Topicwise Questions

Types of Matrices, Addition, Subtraction

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

(a) $\begin{bmatrix}1 & 1\\2 & 1\end{bmatrix}$ (b) $\begin{bmatrix}2/3 & 1/3\\1/3 & 2/3\end{bmatrix}$

(c) $\begin{bmatrix}1/3 & 1/3\\2/3 & 1/3\end{bmatrix}$ (d) $\begin{bmatrix}1/3 & 2/3\\2/3 & 1/3\end{bmatrix}$

Multiplication of Matrices and Identity Matrix

2. If $A=\begin{bmatrix}\cos\alpha & -\sin\alpha\\\sin\alpha & \cos\alpha\end{bmatrix}$ and $B=\begin{bmatrix}\cos\beta & -\sin\beta\\\sin\beta & \cos\beta\end{bmatrix}$, then the correct relation is

(a) $A^2=B^2$ (b) $A+B=B-A$
(c) $AB=BA$ (d) $AB=0$

3. If $A=\begin{bmatrix}4 & 2\\-1 & 1\end{bmatrix}$ and I is the identity matrix of order 2, then $(A-2I)(A-3I)=$

(a) I (b) O

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

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

(a) $A^3+3A^2+A-9I_3=O$
(b) $A^3-3A^2+A+9I_3=O$
(c) $A^3+3A^2-A+9I_3=O$
(d) $A^3-3A^2-A+9I_3=O$

5. If matrix $A=\begin{bmatrix}0 & -1\\1 & 0\end{bmatrix}$, then $A^{16}=$

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

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

6. If A and B are 3×3 matrices such that $AB=A$ and $BA=B$, then

(a) $A^2=A$ and $B^2\neq B$ (b) $A^2\neq A$ and $B^2=B$
(c) $A^2=A$ and $B^2=B$ (d) $A^2\neq A$ and $B^2\neq B$

7. $\begin{bmatrix}7 & 1 & 2\\9 & 2 & 1\end{bmatrix}\begin{bmatrix}3\\4\\5\end{bmatrix}+2\begin{bmatrix}4\\2\end{bmatrix}$ is equal to

(a) $\begin{bmatrix}43\\44\end{bmatrix}$ (b) $\begin{bmatrix}43\\45\end{bmatrix}$

(c) $\begin{bmatrix}45\\44\end{bmatrix}$ (d) $\begin{bmatrix}44\\45\end{bmatrix}$

Transpose of Matrices and other properties

8. If $A=\begin{bmatrix}0 & 1 & -2\\-1 & 0 & 5\\2 & -5 & 0\end{bmatrix}$, then

(a) $A'=A$ (b) $A'=-A$
(c) $A'=2A$ (d) $A'=-2A$

9. In order that the matrix $\begin{bmatrix}1 & 2 & 3\\4 & 5 & 6\\3 & \lambda & 5\end{bmatrix}$ be non-singular, λ should not be equal to

(a) 1 (b) 2
(c) 3 (d) 4

10. If $A=\begin{bmatrix}1 & -2 & 1\\2 & 1 & 3\end{bmatrix}$ and $B=\begin{bmatrix}2 & 1\\3 & 2\\1 & 1\end{bmatrix}$, then $(AB)^T=$

(a) $\begin{bmatrix}-3 & -2\\10 & 7\end{bmatrix}$ (b) $\begin{bmatrix}-3 & 10\\-2 & 7\end{bmatrix}$

(c) $\begin{bmatrix}-3 & 10\\7 & -2\end{bmatrix}$ (d) $\begin{bmatrix}3 & 10\\2 & 7\end{bmatrix}$

Symmetric & Skew symmetric Matrices & determinant of matrices and singular Matrix

11. If A is a square matrix $A+A^T$ is symmetric matrix, then $A-A^T=$

(a) Unit matrix (b) Symmetric matrix
(c) Skew symmetric matrix (d) Zero matrix

12. If A is a symmetric matrix and $n\in N$, then A^n is

(a) Symmetric (b) Skew symmetric
(c) A Diagonal matrix (d) Zero matrix

13. Out of the following a skew- symmetric matrix is

(a) $\begin{bmatrix} 0 & 4 & 5 \\ -4 & 0 & -6 \\ -5 & 6 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 4 & 5 \\ -4 & 1 & -6 \\ -5 & 6 & 1 \end{bmatrix}$

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

Adjoint and Inverse of Matrix

14. The element in the first row and third column of the inverse of the matrix $\begin{bmatrix} 1 & 2 & -3 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$ is

