

Since, $A^2 - A + I = O$

$\Rightarrow \quad A^{-1}A^2 - A^{-1}A + A^{-1}I = 0$

$\Rightarrow \quad (A^{-1}A)\,A - (A^{-1}A) + A^{-1} = 0$

$\Rightarrow \quad A - 1 + A^{-1} = 0 \Rightarrow A^{-1} = I - A$

6 **(a)**

Since, B is invertible, therefore B^{-1} exists

Now, rank $(A) = \text{rank}[(AB)B^{-1}] \leq \text{rank}(AB)$

But $\quad \text{rank}(AB) \leq \text{rank}(A)$

$\therefore \quad \text{rank}\,(AB) = \text{rank}(A)$

7 **(c)**

Given, $A = \begin{bmatrix}4 & 2\\3 & 4\end{bmatrix}$ of order $n = 2$

$\therefore |\text{adj}(A)| = |A|^{2-1} = \begin{bmatrix}4 & 2\\3 & 4\end{bmatrix} = 10$

8 **(d)**

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

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

9 **(b)**

Let A denote the matrix every element of which is unity. Then, all the 2-rowed minors of A obviously vanish. But A is a non-null matrix. Hence, rank of A is 1

10 **(d)**

As $\quad \det(A) = \pm 1, A^{-1}$exists

and $\quad A^{-1} = \frac{1}{\det(A)}(\text{adj}\,A) = \pm(\text{adj}\,A)$

All entries in adj (A) are integers.

$\therefore A^{-1}$ has integer entries.

11 **(c)**

Since, A is invertible

$\therefore \; |A| \neq 0 \;\Rightarrow\; \begin{bmatrix}1 & 0 & -k\\2 & 1 & 3\\k & 0 & 1\end{bmatrix} \neq 0$

$\Rightarrow \; 1(1-0) + k(0-k) \neq 0$

$\Rightarrow \; 1 - k^2 \neq 0 \;\; \Rightarrow k \neq \pm 1$

12 **(b)**

We have,

$$\begin{bmatrix}1 & -\tan\theta\\ \tan\theta & 1\end{bmatrix}\begin{bmatrix}1 & \tan\theta\\ -\tan\theta & 1\end{bmatrix}^{-1}=\begin{bmatrix}a & -b\\ b & a\end{bmatrix}$$

$$\Rightarrow \begin{bmatrix}1 & -\tan\theta\\ \tan\theta & 1\end{bmatrix}\frac{1}{1+\tan^2\theta}\begin{bmatrix}1 & -\tan\theta\\ \tan\theta & 1\end{bmatrix}=\begin{bmatrix}a & -b\\ b & a\end{bmatrix}$$

$$\Rightarrow \frac{1}{1+\tan^2\theta}\begin{bmatrix}1-\tan^2\theta & -2\tan\theta\\ 2\tan\theta & 1-\tan^2\theta\end{bmatrix}=\begin{bmatrix}a & -b\\ b & a\end{bmatrix}$$

$$\Rightarrow \begin{bmatrix}\dfrac{1-\tan^2\theta}{1+\tan^2\theta} & \dfrac{-2\tan\theta}{1+\tan^2\theta}\\ \dfrac{2\tan\theta}{1+\tan^2\theta} & \dfrac{1-\tan^2\theta}{1+\tan^2\theta}\end{bmatrix}=\begin{bmatrix}a & -b\\ b & a\end{bmatrix}$$

$$\Rightarrow \begin{bmatrix}\cos 2\theta & -\sin 2\theta\\ \sin 2\theta & \cos 2\theta\end{bmatrix}=\begin{bmatrix}a & -b\\ b & a\end{bmatrix}$$

$\Rightarrow a=\cos 2\theta, b=\sin 2\theta$

13 **(c)**

We have,

$x^2+y^2+z^2\neq 0$

$\Rightarrow$ At least one of x, y, z is non-zero

Now,

$x=cy+bz, y=az+cx, z=bx+ay$

$\Rightarrow x-cy-bz=0$

$cx-y+az=0$

$bx+zy-z=0$

As at least one of x, y, z is non-zero. Therefore, the above system of equations has non-trivial solutions

$$\therefore \begin{vmatrix}1 & -c & -b\\ c & -1 & a\\ b & a & -1\end{vmatrix}=0\Rightarrow a^2+b^2+c^2+2abc=1$$

14 **(c)**

$A^2-4A+10I=A$

$$\Rightarrow \begin{bmatrix}1 & -3\\ 2 & k\end{bmatrix}\begin{bmatrix}1 & -3\\ 2 & k\end{bmatrix}-4\begin{bmatrix}1 & -3\\ 2 & k\end{bmatrix}+10\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}=\begin{bmatrix}1 & -3\\ 2 & k\end{bmatrix}$$

$$\Rightarrow \begin{bmatrix}-5 & -3-3k\\ 2+2k & -6+k^2\end{bmatrix}-\begin{bmatrix}4 & -12\\ 8 & 4K\end{bmatrix}+\begin{bmatrix}10 & 0\\ 0 & 10\end{bmatrix}=\begin{bmatrix}1 & -3\\ 2 & k\end{bmatrix}$$

$$\Rightarrow \begin{bmatrix}1 & 9-3k\\ -6+2k & 4+k^2-4K\end{bmatrix}=\begin{bmatrix}1 & -3\\ 2 & k\end{bmatrix}$$

$\Rightarrow 9-3k=-3, -6+2k=2$ ...(i)

and $4+k^2-4k=k$

$\Rightarrow k^2-5k+4=0\Rightarrow k=4,1$ But $k=1$ is not satisfied the Eq (i).

15 **(a)**

Given, $A^2=2A-I$

Now, $A^3=A^2\cdot A=2A^2=-IA$

$=2A^2-A=2(2A-I)-A$

$=3A-2I=3A-(3-1)I$

$\dots\ \dots\ \dots\ \dots\ \dots$

$\dots \quad \dots \quad \dots \quad \dots \quad \dots$

$A^n = nA - (n-1)I$

16 **(c)**

We have, $\begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix} A = \begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix}$

$\Rightarrow A = \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}^{-1} \begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix}$

$\Rightarrow \quad A = \begin{bmatrix} 1 & -3 \\ 0 & 1 \end{bmatrix} \begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix}$

$= \begin{bmatrix} 1 & 4 \\ 0 & -1 \end{bmatrix}$

17 **(b)**

It is given that A is an orthogonal matrix $\quad \therefore A\,A^T = I = A^T A \Rightarrow A^{-1} = A^T$

18 **(a)**

Let $A = IA$

$\Rightarrow \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 6 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} A$

Applying $R_2 \to R_2 - 2R_1$ and $R_3 \to R_3 - 3R_1$

$\begin{bmatrix} 1 & 2 & 3 \\ 0 & -1 & -2 \\ 0 & -2 & -3 \end{bmatrix} \approx \begin{bmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ -3 & 0 & 1 \end{bmatrix} A$

Applying $R_3 \to R_3 - 2R_2$

$\begin{bmatrix} 1 & 2 & 3 \\ 0 & -1 & -2 \\ 0 & 0 & 1 \end{bmatrix} \approx \begin{bmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ 1 & -2 & 1 \end{bmatrix} A$

Applying $R_2 \to -R_2$ and $R_2 \to R_2 - 2R_3$

$\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \approx \begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & -2 \\ 1 & -2 & 1 \end{bmatrix} A$

Applying $R_1 \to R_1 - 2R_2 - 3R_3$

$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \approx \begin{bmatrix} -2 & 0 & 1 \\ 0 & 3 & -2 \\ 1 & -2 & 1 \end{bmatrix} A$

$\therefore \quad A^{-1} = \begin{bmatrix} -2 & 0 & 1 \\ 0 & 3 & -2 \\ 1 & -2 & 1 \end{bmatrix}$

19 **(a)**

Given that, $2X + \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 3 & 8 \\ 7 & 2 \end{bmatrix}$

$\Rightarrow \; 2X = \begin{bmatrix} 3 & 8 \\ 7 & 2 \end{bmatrix} - \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

$\Rightarrow \; 2X = \begin{bmatrix} 2 & 6 \\ 4 & -2 \end{bmatrix} = 2\begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}$

$\Rightarrow \; X = \begin{bmatrix} 1 & 3 \\ 2 & -1 \end{bmatrix}$

20 **(b)**

Since the given matrix is symmetric

$$\therefore (A)_{12} = (A)_{21} \Rightarrow x + 2 = 2\,x - 3 \Rightarrow x = 5$$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	A	D	C	C	A	A	C	D	B	D
Q.	11	12	13	14	15	16	17	18	19	20
A.	C	B	C	C	A	C	B	A	A	B

