

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

Max. Marks: 44
Questions: 11

Section A (MCQ) — 7 questions

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

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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

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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

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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) $x = 18, y = 11$

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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

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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

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Section B (Numerical) — 4 questions

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]

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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]

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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]

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ANSWER KEY

Section A (MCQ) — 7 questions

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

Section B (Numerical) — 4 questions

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