(a) -2 (b) 0
(c) 1 (d) 7

15. If a matrix A is such that $3A^3+2A^2+5A+I=0$, then its inverse is

(a) $-(3A^2+2A+5I)$ (b) $3A^2+2A+5I$
(c) $3A^2-2A-5I$ (d) $3A^2+2A-5I$

16. The inverse of matrix $A=\begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is

(a) A (b) A^T

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

17. The inverse matrix of $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$, is

(a) $\begin{bmatrix} \frac{1}{2} & -\frac{1}{2} & \frac{1}{2} \\ -4 & 3 & -1 \\ \frac{5}{2} & \frac{-3}{2} & \frac{1}{2} \end{bmatrix}$ (b) $\begin{bmatrix} \frac{1}{2} & -4 & \frac{5}{2} \\ 1 & -6 & 3 \\ 1 & 2 & -1 \end{bmatrix}$

(c) $\frac{1}{2}\begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \\ 4 & 2 & 3 \end{bmatrix}$ (d) $\frac{1}{2}\begin{bmatrix} 1 & -1 & -1 \\ -8 & 6 & -2 \\ 5 & -3 & 1 \end{bmatrix}$

18. For any 2×2 matrix A, if $A(\text{adj}\,A)=\begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$ then $|A|$ is equal

(a) 0 (b) 10
(c) 20 (d) 100

19. If $X=\begin{bmatrix} -x & -y \\ z & t \end{bmatrix}$ then transpose of adj X is

(a) $\begin{bmatrix} t & z \\ -y & -x \end{bmatrix}$ (b) $\begin{bmatrix} t & y \\ -z & -x \end{bmatrix}$

(c) $\begin{bmatrix} t & -z \\ y & -x \end{bmatrix}$ (d) $\begin{bmatrix} -t & z \\ -y & x \end{bmatrix}$

20. If $A=\begin{bmatrix} 1 & -1 & 1 \\ 0 & 2 & -3 \\ 2 & 1 & 0 \end{bmatrix}$ and $B=(\text{adj}\,A)$,, and $C=5A$, then

$\frac{|\text{adj}\,B|}{|C|}=$

(a) 5 (b) 25
(c) -1 (d) 1

21. If $A=\begin{bmatrix} 1 & 2 & 3 \\ 1 & 4 & 9 \\ 1 & 8 & 27 \end{bmatrix}$, then the value of $|\text{adj}\,A|$ is

(a) 36 (b) 72
(c) 144 (d) 6

22. If A is a matrix of order 3 and $|A|=8$, then $|\text{adj}\,A|=$

(a) 1 (b) 2
(c) 2^3 (d) 2^6

Special Case of Matrices and System of Equation

23. The matrix $A=\begin{bmatrix} 1 & -3 & -4 \\ -1 & 3 & 4 \\ 1 & -3 & -4 \end{bmatrix}$ is nilpotent of index

(a) 2 (b) 3
(c) 4 (d) 6

24. The matrix $A=\frac{1}{3}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$ is

(a) Orthogonal (b) Involutory
(c) Idempotent (d) Nilpotent

Learning Plus

1. The number of different possible orders of matrices having 12 identical elements is
   (a) 3 (b) 1
   (c) 6 (d) 2

2. $\begin{bmatrix} x^2+x & x \\ 3 & 2 \end{bmatrix} + \begin{bmatrix} 0 & -1 \\ -x+1 & x \end{bmatrix} = \begin{bmatrix} 0 & -2 \\ 5 & 1 \end{bmatrix}$ then x is equal to -
   (a) -1 (b) 2
   (c) 1 (d) No value of x

3. If $A = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ and $B = \begin{bmatrix} -5 & 4 & 0 \\ 0 & 2 & -1 \\ 1 & -3 & 2 \end{bmatrix}$, then
   (a) $AB = \begin{bmatrix} -5 & 8 & 0 \\ 0 & 4 & -2 \\ 3 & -9 & 6 \end{bmatrix}$ (b) $AB = [-2 -1\ 4]$
   (c) $AB = \begin{bmatrix} -1 \\ 1 \\ 1 \end{bmatrix}$ (d) AB does not exist

4. If $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, $J = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then $B =$
   (a) $I\cos\theta + J\sin\theta$ (b) $I\cos\theta - J\sin\theta$
   (c) $I\sin\theta + J\cos\theta$ (d) $-I\cos\theta + J\sin\theta$