SESSION : 2025-26

DPP

DAILY PRACTICE PROBLEMS

CLASS : XIIth

DATE :

SOLUTIONS

SUBJECT : MATHS

DPP NO. :5

Topic :-MATRICES

1 **(d)**

Given, $A = 3\begin{bmatrix}1 & 1 & 1\\1 & 1 & 1\\1 & 1 & 1\end{bmatrix}$

$\therefore \quad A^2 = 3\begin{bmatrix}1 & 1 & 1\\1 & 1 & 1\\1 & 1 & 1\end{bmatrix}.3\begin{bmatrix}1 & 1 & 1\\1 & 1 & 1\\1 & 1 & 1\end{bmatrix}9A$

$\therefore \quad A^4 = A^2.A^2 = 9A.9A = 81.9A = 729A$

2 **(a)**

Now, $\begin{vmatrix}1 & \omega^2 & \omega\\ \omega^2 & \omega & 1\\ \omega & 1 & \omega^2\end{vmatrix}$

$= 1(\omega^3 - 1) - \omega^2(\omega^4 - \omega) + \omega(\omega^2 - \omega^2)$

$= 1(1 - 1) - \omega^2(\omega - \omega) + 0$

$= 0$

Hence, matrix A is singular

3 **(a)**

Given system of equations are

$x + y + z = 6, x + 2y + 3z = 10$

and $\quad x + 2y + \lambda z = \mu$

The given system of equations has infinite number of solutions, if any tow equations will be same *ie*, the last two equations will be same, if $\lambda = 3, \mu = 10$.

4 **(a)**

Given, $(A + B)(A - B) = A^2 - B^2$

$\Rightarrow \quad A^2 - AB + BA - B^2 = A^2 - B^2$

$\Rightarrow \quad AB = BA$

Now,$(ABA^{-1})^2 = (BAA^{-1})^2 = B^2$

5 **(c)**

Since diagonal elements of a skew –symmetric matrix are all zeros i.e. $a_{ii} = 0$ for all i

$\therefore \text{tr}\,(A) = \sum_{i=1}^{n} a_{ii} = 0$

6 **(c)**

$\because\ P63 = P(I-P) \quad \because P^2 = I - P)$

$= PI - P^2 = PI - (I - P)$

Now, $P^4 = P \cdot P^3$

$\Rightarrow\ P^4 = P(2P - I)$

$\Rightarrow\ P^4 = 2P^2 - P$

$\Rightarrow\ P^4 = 2I - 2P - P$

$\Rightarrow\ P^4 = 2I - 3P$

And $P^5 = P(2I - 3P)$

$\Rightarrow\ P^5 = 2P - 3(I - P)$

$\Rightarrow\ P^5 = 5P - 3I$

Also, $P^6 = P(5P - 3I)$

$\Rightarrow P^6 = 5P^2 - 3P$

$\Rightarrow P^6 = 5(I - P) - 3P$

$\Rightarrow P^6 = 5I - 8P$

So, $n = 6$

Alternate Solution

$\because\ P^n = 5I - 8P$

$= 5(I - P) - 3P$

$= P(5P - 3I)\ (\because\ P^2 = I - P)$

$= P(2P - 3P^2)$

$= P^2(2I - 3P)$

$= P^2[2(I - P) - P]$

$= P^2[2P^2 - P]$

$= P^3[2P - I]$

$= P^4\ [I - P]$

$= P^4 \cdot P^2 = P^6$

$\Rightarrow\ n = 6$

7 **(b)**

$A^2 = A.A = AB.A$

$= A.BA = AB = A$

9 **(d)**

Let $A = \begin{bmatrix} 1 & 2 & -3 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$

$\therefore\ |A| = \begin{vmatrix} 1 & 2 & -3 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{vmatrix} = \begin{vmatrix} 1 & 2 \\ 0 & 1 \end{vmatrix} = 1$

and adj $A = \begin{bmatrix} 1 & -2 & 7 \\ 0 & 1 & -2 \\ 0 & 0 & 1 \end{bmatrix}$

hence, $A^{-1} = \frac{1}{|A|}$ adj $A = \begin{bmatrix} 1 & -2 & 7 \\ 0 & 1 & -2 \\ 0 & 0 & 1 \end{bmatrix}$

so, required element $= A_{13}^{-1} = 7$

10 **(a)**

$\because\ |A| = 1$

and $A^c = \begin{bmatrix} \cos x & \sin x & 0 \\ -\sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$

and $\operatorname{adj} A = (A^c)' = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$\therefore\ A^{-1} = \dfrac{\operatorname{adj} A}{|A|} = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix} = f(-x)$

11 **(b)**

$\because |A| = 1(0-1) = -1$

$\therefore$ Cofactors of A are

$C_{11} = 0, C_{12} = 0, C_{13} = -1$

$C_{21} = 0, C_{22} = -1, C_{23} = 0$

$C_{31} = -1, C_{32} = 0, C_{33} = 0$

$\therefore\ A^{-1} = \dfrac{1}{-1}\begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix} = A$

12 **(b)**

We have,

$A^2 - 5\,I_2 - \begin{bmatrix} 10 & 15 \\ 15 & 25 \end{bmatrix} - \begin{bmatrix} 5 & 0 \\ 0 & 5 \end{bmatrix} = \begin{bmatrix} 5 & 15 \\ 15 & 20 \end{bmatrix} = 5\,A$

$\therefore k = 5$

14 **(b)**

Let $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & -2 & -2 \\ 1 & 3 & 1 \end{bmatrix},\ X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$

and $B\begin{bmatrix} 0 \\ 3 \\ 4 \end{bmatrix}$ $\quad\therefore\ AX = B \quad\quad \Rightarrow X = A^{-1}B$

Here, $A^{-1} = \frac{1}{6}\begin{bmatrix} 4 & 2 & 0 \\ -3 & 0 & 3 \\ 5 & -2 & -3 \end{bmatrix}$

$\therefore\ X = \dfrac{1}{6}\begin{bmatrix} 4 & 2 & 0 \\ -3 & 0 & 3 \\ 5 & -2 & -3 \end{bmatrix}\begin{bmatrix} 0 \\ 3 \\ 4 \end{bmatrix}$

$= \dfrac{1}{6}\begin{bmatrix} 0+6+0 \\ 0+0+12 \\ 0-6-12 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ -3 \end{bmatrix}$

Thus, $\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ -3 \end{bmatrix}$

15 **(a)**

The given system of equations can be rewritten as matrix from $AX = B$ as

$\begin{bmatrix} 1 & -1 & 1 \\ 1 & 2 & -1 \\ 2 & 1 & 3 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$

Now, $\quad |A| = 1(6+1) + 1(3+2) + 1(1-4)$

$= 7 + 5 - 3 = 9 \neq 0$

Since, $|A \neq 0|$. So, the given system of equations has only trivial solution. So, there is no non-trivial solution.

16 **(d)**

If matrix has no inverse it means the value of determinant should be zero.

$\therefore \quad \begin{vmatrix} 1 & -1 & x \\ 1 & x & 1 \\ x & -1 & 1 \end{vmatrix} = 0$

If we put $x = 1$, then column Ist and IIIrd are identical.

