

Q1. 21 January Shift 1

For some $\alpha, \beta \in \mathbf{R}$, let $A = \begin{bmatrix} \alpha & 2 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 \\ 1 & \beta \end{bmatrix}$ be such that $A^2 - 4A + 2I = B^2 - 3B + I = O$. Then $(\det(\text{adj}(A^3 - B^3)))^2$ is equal to ____.

Q2. 21 January Shift 2

For the matrices $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} -29 & 49 \\ -13 & 18 \end{bmatrix}$, if $(A^{15} + B) \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$, then among the following which one is true?

- (1) $x = 5, y = 7$ (2) $x = 18, y = 11$ (3) $x = 11, y = 2$ (4) $x = 16, y = 3$

Q3. 22 January Shift 1

If $A = \begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix}$, then the determinant of the matrix $(A^{2025} - 3A^{2024} + A^{2023})$ is

- (1) 12 (2) 28 (3) 24 (4) 16

Q4. 22 January Shift 1

Let A be a 3×3 matrix such that $A + A^T = O$. If $A \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix} = \begin{bmatrix} 3 \\ 3 \\ 2 \end{bmatrix}$, $A^2 \begin{bmatrix} 1 \\ -1 \\ 0 \end{bmatrix} = \begin{bmatrix} -3 \\ 19 \\ -24 \end{bmatrix}$ and

$\det(2 \text{adj}(A + I)) = (2)^\alpha \cdot (3)^\beta \cdot (11)^\gamma$, α, β, γ are non-negative integers, then $\alpha + \beta + \gamma$ is equal to ____.

Q5. 22 January Shift 2

If $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$ is a solution of the system of equations $AX = B$, where $\text{adj } A = \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & 5 \\ 1 & -2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 4 \\ 0 \\ 2 \end{bmatrix}$, then $|x + y + z|$ is equal to :

- (1) 2 (2) $\frac{3}{2}$ (3) 1 (4) 3

Q6. 23 January Shift 1

Let $|A| = 6$, where A is a 3×3 matrix. If $|\text{adj}(3 \text{adj}(A^2 \cdot \text{adj}(2A)))| = 2^m \cdot 3^n$, $m, n \in \mathbf{N}$, then $m + n$ is equal to ____.

Questions with Answer Keys

Q7. 23 January Shift 2

Let $A = \begin{bmatrix} 0 & 2 & -3 \\ -2 & 0 & 1 \\ 3 & -1 & 0 \end{bmatrix}$ and B be a matrix such that $B(I - A) = I + A$. Then the sum of the diagonal elements of $B^T B$ is equal to ____.

Q8. 24 January Shift 1

The number of 3×2 matrices A , which can be formed using the elements of the set $\{-2, -1, 0, 1, 2\}$ such that the sum of all the diagonal elements of $A^T A$ is 5, is

Q9. 24 January Shift 2

Let $f(x) = \int \frac{7x^{10}+9x^8}{(1+x^2+2x^9)^2} dx$, $x > 0$, $\lim_{x \rightarrow 0} f(x) = 0$ and $f(1) = \frac{1}{4}$. If $A = \begin{bmatrix} 0 & 0 & 1 \\ \frac{1}{4} & f'(1) & 1 \\ \alpha^2 & 4 & 1 \end{bmatrix}$ and $B = \text{adj}(\text{adj } A)$ be such that $|B| = 81$, then α^2 is equal to

- (1) 2 (2) 1 (3) 3 (4) 4

Q10. 24 January Shift 2

Let $P = [p_{ij}]$ and $Q = [q_{ij}]$ be two square matrices of order 3 such that $q_{ij} = 2^{(i+j-1)} p_{ij}$ and $\det(Q) = 2^{10}$. Then the value of $\det(\text{adj}(\text{adj } P))$ is:

- (1) 81 (2) 16 (3) 124 (4) 32

Q11. 28 January Shift 1

Let A , B and C be three 2×2 matrices with real entries such that $B = (I + A)^{-1}$ and $A + C = I$. If $BC = \begin{bmatrix} 1 & -5 \\ -1 & 2 \end{bmatrix}$ and $CB \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 12 \\ -6 \end{bmatrix}$, then $x_1 + x_2$ is

- (1) 2 (2) -2 (3) 0 (4) 4

Q12. 28 January Shift 2

Let $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ and B be two matrices such that $A^{100} = 100B + I$. Then the sum of all the elements of B^{100} is

ANSWER KEYS

1. 225 2. (3) 3. (4) 4. 18 5. (1) 6. 62 7. 3 8. 312

9. (4) 10. (2) 11. (3) 12. 0