5. Let $A = \begin{bmatrix} 3x^2 \\ 1 \\ 6x \end{bmatrix}$, $B = [a\ b\ c]$ and $C = \begin{bmatrix} (x+2)^2 & 5x^2 & 2x \\ 5x^2 & 2x & (x+1)^2 \\ 2x & (x+2)^2 & 5x^2 \end{bmatrix}$
   Where a, b, c and $x \in R$, Given that tr (AB) = tr(C), then the value of $(a+b+c)$.
   (a) 7 (b) 2
   (c) 1 (d) 4

6. If A = diag $(2, -1, 3)$, B = diag $(-1, 3, 2)$, then $A^2B =$
   (a) diag (5, 4, 11) (b) diag (−4, 3, 18)
   (c) diag (3, 1, 8) (d) B

7. $A = \begin{bmatrix} 0 & 1 \\ 2 & 0 \end{bmatrix}$ and $(A^8 + A^6 + A^4 + A^2 + I)\,V = \begin{bmatrix} 31 \\ 62 \end{bmatrix}$.
   (Where I is the (2×2) identity matrix), then the product of all elements of matrix V is
   (a) 2 (b) 1
   (c) 3 (d) -2

8. The equation $[1\ x\ y]\begin{bmatrix} 1 & 3 & 1 \\ 0 & 2 & -1 \\ 0 & 0 & 1 \end{bmatrix}\begin{bmatrix} 1 \\ x \\ y \end{bmatrix} = [0]$ has

(i) for $y = 0$	(p) rational roots
(ii) for $y = -1$	(q) irrational roots
	(r) integral roots

   Then

	(i)	(ii)
(a)	(p)	(r)
(b)	(q)	(p)
(c)	(p)	(q)
(d)	(r)	(p)

9. If $A = \begin{bmatrix} a & b \\ 0 & a \end{bmatrix}$ is n^{th} root of I_2, then choose the correct statement :
   (i) if n is odd, $a = 1$, $b = 0$
   (ii) if n is odd, $a = -1$, $b = 0$
   (iii) if n is even, $a = 1$, $b = 0$
   (iv) if n is even, $a = -1$, $b = 0$
   (a) (i), (ii), (iii) (b) (ii), (iii), (iv)
   (c) (i), (ii), (iii), (iv) (d) (i), (iii), (iv)

10. If A is a square matrix such that $A^2 = A$, then $(I+A)^3 - 7A$ is
   (a) $3I$ (b) O
   (c) I (d) $2I$

11. If $\begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is to be the square root of two-rowed unit matrix, then α, β and γ should staisfy the relation
   (a) $1 - \alpha^2 + \beta\gamma = 0$ (b) $\alpha^2 + \beta\gamma - 1 = 0$
   (c) $1 + \alpha^2 + \beta\gamma = 0$ (d) $1 - \alpha^2 - \beta\gamma = 0$

12. Find number of all possible ordered sets of two $(n \times n)$ matrices A and B for which $AB - BA = I$
   (a) infinite (b) n^2
   (c) $n!$ (d) zero

13. If B, C are square matrices of order n and if $A = B + C$, $BC = CB$, $C^2 = 0$, then which of following is true for any positive integer N.
   (a) $A^{N+1} = B^N(B + (N+1)C)$
   (b) $A^N = B^N(B + (N+1)C)$
   (c) $A^{N+1} = B(B + (N+1)C)$
   (d) $A^{N+1} = B^N(B + (N+2)C)$

14. Matrix A is such that $A^2 = 2A - I$, where I is the identity matrix. Then for $n \geq 2$, $A^n =$
   (a) $nA - (n-1)I$ (b) $nA - I$
   (c) $2^{n-1}A - (n-1)I$ (d) $2^{n-1}A - I$

15. If A and B are two matrices such that $AB = B$ and $BA = A$, then $A^2 + B^2 =$

(a) $2AB$ (b) $2BA$

(c) $A+B$ (d) AB

16. Let A, B be two matrices such that they commute, then for any positive integer n,

(i) $AB^n = B^nA$

(ii) $(AB)^n = A^nB^n$

(a) only (i) is correct

(b) Both (i) and (ii) are correct

(c) only (ii) is correct

(d) none of (i) and (ii) is correct

17. In an upper triangular matrix $A = [a_{ij}]_{n\times n}$ the elements $a_{ij} = 0$ for

(a) $i<j$ (b) $i=j$

(c) $i>j$ (d) $i\le j$

18. If A is a skew- symmetric matrix, then trace of A is

(a) 1 (b) -1

(c) 0 (d) 2

19. Let $S = \left\{ \begin{pmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{pmatrix} : a_{ij} \in \{-1, 0, 1\} \right\}$