17 **(b)**

Since, $\begin{bmatrix} 2+x & 3 & 4 \\ 1 & -1 & 2 \\ x & 1 & -5 \end{bmatrix}$ is a singular matrix

$\therefore \quad \begin{vmatrix} 2+x & 3 & 4 \\ 1 & -1 & 2 \\ x & 1 & -5 \end{vmatrix} = 0$

$\Rightarrow \ (2+x)(5-2) - 3(-5-2x) + 4(1+x) = 0$

$\Rightarrow \ 6 + 3x + 15 + 6x + 4 + 4x = 0$

$\Rightarrow \ 13x + 25 = 0 \ \Rightarrow \ x = -\dfrac{25}{13}$

18 **(a)**

We have,

$A = \begin{bmatrix} 2 & 3 & 1 & 4 \\ 0 & 1 & 2 & -1 \\ 0 & -2 & -4 & 2 \end{bmatrix}$

$\Rightarrow A \sim \begin{bmatrix} 2 & 3 & 1 & 4 \\ 0 & 0 & 0 & 0 \\ 0 & -2 & -4 & 2 \end{bmatrix}$ Applying $R_2 \to 2R_2 + R_3$

$\Rightarrow A \sim \begin{bmatrix} 2 & 3 & -5 & 7 \\ 0 & 0 & 0 & 0 \\ 0 & -2 & 0 & 0 \end{bmatrix}$ Applying $C_3 \to C_3 - 2C_2$
$C_4 \to C_4 + C_2$

$\Rightarrow A \sim \begin{bmatrix} 2 & 3 & -5 & 7 \\ 0 & -2 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{bmatrix}$ Applying $R_2 \leftrightarrow R_3$

Clearly, $\begin{vmatrix} 2 & 3 \\ 0 & -2 \end{vmatrix} \neq 0$ and every minor of order 3 is zero

Hence, rank of A is 2

19 **(b)**

We have,

$A^2 = AA = \begin{bmatrix} a & b \\ b & a \end{bmatrix} \begin{bmatrix} a & b \\ b & a \end{bmatrix} = \begin{bmatrix} a^2 + b^2 & 2\,ab \\ 2\,ab & a^2 + b^2 \end{bmatrix}$

$\therefore A^2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$

$\Rightarrow \alpha = a^2 + b^2, \beta^2 = 2\,ab$

20 **(d)**

In a square matrix, the trace of A is defined as the sum of the diagonal elements

Hence, trace of $A = \sum_{i=1}^{n} a_{ii}$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	D	A	A	A	C	C	B	A	D	A
Q.	11	12	13	14	15	16	17	18	19	20
A.	B	B	D	B	A	D	B	A	B	D

SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

CLASS : XIIth
DATE :

SOLUTIONS

SUBJECT : MATHS
DPP NO. :6

Topic :-MATRICES

1 **(a)**

Given system of equations is $x + 2y + 3z = 1,\ 2x + y + 3z = 2$ and $5x + 5y + 9z = 5$

Now, $\Delta = \begin{vmatrix} 1 & 2 & 3 \\ 2 & 1 & 3 \\ 5 & 5 & 9 \end{vmatrix}$

$= 1(9 - 15) - 2(18 - 15) + 3(10 - 5)$

$= -6 - 6 + 15$

$= 3 \neq 0$

Hence, it has unique solution

2 **(a)**

Let $\Delta = \begin{vmatrix} 4 & 2 & (1-x) \\ 5 & k & 1 \\ 6 & 3 & (1+x) \end{vmatrix}$

Applying $R_1 \to R_1 + R_3$

$\Rightarrow \quad \Delta = \begin{vmatrix} 10 & 5 & 2 \\ 5 & k & 1 \\ 6 & 3 & 1+x \end{vmatrix}$

Applying $C_1 \to C_1 - 2C_2$

$\Rightarrow \quad \Delta = \begin{vmatrix} 0 & 5 & 2 \\ 5-2k & k & 1 \\ 0 & 3 & 1+x \end{vmatrix}$

$\Rightarrow \quad (5 - 2k)(5 + 5x - 6) = 0$

$\Rightarrow \quad k = \frac{5}{2}, \qquad x = \frac{1}{5}$

4 **(b)**

Since, $\begin{bmatrix} 1 & 1 & 1 \\ 1 & \omega & \omega^2 \\ 1 & \omega^2 & \omega \end{bmatrix} \cdot \frac{1}{3} \begin{bmatrix} 1 & 1 & 1 \\ 1 & \omega^2 & \omega \\ 1 & \omega & \omega^2 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$\therefore \quad A^{-1} = \frac{1}{3} \begin{bmatrix} 1 & 1 & 1 \\ 1 & \omega^2 & \omega \\ 1 & \omega & \omega^2 \end{bmatrix}$

5 **(c)**

It is a direct consequence of the definition of rank

6 **(a)**

Now, $A(x)A(y) = (1-x)^{-1}\begin{bmatrix} 1 & -x \\ -x & 1 \end{bmatrix}(1-y)^{-1}\begin{bmatrix} 1 & -y \\ -y & 1 \end{bmatrix}$

$= [(1+xy)-(x+y)]^{-1}\begin{bmatrix} 1+xy & -(x+y) \\ -(x+y) & 1+xy \end{bmatrix}$

$= \left(1-\dfrac{x+y}{1+xy}\right)^{-1}\begin{bmatrix} 1 & -\dfrac{x+y}{1+xy} \\ -\dfrac{x+y}{1+xy} & 1 \end{bmatrix}$

$= A(z)$

7 **(a)**

$A^2(\alpha) = \begin{vmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{vmatrix}\begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$

$= \begin{bmatrix} \cos^2\alpha - \sin^2\alpha & 2\cos\alpha\sin\alpha \\ -2\sin\alpha\cos\alpha & \cos^2\alpha - \sin^2\alpha \end{bmatrix}$

$=\begin{bmatrix} \cos 2\alpha & \sin 2\alpha \\ -\sin 2\alpha & \cos 2\alpha \end{bmatrix} = \mathrm{A}(2\alpha)$

8 **(a)**

Since, A is symmetric matrix, therefore $A^T = A$

Now, $(A^n)^T = (A^T)^n = A^n$

Hence, A^n is a symmetric matrix.

9 **(a)**

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

$\therefore\ |A| = \begin{vmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{vmatrix}$

$= 0\begin{vmatrix} 2 & 3 \\ 1 & 1 \end{vmatrix} - 1\begin{vmatrix} 1 & 3 \\ 3 & 1 \end{vmatrix} + 2\begin{vmatrix} 1 & 2 \\ 3 & 1 \end{vmatrix}$

$= -(1-9) + 2(1-6) = 8 - 10 = -2$

and $\operatorname{Adj} A = \begin{bmatrix} -1 & 8 & -5 \\ 1 & -6 & 3 \\ -1 & 2 & -1 \end{bmatrix}^T = \begin{bmatrix} -1 & 1 & -1 \\ 8 & -6 & 2 \\ -5 & 3 & -1 \end{bmatrix}$

Hence, $A^{-1} = \frac{1}{|A|}(\operatorname{adj} A)$

$= -\dfrac{1}{2}\begin{bmatrix} -1 & 1 & -1 \\ 8 & -6 & 2 \\ -5 & 3 & -1 \end{bmatrix}$

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

10 **(a)**

We know that

$A = \dfrac{1}{2}(A + A^T) + \dfrac{1}{2}(A - A^T)$

Clearly, $\frac{1}{2}(A + A^T)$ is a symmetric matrix and $\frac{1}{2}(A - A^T)$ is a skew-symmetric matrix

Now,

$$\frac{1}{2}(A+A^T)=\frac{1}{0}\left\{\begin{bmatrix}2 & 0 & -3\\ 4 & 3 & 1\\ -5 & 7 & 2\end{bmatrix}+\begin{bmatrix}2 & 4 & -5\\ 0 & 3 & 7\\ -3 & 1 & 2\end{bmatrix}\right\}$$

$$\Rightarrow \frac{1}{2}(A+A^T)=\frac{1}{2}\begin{bmatrix}4 & 4 & -8\\ 4 & 6 & 8\\ -8 & 8 & 4\end{bmatrix}=\begin{bmatrix}2 & 2 & -4\\ 2 & 3 & 4\\ -4 & 4 & 2\end{bmatrix}$$

11 **(c)**

Since, the system of linear equations has a non-zero solution , then

$$\begin{bmatrix}1 & 2a & a\\ 1 & 3b & b\\ 1 & 4c & c\end{bmatrix}=0$$

Applying $R_2 \to R_2 - R_1, R_3 \to R_3 - R_1$

$$\Rightarrow \begin{vmatrix}1 & 2a & a\\ 0 & 3b-2a & b-a\\ 0 & 4c-2a & c-a\end{vmatrix}=0$$

$\Rightarrow \quad (3b-2a)(c-a)-(4c-2a)(b-a)=0$

$\Rightarrow \quad 3bc-3ba-2ac+2a^2=4bc-2ab-4ac+2a^2$

$\Rightarrow \quad 2ac=bc+ab$

On dividing by abc both sides ,we get

$$\frac{2}{b}=\frac{1}{a}+\frac{1}{c}$$

$\Rightarrow \quad a, b, c$ are in HP.

