

PYQSide

JEE MAIN MATRICES — POWERS OF A MATRIX AND MATRIX EQUATIONS (JEE) — PYQS

Max. Marks: 44

Questions: 11

Section A (MCQ)

Q.1 Let $A = \begin{bmatrix} 1 & 0 & 0 \\ 3 & 1 & 0 \\ 9 & 3 & 1 \end{bmatrix}$ and $B = [b_{ij}]$, $1 \leq i, j \leq 3$. If

$B = A^{99} - I$, then the value of $\frac{b_{31} - b_{21}}{b_{32}}$ is :

[JEE Main 2026 (Online) 6th April Evening Shift]

- (1) 99 (2) 199 (3) 149 (4) 159

Scan or tap for the full solution



Q.2 Let $S = \{A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} : a, b, c, d \in \{0, 1, 2, 3, 4\} \text{ and } A^2 - 4A + 3I = 0\}$ be a set of 2×2 matrices. Then the number of matrices in S , for which the sum of the diagonal elements is equal to 4, is :

[JEE Main 2026 (Online) 4th April Morning Shift]

- (1) 20 (2) 17 (3) 21 (4) 19

Scan or tap for the full solution



Q.3 Let $A = \begin{bmatrix} 1 & 2 \\ 1 & \alpha \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 3 \\ \beta & 2 \end{bmatrix}$. If $A^2 - 4A + I = 0$ and $B^2 - 5B - 6I = 0$, then among the two statements:

(S1) : $[(B - A)(B + A)]^T = \begin{bmatrix} 13 & 15 \\ 7 & 10 \end{bmatrix}$

and

(S2) : $\det(\text{adj}(A + B)) = -5$

[JEE Main 2026 (Online) 2nd April Morning Shift]

- (1) only (S1) is correct
(2) only (S2) is correct
(3) both (S1) and (S2) are correct
(4) both (S1) and (S2) are wrong

Scan or tap for the full solution



Q.4 If $A = \begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix}$, then the determinant of the matrix $(A^{2025} - 3A^{2024} + A^{2023})$ is

[JEE Main 2026 (Online) 22nd January Morning Shift]

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

Scan or tap for the full solution



Q.5 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**?

[JEE Main 2026 (Online) 21st January Evening Shift]

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

Scan or tap for the full solution



Q.6 Let the matrix $A = \begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$ satisfy

$A^n = A^{n-2} + A^2 - I$ for $n \geq 3$. Then the sum of all the elements of A^{50} is :

[JEE Main 2025 (Online) 4th April Evening Shift]

- (1) 44 (2) 39 (3) 52 (4) 53

Scan or tap for the full solution



Q.7 Let A be a 3×3 real matrix such that $A^2(A - 2I) - 4(A - I) = O$, where I and O are the identity and null matrices, respectively. If $A^5 = \alpha A^2 + \beta A + \gamma I$, where α, β , and γ are real constants, then $\alpha + \beta + \gamma$ is equal to :

[JEE Main 2025 (Online) 2nd April Evening Shift]

- (1) 76 (2) 12 (3) 4 (4) 20

Scan or tap for the full solution



Section B (Numerical)

Q.8 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 _____

[JEE Main 2026 (Online) 28th January Evening Shift]

Scan or tap for the full solution



Q.9 For some $\alpha, \beta \in \mathbb{R}$, 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 _____.

[JEE Main 2026 (Online) 21st January Morning Shift]

Scan or tap for the
full solution



Q.10 Let $A = \begin{bmatrix} \cos \theta & 0 & -\sin \theta \\ 0 & 1 & 0 \\ \sin \theta & 0 & \cos \theta \end{bmatrix}$. If for some $\theta \in (0, \pi)$, $A^2 = A^T$, then the sum of the diagonal elements of the matrix $(A + I)^3 + (A - I)^3 - 6A$ is equal to _____.

[JEE Main 2025 (Online) 4th April Morning Shift]

Scan or tap for the
full solution



Q.11 Let $S = \{m \in \mathbb{Z} : A^{m^2} + A^m = 3I - A^{-6}\}$, where $A = \begin{bmatrix} 2 & -1 \\ 1 & 0 \end{bmatrix}$. Then $n(S)$ is equal to _____.

[JEE Main 2025 (Online) 29th January Morning Shift]

Scan or tap for the
full solution



ANSWER KEY

Section A (MCQ)

Ques.	1	2	3	4	5	6	7				
Ans.	3	4	2	4	3	4	2				

Section B (Numerical)

Ques.	8	9	10	11			
Ans.	0	225	6	2			