then the number of symmetric matrices with trace equals zero, is

(a) 729 (b) 189

(c) 162 (d) 27

20. If A is a skew - symmetric matrix and n is an even positive integer, then A^n is

(a) a symmetric matrix (b) a skew-symmetric matrix

(c) a diagonal matrix (d) zero matrix

21. For what value of x, is the matrix $A = \begin{bmatrix} 0 & 1 & -2 \\ -1 & 0 & 3 \\ x & -3 & 0 \end{bmatrix}$ a skew-symmetric matrix ?

(a) 1 (b) 2

(c) 3 (d) 4

22. Let $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$ and $kB = \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{bmatrix}$ where $k, \alpha \in N$. If B is the inverse of the matrix A, then the value of $k+\alpha$ equals

(a) 10 (b) 15

(c) 5 (d) 20

23. A skew - symmetric matrix A satisfies the relation $A^2 + I = 0$, where I is a unit matrix. Then A is

(a) Idempotent matrix (b) Orthogonal matrix

(c) Nilpotent matrix (d) Periodic matrix

24. If $A = \frac{1}{3}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}$ is a orthogonal matrix, then the value of $(a+b)$ is equal to

(a) 0 (b) ± 1

(c) 3 (d) -3

25. If A is idempotent matrix and I is identity matrix such that $(I+A)^n = I + (2^n + k)A$. Then the value of k is

(a) 0 (b) 1

(c) -1 (d) 2

Advanced Level Multiconcept Questions

MCQ/COMPREHENSION/COLUMN/ NUMERICAL

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

(a) $|A| = 2$

(b) A is non-singular

(c) Adj. $A = \begin{bmatrix} 1/2 & -1/2 & 0 \\ 0 & -1 & 1/2 \\ 0 & 0 & -1/2 \end{bmatrix}$

(d) A is skew symmetric matrix

2. Which of the following statement(s) is/are **CORRECT?**

(a) Every skew-symmetric matrix is non-invertible.

(b) If A and B are two 3×3 matrices such that $AB = \mathbf{O}$ then alteast one of A and B must be null matrix.

(c) If the minimum number of cyphers in an upper triangular matrix of order n is 5050, then the order of matrix is 101.

(d) If A and B are two square matrices of order 3 such that det. $A = 5$ and det. $B = 2$, then det. $(10AB)$ equals 10^4

3. If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ (where $bc \ne 0$) satisfies the equations $x^2 + k = 0$, then

(a) $a+d=0$ (b) $k = -|A|$

(c) $k = |A|$ (d) $a+d \ne 0$

4. Which of the following is true for matrix $A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$

(a) $A + 4I$ is a symmetric matrix

(b) $A^2 - 4A + 5I_2 = 0$

(c) $A - B$ is a diagonal matrix for any value of α if $B = \begin{bmatrix} \alpha & -1 \\ 2 & 5 \end{bmatrix}$

(d) $A - 4I$ is a skew symmetric matrix

5. Which of the following is(are) correct?

(a) If A and B are two square matrices of order 3 and A is a non-singular matrix such that $AB = O$, then B must be a null matrix.

(b) If A, B, C are three square matrices of order 2 and det. $(A) = 2$, det.$(B) = 3$, det. $(C) = 4$, then the value of det. $(3ABC)$ is 216.

(c) If A is a square matrix of order 3 and det. $(A) = \frac{1}{2}$, then det. (adj. A^{-1}) is 8.

(d) Every skew symmetric matrix is singular.

6. Which of the following statement(s) is/are true

(a) The system of equations $\begin{matrix} 4x - 5y - 2z = 2 \\ 5x - 4y + 2z = 3 \\ 2x + 2y + 8z = 1 \end{matrix}$ is Inconsistent.

(b) A matrix 'A' has 6 elements. The number of possible orders of A is 6.

(c) For any 2×2 matrix A, if $A(\text{adj } A) = \begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$, then $|A| = 10$.

(d) If A is skew symmetric, then $B'AB$ is also skew symmetric.

7. Let A and B be two 2×2 matrix with real entries. If $AB = O$ and $\text{tr}(A) = \text{tr}(B) = 0$ then

(a) A and B are comutative w.r.t. operation of multiplication.