12 **(c)**

Given system of equations is

$x-y+z=3$

$2x+y-z=2$

and $-3x-2ky+6z=3$

$\therefore$ The given system will have infinite solutions.

$$\therefore \begin{vmatrix}1 & -1 & 1\\ 2 & 1 & -1\\ -3 & -2k & 6\end{vmatrix}=0$$

$\Rightarrow \quad 6k-18=0 \Rightarrow k=3$

13 **(a)**

The product of two orthogonal matrix is an orthogonal matrix

14 **(b)**

Given system of equations can be rewritten as $AX=B$

$$\Rightarrow \begin{bmatrix}1 & 1 & 1\\ 1 & -1 & 2\\ 3 & 5 & -7\end{bmatrix}\begin{bmatrix}x\\ y\\ z\end{bmatrix}=\begin{bmatrix}8\\ 6\\ 14\end{bmatrix}$$

$\therefore \quad |A|=1(7-10)-1(-7-6)+1(5+3)$

$=-3+13+8=18\neq 0$

$\therefore$ Given system has unique solution.

15 **(a)**

Given, equations $(x+ay=0, az+y=0, ax+z=0)$ has infinite soluations.

$\therefore$ Using Crames's rule, its determinant=0

$$\Rightarrow \quad \begin{vmatrix} 1 & a & 0 \\ 0 & 1 & a \\ a & 0 & 1 \end{vmatrix} 0$$

$\Rightarrow \quad 1 + a^3 = 0 \quad \Rightarrow \quad a = -1$

17 **(a)**

Given that, $F(\alpha) = \begin{bmatrix} \cos\alpha & -\sin\alpha & 0 \\ \sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$\Rightarrow \quad F(-\alpha) = \begin{bmatrix} \cos\alpha & \sin\alpha & 0 \\ -\sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$\therefore \; F(\alpha)F(-\alpha) = \begin{bmatrix} \cos\alpha & -\sin\alpha & 0 \\ \sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} \cos\alpha & \sin\alpha & 0 \\ -\sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$

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

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

$\Rightarrow \; [F(\alpha)]^{-1} = F(-\alpha)$

18 **(b)**

By using inverse of matrix, we know

$|M^{-1}| = |M|^{-1}$holds true

$(M^T)^{-1} = (M^{-1})^T$ holds true

and $(M^{-1})^{-1} = M$ holds true

but $(M^2)^{-1} = (M^{-1})^{-2}$ not true

19 **(a)**

Since, $A^2 - B^2 = (A - B)(A + B)$

$= A^2 - B^2 + AB - BA$

$\Rightarrow \quad AB = BA$

20 **(c)**

Given, $x_1 + 2x_2 + 3x_3 = 0$ ...(i)

$2x_1 + 3x_2 + x_3 = 0$ ...(ii)

$3x_1 + x_2 + 2x_3 = 0$ ...(iii)

$\Rightarrow \quad \Delta = \begin{vmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \\ 3 & 1 & 2 \end{vmatrix}$

$= 1(6 - 1) - 2(4 - 3) + 3(2 - 9)$

$= -18$

Then, this is system has the unique solution.

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	A	A	D	B	C	A	A	A	A	A
Q.	11	12	13	14	15	16	17	18	19	20
A.	C	C	A	B	A	A	A	B	A	C

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DPP
DAILY PRACTICE PROBLEMS

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SOLUTIONS

SUBJECT : MATHS
DPP NO. :7

Topic :-MATRICES

2 **(d)**

$X^2 = X \cdot X = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix} \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix} = \begin{bmatrix} 5 & -8 \\ 2 & -3 \end{bmatrix}$

For $n = 2$, no option is satisfied

Hence, option (d) is correct

3 **(a)**

We have,

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

$\Rightarrow F(\alpha)F(-\alpha) = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = I$

$\Rightarrow F(-\alpha) = [F(\alpha)]^{-1}$

4 **(b)**

We have, $(AA^T)^T = (A^T)^T A^T = AA^T$

$\therefore$ AA^T is symmetric matrix

5 **(c)**

For any square matrix X, we have

$X(\text{adj } X) = |X|\ I_n$

Taking $X = \text{adj } A$, we have

$(\text{adj } A)\big(\text{adj } (\text{adj } A)\big) = |\text{adj } A|\ I_n$

$\Rightarrow \text{adj } A\big(\text{adj } (\text{adj } A)\big) = |A|^{n-1} I_n\ [\because |\text{adj } A| = |A|^{n-1}]$

$\Rightarrow (A \text{ adj } A)\big(\text{adj } (\text{adj } A)\big) = |A|^{n-1} A \qquad [\because A\, I_n = A]$

$\Rightarrow (|A|\ I_n)\big(\text{adj } (\text{adj } A)\big) = |A|^{n-1} A$

$\Rightarrow \text{adj } (\text{adj } A) = |\mathrm{A}|^{n-2}\ A$

6 **(d)**

Given equations are

$(\alpha + 1)^3 x + (\alpha + 2)^3 y - (\alpha + 3)^3 = 0$

$(\alpha + 1)x + (\alpha + 2)y - (\alpha + 3) = 0$

and $\qquad x + y - 1 = 0$

Since, this system of equations is consistent.

$\therefore \begin{vmatrix} (\alpha+1)^3 & (\alpha+2)^3 & -(\alpha+3)^3 \\ (\alpha+1) & (\alpha+2) & -(\alpha+3) \end{vmatrix} = 0$

Applying $C_2 \to C_2 - C_1$ *and* $C_3 \to C_3 + C_1$

$$\Rightarrow \begin{bmatrix} (\alpha+1)^3 & (\alpha+2)^3 & -(\alpha+1)^3 \\ & (\alpha+1)^3 - (\alpha+3)^3 & \\ (\alpha+1) & (\alpha+2) & -(\alpha+1) \\ & -(\alpha+3) + (\alpha+1) & \end{bmatrix} = 0$$

$$\Rightarrow \begin{bmatrix} (\alpha+1)^3 & 3\alpha^2+9\alpha+7 & -6\alpha^2-24\alpha-26 \\ (\alpha+1) & 1 & -2 \\ 1 & 0 & 0 \end{bmatrix} = 0$$

$\Rightarrow \quad -2(3\alpha^2+9\alpha+7) + 6\alpha^2 + 24\alpha + 26 = 0$

$\Rightarrow 6\alpha + 12 = 0 \quad \Rightarrow \alpha = -2$

7 **(a)**

We have,

$A^n = \begin{bmatrix} \cos n\theta & \sin n\theta \\ -\sin n\theta & \cos n\theta \end{bmatrix}$

$\Rightarrow \dfrac{1}{n}A^n = \begin{bmatrix} \dfrac{\cos n\theta}{n} & \dfrac{\sin n\theta}{n} \\ \dfrac{-\sin n\theta}{n} & \dfrac{\cos n\theta}{n} \end{bmatrix}$

$\Rightarrow \lim\limits_{n\to\infty} \dfrac{1}{n}A^n = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

8 **(c)**

We have,

$AB = O$

$\Rightarrow \begin{bmatrix} \cos^2\alpha & \cos\alpha\sin\alpha \\ \cos\alpha\sin\alpha & \sin^2\alpha \end{bmatrix} \begin{bmatrix} \cos^2\beta & \cos\beta\sin\beta \\ \cos\beta\sin\beta & \sin^2\beta \end{bmatrix} = O$

$\Rightarrow \begin{bmatrix} \cos\alpha\cos\beta\cos(\alpha-\beta) & \cos\alpha\sin\beta\cos(\alpha-\beta) \\ \cos\beta\sin\alpha\cos(\alpha-\beta) & \sin\alpha\sin\beta\cos(\alpha-\beta) \end{bmatrix} = O$

$\Rightarrow \cos(\alpha-\beta) = 0$

$\Rightarrow \alpha - \beta$ is an odd multiple of $\frac{\pi}{2}$

9 **(c)**

$|A||\text{adj } A| = |A|^n$ for order n

$\Rightarrow \; DD' = D^n$

10 **(c)**

Given, $\begin{bmatrix} 1+\omega & 2\omega \\ -2\omega & -b \end{bmatrix} + \begin{bmatrix} a & -\omega \\ 3\omega & 2 \end{bmatrix} = \begin{bmatrix} 0 & \omega \\ \omega & 1 \end{bmatrix}$

$\Rightarrow \quad \begin{bmatrix} 1+\omega+a & \omega \\ \omega & 2-b \end{bmatrix} = \begin{bmatrix} 0 & \omega \\ \omega & 1 \end{bmatrix}$

$\Rightarrow \quad 1+\omega+a = 0, 2-b = 1$

$\Rightarrow \quad a = -1-\omega, b = 1$

$\therefore \quad a^2 + b^2 = (-1-\omega)^2 + 1^2$

$= 1 + \omega^2 + 2\omega + 1^2$

$= 0 + \omega + 1 \qquad (\because \quad 1 + \omega + \omega^2 = 0)$

$=1+\omega$

12 **(a)**

Given, $2kx-2y+3z=0, x+ky+2z=0, 2x+kz=0$

For non-trivial solution

$$\begin{vmatrix} 2k & -2 & 3 \\ 1 & k & 2 \\ 2 & 0 & k \end{vmatrix}=0$$

$\Rightarrow 2k(k^2-0)+2(k-4)+3(0-2k)=0$

$\Rightarrow \quad 2k^3-4k-8=0$

$\Rightarrow (k-2)(2k^2+4k+4)=0$

$\Rightarrow \quad k=2$

13 **(a)**

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

$$\begin{bmatrix} 2+0+15 & -2+2+0 \\ 4+0+0 & -4+2+0 \end{bmatrix}$$

$$=\begin{bmatrix} 17 & 0 \\ 4 & -2 \end{bmatrix}$$

14 **(d)**

$$A^2=\begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}\begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}=\begin{bmatrix} \alpha^2 & 0 \\ \alpha+1 & 1 \end{bmatrix}$$

$$\therefore \quad A^2=B \Rightarrow \begin{bmatrix} \alpha^2 & 0 \\ \alpha+1 & 1 \end{bmatrix}=\begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$$

$\Rightarrow \quad \alpha^2=1$ and $\alpha+1=5$

Which is not possible at the same time.

$\therefore$ No real values of α exists.

15 **(c)**

We have,

$E(\alpha)\,E(\beta)$

$$=\begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}\begin{bmatrix} \cos\beta & \sin\beta \\ -\sin\beta & \cos\beta \end{bmatrix}$$

$$=\begin{bmatrix} \cos(\alpha+\beta) & \sin(\alpha+\beta) \\ -\sin(\alpha+\beta) & \cos(\alpha+\beta) \end{bmatrix}=E(\alpha+\beta)$$

Hence, option (c) is correct.

17 **(c)**

We have, $A=\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \end{bmatrix}$

$$\therefore \; A^2=\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \end{bmatrix}\begin{bmatrix} \frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}} \\ -\frac{1}{\sqrt{2}} & -\frac{1}{\sqrt{2}} \end{bmatrix}$$

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

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

$\therefore$ Matrix A is nilpotent

18 **(d)**

Since, $A = \begin{bmatrix} 1 & -1 & 2 \\ 2 & 0 & 1 \\ 3 & 2 & 1 \end{bmatrix}$

Now, $|A| = 1(0-2) + 1(2-3) + 2(4-0) = 5$

$\therefore\ A^{-1} = \frac{1}{5}\begin{bmatrix} -2 & 5 & -1 \\ 1 & -5 & 3 \\ 4 & -5 & 2 \end{bmatrix}$

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

$\Rightarrow\ \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix} = \begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix}$

19 **(a)**

Since, A is a skew-symmetric matrix. Therefore,

$A^T = -A \ \Rightarrow\ |A^T| = |-A|$

$\Rightarrow\ |A| = (-1)^n|A|$

Also, n is odd

$\therefore\ 2|A| = 0\ \Rightarrow |A| = 0$

Thus, $|\text{adj } A| = |A|^2 = 0$

20 **(d)**

Given System of equations are

$x + 3y + 2z = 0$

$3x + y + z = 0$

and $2x - 2y - z = 0$

Now, $\Delta = \begin{vmatrix} 1 & 3 & 2 \\ 3 & 1 & 1 \\ 2 & -2 & -1 \end{vmatrix}$

$= 1(-1+2) - 3(-3-2) + 2(-6-2)$

$= 1 + 15 - 16$

$= 0$

Since, determinant is zero, then it has infinitely many solutions.

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	A	D	A	B	C	D	A	C	C	C
Q.	11	12	13	14	15	16	17	18	19	20
A.	A	A	A	D	C	C	C	D	A	D

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DAILY PRACTICE PROBLEMS

CLASS : XIIth
DATE :

SOLUTIONS

SUBJECT : MATHS
DPP NO. :8

Topic :-MATRICES

2 **(b)**

Let$\Delta=\begin{bmatrix} a_1 & a_2 \\ a_4 & a_5 \end{bmatrix}$

$= a_1 a_5 - a_2 a_4$

$= a_1(a_1+4d)-(a_1+d)(a_1+3d)$

$= a_1^2+4a_1 d - a_1^2 - 4a_1 d - 3d^2 = -3d^2 \neq 0$

Hence, given system of equations has unique solution.

3 **(b)**

$\because \quad I_n = \begin{bmatrix} 1 & 0 & 0 & \cdots & 0 \\ 0 & 1 & 0 & \cdots & 0 \\ 0 & 0 & 1 & \cdots & 0 \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ 0 & 0 & 0 & \cdots & 1 \end{bmatrix}, |I_n| = 1$

adj $(I_n) = I_n$

$\therefore \ (I_n)^{-1} = I_n$

4 **(c)**

We know that

$(\text{adj } A)^T = \text{adj } A^T$

$\Rightarrow \text{adj } A^T - (\text{adj } A)^T = O$ (Null matrix)

5 **(c)**

Given, $\begin{bmatrix} 2 & -1 & 3 \\ 1 & 3 & -1 \\ 3 & 2 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 9 \\ 4 \\ 10 \end{bmatrix}$

It is of the form $AX = B$ ...(i)

$|A| = 2(3+2)+1(1+3)+3(2-9) = -7$

$\therefore \quad \text{adj }(A) = \begin{bmatrix} 5 & 7 & -8 \\ -4 & -7 & 5 \\ -7 & -7 & 7 \end{bmatrix}$

$\Rightarrow A^{-1} = \frac{1}{-7}\begin{bmatrix} 5 & 7 & -8 \\ -4 & -7 & 5 \\ -7 & -7 & 7 \end{bmatrix}$

From Eq.(i),$X = -\frac{1}{7}\begin{bmatrix} 5 & 7 & -8 \\ -4 & -7 & 5 \\ -7 & -7 & 7 \end{bmatrix}\begin{bmatrix} 9 \\ 4 \\ 10 \end{bmatrix}$

$$\Rightarrow \begin{bmatrix} x \\ y \\ z \end{bmatrix} = -\frac{1}{7}\begin{bmatrix} -7 \\ -14 \\ -21 \end{bmatrix}$$

$\Rightarrow \quad x = 1, y = 2, z = 3$

7 **(b)**

$$A = \begin{vmatrix} 1 & -1 & 1 \\ 2 & 1 & -1 \\ 4 & 1 & 1 \end{vmatrix}$$

$= 1(1+1) + 1(2+4) + 1(2-4) = 6 \neq 0$

Hence, it has unique solution.

8 **(d)**

Given, A= $\begin{bmatrix} \cos\theta - \sin\ \theta \\ \sin\theta\ \ \cos\theta \end{bmatrix}$

Now, $|A| = \cos^2\ \theta + \sin^2\ \theta = 1 \neq 0.$

$\therefore A$ is invertible.

9 **(b)**

$$|A| = -1 \text{ and adj } A = \begin{bmatrix} 0 & -1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & -1 \end{bmatrix}$$

$$\text{Now,} \quad A^{-1} = \frac{1}{-1}\begin{bmatrix} 0 & -1 & 0 \\ -1 & 0 & 0 \\ 0 & 0 & -1 \end{bmatrix} = A$$

10 **(b)**

$$A = \begin{vmatrix} -1 & 2 & 5 \\ 2 & -4 & a-4 \\ 1 & -2 & a+1 \end{vmatrix} = \begin{vmatrix} 0 & 0 & a+6 \\ 0 & 0 & -a-6 \\ 1 & -2 & a+1 \end{vmatrix}$$

[using $R_1 \to R_1 + R_3$and $R_2 \to R_2 - 2R_3$]

$$= \begin{vmatrix} 0 & 0 & 0 \\ 0 & 0 & -a-6 \\ 1 & -2 & a+1 \end{vmatrix} \qquad [\text{using} R_1 \to R_1 + R_2]$$

When $a = -6$, $A = \begin{vmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 1 & -2 & -5 \end{vmatrix}$ $\quad \therefore \rho(A) = 1$

When $a = 6$, $A = \begin{vmatrix} 0 & 0 & 0 \\ 0 & 0 & -12 \\ 1 & -2 & 7 \end{vmatrix}$, $\quad \therefore \rho(A) = 2$

When $a = 1$, $A = \begin{vmatrix} 0 & 0 & 0 \\ 0 & 0 & -7 \\ 1 & -2 & 2 \end{vmatrix}$, $\quad \therefore \rho(A) = 2$