(b) A and B are not commutative w.r.t. operation of multi plication.

(c) A and B are both null matrices.

(d) $BA = 0$

8. Matrix $\begin{bmatrix} a & b & (a\alpha - b) \\ b & c & (b\alpha - c) \\ 2 & 1 & 0 \end{bmatrix}$ is non invertible if

(a) $\alpha = 1/2$ (b) a, b, c are in A.P.

(c) a, b, c are in G.P. (d) a, b, c are in H.P.

9. Let M be a 3×3 non-singular matrix with det $(M) = 4$. If M^{-1} adj(adj M) $= k^2 I$, then the value of 'k' may be:

(a) +2 (b) 4

(c) −2 (d) −4

10. If A and B are square matrices of order 3, then the true statement is/are (where I is unit matrix).

(a) $\det(-A) = -\det A$

(b) If AB is singular then atleast one of A or B is singular

(c) $\det(A + I) = 1 + \det A$

(d) $\det(2A) = 2^3 \det A$

Comprehension – 1 (Q. No. 11 to 13)

Let A be the set of all 3×3 symmetric matrices whose entries are $1,1,1,0,0,0,-1,-1,-1$. B is one of the matrix in set A and

$$X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}; \qquad U = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}; \ V = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}.$$

11. Number of such matrices B in set A is λ, then λ lies in the interval

(a) (30,40) (b) (38,40)

(c) (34,38) (d) (25,35)

12. Number of matrices B such that equation $BX = U$ has infinite solutions

(a) is at least 6 (b) is not more than 10

(c) lie between 8 to 16 (c) is zero.

13. The equation $BX = V$

(a) is inconsistent for atleast 3 matrices B.

(b) is inconsistent for all matrices B.

(c) is inconsistent for at most 12 matrices B.

(d) has infinite number of solutions for at least 3 matrices B.

Comprehension – 2 (Q. No. 14 to 16)

Some special square matrices are defined as follows :

Nilpotent matrix : A square matrix A is said to be nilpotent (of order 2) if, $A^2 = O$. A square matrix is said to be nilpotent of order p, if p is the least positive integer such that $A^p = O$.

Idempotent matrix : A square matrix A is said to be idempotent if, $A^2 = A$.

e.g. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ is an idempotent matrix.

Involutory matrix : A square matrix A is said to be involutory if $A^2 = I$, I being the identity matrix.

e.g. $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ is an involutory matrix.

Orthogonal matrix : A square matrix A is said to be an orthogonal matrix if $A'A = I = AA'$.

14. If A and B are two square matrices such that $AB = A$ & $BA = B$, then A & B are

(a) Idempotent matrices (b) Involutory matrices

(c) Orthogonal matrices (d) Nilpotent matrices

15. If the matrix $\begin{bmatrix} 0 & 2\beta & \gamma \\ \alpha & \beta & -\gamma \\ \alpha & -\beta & \gamma \end{bmatrix}$ is orthogonal, then

(*a*) $\alpha = \pm \frac{1}{\sqrt{2}}$ (*b*) $\beta = \pm \frac{1}{\sqrt{6}}$

(*c*) $\gamma = \pm \frac{1}{\sqrt{3}}$ (*c*) all of these

16. The matrix $A = \begin{bmatrix} 1 & 1 & 3 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{bmatrix}$ is

(*a*) idempotent matrix (*b*) involutory matrix

(*c*) nilpotent matrix (*c*) none of these

17. **Match the column:**

Column – I	**Column – II**
(a) If A and B are square matrices of order 3×3, where $\|A\| = 2$ and $\|B\| = 1$, then $\|(A^{-1}) . \text{adj}\,(B^{-1}) . \text{adj}\,(2A^{-1})\| =$	(*p*) 7
(b) If A is a square matrix such that $A^2 = A$ and $(I + A)^3 = I + kA$, then k is equal to	(*q*) 8
(c) If A and B are two invertible matrices such that $AB = C$ and $\|A\| = 2, \|C\| = -2$, then $\det(B)$ is	(*r*) 0
(d) If $A = [a_{ij}]_{3\times3}$ is a scalar matrix with $a_{11} = a_{22} = a_{33} = 2$ and $A(\text{adj}\,A) = kI_3$ then k is	(*s*) – 1