When $a = 2$, $A = \begin{vmatrix} 0 & 0 & 0 \\ 0 & 0 & -8 \\ 1 & -2 & 3 \end{vmatrix}$ $\quad \therefore \rho(A) = 2$

11 **(b)**

$$\text{Let } D = \begin{bmatrix} d_1 & 0 & 0 \cdots & 0 \\ 0 & d_2 & 0 \cdots & 0 \\ \vdots & \vdots & \vdots & \\ 0 & 0 & 0 \cdots & d_n \end{bmatrix}$$

Then, $|D| = d_1\ d_2 \cdots d_n$

Now, Cofactor of $D_{11} = d_2\ d_3 \cdots d_n$

Cofactor of $D_{22} = d_1\, d_3 \cdots d_n$ etc
And, Cofactor of $D_{ij} = 0$ when $i \neq j$

$\therefore\ D^{-1} = \dfrac{1}{|D|}$ adj D

$$= \frac{1}{d_1\, d_2\, \cdots d_n}\begin{bmatrix} d_2\, d_3\, \cdots d_n & 0 & 0 \cdots & 0 \\ 0 & d_2 d_3 \cdots d_n & 0 \cdots & 0 \\ \vdots & \vdots & \vdots & \\ 0 & 0 & 0 \cdots & d_1\, d_2\, \cdots d_{n-1} \end{bmatrix}$$

$$\therefore\ D^{-1} = \begin{bmatrix} \frac{1}{d_1} & 0 & 0 & \cdots & 0 \\ 0 & 0 & 0 & \cdots & 0 \\ \vdots & \vdots & \vdots & & \frac{1}{d_n} \\ 0 & 0 & 0 & & \end{bmatrix} = \text{diag}\,(s_1^{-1}\, d_2^{-1} \cdots d_n^{-1})$$

12 **(d)**

$\because\ A^2 = \begin{bmatrix} 1 & 2 \\ 4 & -3 \end{bmatrix}\begin{bmatrix} 1 & 2 \\ 4 & -3 \end{bmatrix} = \begin{bmatrix} 9 & -4 \\ -8 & 17 \end{bmatrix}$

$\therefore\ f(A) = A^2 + 4A - 5$

$= \begin{bmatrix} 9 & -4 \\ -8 & 17 \end{bmatrix} + \begin{bmatrix} 4 & 8 \\ 16 & -12 \end{bmatrix} - \begin{bmatrix} 5 & 0 \\ 0 & 5 \end{bmatrix}$

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

13 **(a)**

$A^2 = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}\begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & -4 \\ -4 & 5 \end{bmatrix}$

Again now, $4A - 3I = 4\begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix} - \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix} = \begin{bmatrix} 5 & -4 \\ -4 & 5 \end{bmatrix}$

$\therefore \qquad A^2 = 4A - 3I$

14 **(d)**

$\because\ (AB)^{-1} = B^{-1}A^{-1}$

15 **(d)**

$|A| = -8$

adj$(A) = \begin{bmatrix} 0 & 0 & -4 \\ 0 & -4 & 0 \\ -4 & 0 & 0 \end{bmatrix}$

$A^{-1} = \dfrac{1}{-8}\begin{bmatrix} 0 & 0 & -4 \\ 0 & -4 & 0 \\ -4 & 0 & 0 \end{bmatrix}$

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

16 **(b)**

Since given system of equations possesses a non-zero solution.

$\therefore \qquad \Delta = \begin{bmatrix} a & 1 & 1 \\ 1 & -a & 1 \\ 1 & 1 & 1 \end{bmatrix} = 0$

$\Rightarrow\ a(-a-1) - 1(1-1) + 1(1+a) = 0$

$\Rightarrow a^2 = 1 \quad \Rightarrow \quad a = \pm 1$

17 **(a)**

Now,$(A+A^T)^T = A^T + (A^T)^T = A^T + A$

$\therefore A + A^T$ is symmetric matrix.

18 **(c)**

$$A = \begin{bmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix} = 14$$

$\because$ $\left(\text{adj}(\text{adj } A)\right) = |A|^{n-2}A = 14^{3-2}A = 14\,A$

$\therefore$ $|\text{adj }(\text{adj } A)| = |14A| = 14^3|A| = 14^4$

19 **(b)**

Given, $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -2 & -2 \\ 1 & 3 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 3 \\ 4 \end{bmatrix} \Rightarrow \begin{bmatrix} x+y+z \\ x-2y-2z \\ x+3y+z \end{bmatrix} = \begin{bmatrix} 0 \\ 3 \\ 4 \end{bmatrix}$

On Comparing both sides, we get

$x + y + z = 0$ ...(i)

$x - 2y - 2z = 3$ ...(ii)

and $x + 3y + z = 4$ ...(iii)

On solving Eqs. (i), (ii) and (iii) , we get

$x = 1, y = 2$ and $z = -3$

20 **(a)**

$|A| = \begin{vmatrix} 1 & 2 \\ -4 & -1 \end{vmatrix}$

$= -1 + 8 = 7$

adj $A = \begin{bmatrix} -1 & -2 \\ 4 & 1 \end{bmatrix}$

$\therefore$ $A^{-1} = \frac{1}{7}\begin{bmatrix} -1 & -2 \\ 4 & 1 \end{bmatrix}$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	B	B	B	C	C	A	B	D	B	B
Q.	11	12	13	14	15	16	17	18	19	20
A.	B	D	A	D	D	B	A	C	B	A

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DPP
DAILY PRACTICE PROBLEMS

CLASS : XIIth
DATE :

SOLUTIONS

SUBJECT : MATHS
DPP NO. :9

Topic :-MATRICES

1 **(c)**

It is given that

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

$\Rightarrow \begin{bmatrix} a & a+b \\ c & c+d \end{bmatrix} = \begin{bmatrix} a+c & b+d \\ c & d \end{bmatrix}$

$\Rightarrow a+c=a, a+b=b+d, c+d=d$

$\Rightarrow c=0$ and $a=d$

2 **(a)**

$AB = \begin{bmatrix} 1 & 2 & -1 \\ 3 & 0 & 2 \\ 4 & 5 & 0 \end{bmatrix}\begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix} = \begin{bmatrix} 5 & 1 & -3 \\ 3 & 2 & 6 \\ 14 & 5 & 0 \end{bmatrix}$

3 **(a)**

Let A be a skew-symmetric matrix of odd order $(2n+1)$ say. Since A is skew-symmetric

$\therefore A^T = -A$

$\Rightarrow |A^T| = |-A|$

$\Rightarrow |A^T| = (-1)^{2n+1}|A|$

$\Rightarrow |A^T| = -|A|$

$\Rightarrow |A| = -|A| \Rightarrow 2|A| = 0 \Rightarrow |A| = 0$

4 **(a)**

As, $PP^T = \begin{bmatrix} \sqrt{3/2} & 1/2 \\ -1/2 & \sqrt{3}/2 \end{bmatrix}\begin{bmatrix} \sqrt{3}/2 & -1/2 \\ 1/2 & \sqrt{3}/2 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$\Rightarrow PP^T = I$ or $P^T = P^{-1}$ ...(i)

As, $Q = PAP^T$

$\therefore P^TQ^{2005}P = P^T[PAP^T)(PAP)^T) \dots 2005 \text{ times}]P$

$= \underbrace{(P^TP)A(P^TP)A(P^TP)\dots(P^TP)A(P^TP)}_{2005\ times}$

$= IA^{2005} = A^{2005}$

$\therefore\ A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}, A^2 = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}.\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}$

$A^3 = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}$...and so on

$A^{2005} = \begin{bmatrix} 1 & 2005 \\ 0 & 1 \end{bmatrix}$

$\Rightarrow P^T Q^{2005} P = \begin{bmatrix} 1 & 2005 \\ 0 & 1 \end{bmatrix}$

5 **(c)**

Given, $2X + 3Y = 0$ ... (i)

and $X + 2Y = I$ ...(ii)

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

On solving Eqs. (i) and (ii), we get

$X = -3I = \begin{bmatrix} -3 & 0 \\ 0 & -3 \end{bmatrix}$

6 **(d)**

Subtracting the addition of first two equations from third equation, we get

$0 = -5$ which is an absurd result.

7 **(d)**

Given $A = \begin{bmatrix} x & -2 \\ 3 & 7 \end{bmatrix}$

$|A| = \begin{vmatrix} x & -2 \\ 3 & 7 \end{vmatrix} = 7x + 6$

$\therefore \quad A^{-1} = \dfrac{1}{7x+6}\begin{bmatrix} 7 & 2 \\ -3 & x \end{bmatrix}$

But given $A^{-1} = \begin{bmatrix} \frac{7}{34} & \frac{1}{17} \\ \frac{-3}{34} & \frac{2}{17} \end{bmatrix}$

$\therefore \quad \dfrac{7}{7x+6} = \dfrac{7}{34}$

$\Rightarrow \quad 7x + 6 = 34 \Rightarrow 7x = 28 \Rightarrow x = 4$

8 **(d)**

(a) It is clear that A is not a zero matrix.

(b) $(-1)I = -1\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} = \begin{bmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -1 \end{bmatrix} \neq A$

ie, $\quad (-1)I \neq A$

(c) $|A| = 0\begin{vmatrix} -1 & 0 \\ 0 & 0 \end{vmatrix} - 0\begin{vmatrix} 0 & 0 \\ -1 & 0 \end{vmatrix} - 1\begin{vmatrix} 0 & -1 \\ -1 & 0 \end{vmatrix}$

$= 0 - 0 - 1(-1) = 1$

Since, $|A| \neq 0$ so A^{-1} exists.

(d) $A^2 = \begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}\begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$

$\Rightarrow A^2 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \Rightarrow A^2 = I$

10 **(a)**

Since, $A = \begin{bmatrix} 1 & 2 & -1 \\ 3 & 0 & 2 \\ 4 & 5 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$

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

$= \begin{bmatrix} 1+4+0 & 0+2-1 & 0+0-3 \\ 3+0+0 & 0+0+2 & 0+0+6 \\ 4+10+0 & 0+5+0 & 0+0+0 \end{bmatrix}$

$= \begin{bmatrix} 5 & 1 & -3 \\ 3 & 2 & 6 \\ 14 & 5 & 0 \end{bmatrix}$

11 **(c)**

We have,

$[F(x)\,G(y)]^{-1} = [G(y)]^{-1}\,[f(x)]^{-1}$

$\Rightarrow [F(x)\,G(y)]^{-1} = G(-y)\,F(-x)$

12 **(a)**

$A^{-1} = \dfrac{1}{1+10}\begin{bmatrix} 1 & -2 \\ 5 & 1 \end{bmatrix} = \dfrac{1}{11}\begin{bmatrix} 1 & -2 \\ 5 & 1 \end{bmatrix}$

Also, $A^{-1} = xA + yI$

$\Rightarrow \dfrac{1}{11}\begin{bmatrix} 1 & -2 \\ 5 & 1 \end{bmatrix} = \begin{bmatrix} x & 2x \\ -5x & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 0 & y \end{bmatrix}$

$\Rightarrow\ x + y = \dfrac{1}{11}, 2x = \dfrac{-2}{11}$

$\Rightarrow\ x = \dfrac{-1}{11},\ y = \dfrac{2}{11}$

13 **(d)**

Now, $(AB)^T = B^T A^T$

14 **(c)**

On comparing corresponding elements, we get

$x + y + z = 9$

$x + y = 5$

and $y + z = 7$

On solving these, we get $x = 2, y = 3, z = 4$

$\Rightarrow\ (x, y, z) = (2,3,4)$

15 **(c)**

$A.A = \begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix} \begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix}$

$= \begin{bmatrix} = a^2b^2 - a^2b^2 & ab^3 - ab^3 \\ -a^3b + a^3b & -a^2b^2 + a^2b^2 \end{bmatrix}$

$\Rightarrow\ A^2 = 0$

$\therefore A$ is nilpotent matrix of order 2.

16 **(d)**

Since A,B and C are non-singular matrices, then

$(AB^{-1}C)^{-1} = C^{-1}(AB^{-1})^{-1}$

$= C^{-1}((B^{-1})^{-1}\,A^{-1}) = C^{-1}BA^{-1}$

17 **(a)**

Given matrix is invertible

$\Rightarrow \begin{vmatrix} \lambda & -1 & 4 \\ -3 & 0 & 1 \\ -1 & 1 & 2 \end{vmatrix} \neq 0$

$\Rightarrow \lambda\ (0-1) + 1(-6+1) + 4(-3-0) \neq 0$

$\Rightarrow \quad -\lambda - 5 - 12 \neq 0$

$\Rightarrow \lambda \neq -17$

18 **(d)**

From Eqs. (ii) and (iii), we get

$\frac{3y^2}{b^2} - \frac{3z^2}{c^2} = 0$

$\Rightarrow \ \frac{z^2}{c^2} = \frac{y^2}{b^2}$

On putting this value in Eq. (i), we get

$\frac{2x^2}{a^2} - \frac{2y^2}{b^2} = 0$

$\Rightarrow \ \frac{x^2}{a62} = \frac{y^2}{b^2}$

$\therefore \ \frac{x^2}{a^2} = \frac{y^2}{b^2} = \frac{z^2}{c^2} = k^2$ (say)

$\Rightarrow \ x = \pm ka, y = \pm kb, z = \pm kc, \forall k \in R$

19 **(b)**

We have, $A = \begin{bmatrix} 1 & \log_b a \\ \log_a b & 1 \end{bmatrix}$

$\therefore \ |A| = 1 - \log_a b \log_b a = 1 - 1 = 0$

20 **(a)**

$|A| = 4 - 6 = -2$

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

$\therefore A^{-1} = -\frac{1}{2}\begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	C	A	A	A	C	D	D	D	B	A
Q.	11	12	13	14	15	16	17	18	19	20
A.	C	A	D	C	C	D	A	D	B	A

SESSION : 2025-26

DPP
DAILY PRACTICE PROBLEMS

CLASS : XIIth
DATE :

SOLUTIONS

SUBJECT : MATHS
DPP NO. :10

Topic :-MATRICES

1 **(b)**

Since, $P=\begin{bmatrix} i & 0 & -i \\ 0 & -i & i \\ -i & i & 0 \end{bmatrix}$ and $Q=\begin{bmatrix} -i & i \\ 0 & 0 \\ i & -i \end{bmatrix}$

$\therefore\ PQ=\begin{bmatrix} i & 0 & -i \\ 0 & -i & i \\ -i & i & 0 \end{bmatrix}\begin{bmatrix} -i & i \\ 0 & 0 \\ i & -i \end{bmatrix}$

$=\begin{bmatrix} -i^2-i^2 & i^2+i^2 \\ i^2 & -i^2 \\ i^2 & -i^2 \end{bmatrix}$

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

2 **(d)**

$B=\operatorname{adj}(A)=\begin{bmatrix} 3 & 1 & 1 \\ -6 & -2 & 3 \\ -4 & -3 & 2 \end{bmatrix}$

Therefore, $\operatorname{adj}(B)=\begin{bmatrix} 5 & -5 & 5 \\ 0 & 10 & -15 \\ 10 & 5 & 0 \end{bmatrix}$

Now, $|\operatorname{adj} B|=\begin{vmatrix} 5 & -5 & 5 \\ 0 & 10 & -15 \\ 10 & 5 & 0 \end{vmatrix}=625$

and $|C|=125|A|=125\begin{vmatrix} 1 & -1 & 1 \\ 0 & 2 & -3 \\ 2 & 5 & 0 \end{vmatrix}=625$

$\therefore \frac{|\operatorname{adj}(B)|}{|C|}=\frac{625}{625}=1$

Alternate

$|A|=1(0+3)+1(0+6)+(0-4)$

Now, $\operatorname{adj} B=\operatorname{adj}(\operatorname{adj} A)$

$=|A|A=5A$

$\therefore\ \frac{|\operatorname{adj} B|}{|C|}=\frac{|5A|}{|5A|}=1$

3 **(d)**

Given, $A=\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$

$\therefore \quad A^{-1} = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} = A^T$

4 **(b)**

The given system of equations posses non-zero solutions,

$\therefore \begin{bmatrix} 1 & 1 & 1 \\ 1 & a & a \\ 1 & -a & 1 \end{bmatrix} = 0$

Applying $R_2 \to R_2 - R_1$ and $R_3 \to R_3 - R_1$

$\Rightarrow \begin{vmatrix} 1 & 1 & 1 \\ 0 & a-1 & a-1 \\ 0 & -a-1 & 0 \end{vmatrix} = 0$