18. **Match the column:**

Column – I	**Column – II**
(*a*) $[1 \times 1] \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 3 & 2 & 5 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} = 0$ then x =	(p) 2
(*b*) If square matrix $A = \begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$ and $A^2 - 2xA + 5I_2 = 0$, then find x	(q) – 2
(*c*) If $A = \begin{bmatrix} 2 & \mu \\ \mu^2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} \gamma & 7 \\ 49 & \delta \end{bmatrix}$ here $(A - B)$ is upper triangular matrix then number of possible values of μ are	(r) 1
(*d*) If $\begin{vmatrix} (b+c)^2 & a^2 & a^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = k\,abc\,(a+b+c)^3$ then the value of k is	(s) $-\frac{9}{8}$

NUMERICAL VALUE BASED

19. Let $A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ such that $A^T A = 1$. Find the value of $x^2 + y^2 + z^2$

20. If $Y = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$ and $2X + Y = \begin{bmatrix} 1 & 0 \\ -3 & 2 \end{bmatrix}$, then absolute value of the sum of element of X is equal to

21. If $X + Y = \begin{bmatrix} 7 & 0 \\ 2 & 5 \end{bmatrix}$ and $X - Y = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$ then the sum of the elements of the matrix $3X - 4Y$ is equal to

22. If $A = \begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then absolute value of k so that $A^2 = 8A + kI$.

23. If $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}$ and if $A^6 = KA - 205I$, then K equals

24. Let A is a 3×3 matrix and $A = \left[a_{ij}\right]_{3\times3}$. If for every column matrix X, if $X^T A X$ and $a_{23} = -2009$ then $a_{32} =$.......

25. If $A = \begin{bmatrix} 3 & x-1 \\ 2x+3 & x+2 \end{bmatrix}$ is a symmetric matrix, then $x =$

26. Let $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$ and $B = \frac{1}{10}\begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & k \\ 1 & -2 & 3 \end{bmatrix}$ If B is the inverse of A, then $k =$

27. If A square matrix of order 2×2 and $|A| = 5$, then $|A(\text{adj}\,A)| =$

28. If $\begin{bmatrix} \sin\frac{\pi}{2} & \cos\frac{\pi}{3} \\ 2\tan\frac{\pi}{4} & 2k \end{bmatrix}$ is a singular matrix then $k =$

ANSWER KEY

Topicwise Questions

1. (*c*)	**2.** (*c*)	**3.** (*b*)	**4.** (*d*)	**5.** (*d*)	**6.** (*c*)	**7.** (*a*)	**8.** (*b*)	**9.** (*d*)	**10.** (*b*)
11. (*c*)	**12.** (*a*)	**13.** (*a*)	**14.** (*d*)	**15.** (*a*)	**16.** (*a*)	**17.** (*a*)	**18.** (*b*)	**19.** (*c*)	**20.** (*d*)
21. (*c*)	**22.** (*d*)	**23.** (*a*)	**24.** (*a*)						

Learning Plus

1. (*c*)	**2.** (*a*)	**3.** (*d*)	**4.** (*a*)	**5.** (*a*)	**6.** (*b*)	**7.** (*a*)	**8.** (*c*)	**9.** (*d*)	**10.** (*c*)
11. (*b*)	**12.** (*d*)	**13.** (*a*)	**14.** (*a*)	**15.** (*c*)	**16.** (*b*)	**17.** (*c*)	**18.** (*c*)	**19.** (*b*)	**20.** (*a*)
21. (*b*)	**22.** (*b*)	**23.** (*b*)	**24.** (*d*)	**25.** (*c*)					

Advanced Level Multiconcept Questions

MCQ/COMPREHENSION/MATCHING/NUMERICAL

1. (*b,c*) **2.** (*c,d*) **3.** (*a,c*) **4.** (*b,c*) **5.** (*a,b*) **6.** (*a,c,d*) **7.** (*a,d*) **8.** (*a,c*) **9.** (*a,c*) **10.** (*a,b,d*)

11. (*a,c*) **12.** (*a,c*) **13.** (*a,c*) **14.** (*a*) **15.** (*d*) **16.** (*c*) **17.** (*a*) $\rightarrow$ (q); (*b*) $\rightarrow$ (p); (*c*) $\rightarrow$ (s); (*d*) $\rightarrow$ (q)

18. (*a*) $\rightarrow$ (s); (*b*) $\rightarrow$ (p); (*c*) $\rightarrow$ (p); (*d*) $\rightarrow$ (p) **19.** [0001] **20.** [005] **21.** [0014] **22.** [0007] **23.** [0044] **24.** [2009]

25. [–4] **26.** [5] **27.** [25] **28.** [0.5]