$\Rightarrow \quad 1\left(0 - (a^2 - 1)\right) = 0$

$\Rightarrow a^2 = 1 \Rightarrow \quad a = \pm 1$

5 **(a)**

Given, $x\begin{bmatrix} -3 \\ 4 \end{bmatrix} + y\begin{bmatrix} 4 \\ 3 \end{bmatrix} = \begin{bmatrix} 10 \\ -5 \end{bmatrix}$

$\therefore -3x + 4y = 10 \qquad$ ...(i)

and $\qquad 4x + 3y = -5 \qquad$ ...(ii)

On solving Eqs. (i) and (ii), we get

$x = -2, y = 1$

7 **(a)**

$|A| = 5 + 6 = 11$

and $\quad \text{adj } A = \begin{bmatrix} 1 & 2 \\ -3 & 5 \end{bmatrix}$

$A^{-1} = \frac{1}{11}\begin{bmatrix} 1 & 2 \\ -3 & 5 \end{bmatrix}$

8 **(c)**

We know that, if

$A^n = \begin{bmatrix} d_1 & 0 & 0 \\ 0 & d_2 & 0 \\ 0 & 0 & d_3 \end{bmatrix} = \text{diag } [d_1\ d_2\ d_3]$

Then,

$A^n = \begin{bmatrix} d_1^n & 0 & 0 \\ 0 & d_2^n & 0 \\ 0 & 0 & d_3^n \end{bmatrix} = \text{diag } [d_1^n\ d_2^n\ d_3^n]$

$\therefore A^5 = \begin{bmatrix} 2^5 & 0 & 0 \\ 0 & 2^5 & 0 \\ 0 & 0 & 2^5 \end{bmatrix} = 16\, A$

9 **(c)**

$AB = I \Rightarrow \quad B = A^{-1}$

$= \frac{1}{1 + \tan^2\theta}\begin{bmatrix} 1 & -\tan\theta \\ \tan\theta & 1 \end{bmatrix}$

$= \frac{1}{\sec^2\theta}\begin{bmatrix} 1 & -\tan\theta \\ \tan\theta & 1 \end{bmatrix}$

$\Rightarrow \quad (\sec^2\theta)\, \mathrm{B} = \begin{bmatrix} 1 & -\tan\theta \\ \tan\theta & 1 \end{bmatrix} = \mathrm{A}(-\theta)$

10 **(b)**

It is given that $A = [a_{ij}]$ is a skew-symmetric matrix

$a_{ij} = -a_{ji}$ for all i, j

$\Rightarrow a_{ii} = -a_{ii}$ for all i

$\Rightarrow 2\, a_{ii} = 0$ for all $i \Rightarrow a_{ii} = 0$ for all i

11 **(c)**

We know that, if $A = \text{diag.}(d_1\, d_2, \dots \dots .., d_n)$ is a diagonal matrix, then for any $k \in N$

$A^k = \text{diag}\,(d_1^k, d_2^k, \dots, d_n^k)$

Here, $A = \text{diag.}(a, a, a)$

$\therefore A^n = \text{diag}\,(a^n, a^n, a^n) = \begin{bmatrix} a^n & 0 & 0 \\ 0 & a^n & 0 \\ 0 & 0 & a^n \end{bmatrix}$

12 **(b)**

We have,

$(A\,B - B\,A)^T = (A\,B)^T - (B\,A)^T = B^T\,A^T - A^T\,B^T$

$\Rightarrow (A\,B - B\,A)^T = B\,A - A\,B \qquad [\because A^T = A, B^T = B]$

$\Rightarrow (A\,B - B\,A)^T = -(A\,B - B\,A)$

So, $A\,B - B\,A$ is skew-symmetric matrix

13 **(b)**

Since $A\,B$ exists

$\therefore$ No. of rows in B = No. of columns in A

$\Rightarrow$ No. of rows in $B = n$

Also, $B\,A$ exists

$\Rightarrow$ No. of columns in B = No. of rows in A

$\Rightarrow$ No. of columns in $= m$

Hence, B is of order $n \times m$

14 **(c)**

We have,

$(k\,A)(\text{adj}\;k\,A) = |k\,A|\,I_n$

$\Rightarrow k(A\;\text{adj}\;k\,A) = k^n|A|\,I_n \qquad [\because |k\,A| = k^n|A|]$

$\Rightarrow A(\text{adj}\;k\,A) = k^{n-1}|A|\,I_n$

$\Rightarrow A\;\text{adj}\;(k\,A) = k^{n-1}A(\text{adj}\;A) \quad [\because A\;\text{adj}\;A = |A|\,I_n]$

$\Rightarrow A\;\text{adj}\;(k\,A) = A(k^{n-1}\text{adj A})$

$\Rightarrow A^{-1}\big(A\;\text{adj}\;(k\,A)\big) = A^{-1}\big(A\;(k^{n-1}\text{adj}\;A)\big)$

$\Rightarrow (A^{-1}A)(\text{adj}\;k\,A) = (A^{-1}\,A)(k^{n-1}\;\text{adj}\;A)$

$\Rightarrow I(\text{adj}\;k\,A) = I(k^{n-1}\;\text{adj}\;A)$

$\Rightarrow \text{adj}\;k\,A = k^{n-1}\;(\text{adj}\;A)$

15 **(c)**

It has a non- zero solution if

$\begin{vmatrix} 1 & k & -1 \\ 3-k & & -1 \\ 1 & -3 & 1 \end{vmatrix} = 0$

$\Rightarrow \quad -6k + 6 = 0$

$\Rightarrow \quad k = 1$

16 **(b)**

$(aI + bA)^2 = (aI + bA)(aI + bA)$

$\quad = a^2I^2 + aI(bA) + bA(aI) + (bA)^2$

Now, $I^2 = I$ and $IA = A$

$\therefore (aI + bA)^2 = a^2I + 2abA + b^2(A^2)$

Now, $A^2 = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix} = O$

$\therefore (aI + bA)^2 = a^2I + 2abA$

17 **(b)**

Since A is orthogonal matrix

$\therefore A\,A^T = I = A^T\,A$

$\Rightarrow |A\,A^T| = |I| = |A^T\,A|$

$\Rightarrow |A||A^T| = 1 = |A^T||A|$

$\Rightarrow |A|^2 = 1 \Rightarrow |A| = \pm 1$

18 **(b)**

Since, given system of equations has no solution, $\Delta = 0$ and any one amongst $\Delta x, \Delta y, \Delta z$ is non-zero.

Where $\quad \Delta = \begin{vmatrix} 2 & -1 & 2 \\ 1 & -2 & 1 \\ 1 & 1 & \lambda \end{vmatrix} = 0$

And $\Delta z = \begin{vmatrix} 2 & -1 & 2 \\ 1 & -2 & -4 \\ 1 & 1 & \lambda \end{vmatrix} = 6 \neq 0$

$\Rightarrow \quad \lambda = 1$

19 **(c)**

Since, A is an idempotent matrix, therefore $A^2 = A$

$\Rightarrow \begin{bmatrix} 2 & -2 & -16-4x \\ -1 & 3 & 16+4x \\ 4+x & -8-2x & -12+x^2 \end{bmatrix} = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & x \end{bmatrix}$

On comparing, $16 + 4x = 4$

$\Rightarrow \quad x = -3$

20 **(a)**

We have,

$A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 3 & 0 \\ 0 & 1 & 2 \end{bmatrix}$ and adj $A = \begin{bmatrix} 6 & -2 & -6 \\ -4 & 2 & x \\ y & -1 & 1 \end{bmatrix}$

Clearly, $|A| = 6 - 8 + 4 = 2$

$\therefore A\,(\text{adj}\,A) = |A|\,I$

$\Rightarrow \begin{bmatrix} 1 & 2 & 2 \\ 2 & 3 & 0 \\ 0 & 1 & 2 \end{bmatrix}\begin{bmatrix} 6 & -2 & -6 \\ -4 & 2 & x \\ y & -1 & -1 \end{bmatrix} = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$

$\Rightarrow \begin{bmatrix} 2y-2 & 0 & 2x-18 \\ 0 & 2 & 3x-12 \\ 2y-4 & 0 & x-2 \end{bmatrix} = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$

$\Rightarrow 2y - 2 = 2, 2y - 4 = 0, 2x - 8 = 0, 3x - 12 = 0, x - 2 = 2$

$\Rightarrow x = 4, y = 2 \Rightarrow x + y = 6$

ANSWER-KEY										
Q.	1	2	3	4	5	6	7	8	9	10
A.	B	D	D	B	A	D	A	C	C	B
Q.	11	12	13	14	15	16	17	18	19	20
A.	C	B	B	C	C	B	B	B	C	A