

JEE MAIN MATRICES — PYQS

Max. Marks: 76

Questions: 19

Section A (MCQ) — 11 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 M be a 3×3 matrix such that

$$M \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}, M \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix} = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix} \text{ and } M \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} -1 \\ 1 \\ 1 \end{bmatrix}.$$

$$M \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 7 \\ 11 \end{bmatrix}, \text{ then } x + y + z \text{ equals :}$$

[JEE Main 2026 (Online) 5th April Evening Shift]

- (1) 4 (2) 5 (3) 7 (4) 11

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Q.3 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.4 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.5 Let A, B and C be three 2×2 matrices with real entries such that $B = (I + A)^{-1}$ and $A + C = I$.

$$\text{If } BC = \begin{bmatrix} 1 & -5 \\ -1 & 2 \end{bmatrix} \text{ and } CB \begin{bmatrix} x_1 \\ x_2 \end{bmatrix} = \begin{bmatrix} 12 \\ -6 \end{bmatrix}, \text{ then}$$

$x_1 + x_2$ is

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

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

Scan or tap for the full solution



Q.6 If $A = \begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix}$, then the determinant of the matrix

$$(A^{2025} - 3A^{2024} + A^{2023}) \text{ is}$$

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

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

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Q.7 For the matrices $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} -29 & 49 \\ -13 & 18 \end{bmatrix}$,

$$\text{if } (A^{15} + B) \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}, \text{ then among the following}$$

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.8 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.9** Let $A = \begin{bmatrix} \alpha & -1 \\ 6 & \beta \end{bmatrix}$, $\alpha > 0$, such that $\det(A) = 0$ and $\alpha + \beta = 1$. If I denotes 2×2 identity matrix, then the matrix $(I + A)^8$ is :

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

- (1) $\begin{bmatrix} 257 & -64 \\ 514 & -127 \end{bmatrix}$ (2) $\begin{bmatrix} 766 & -255 \\ 1530 & -509 \end{bmatrix}$
 (3) $\begin{bmatrix} 1025 & -511 \\ 2024 & -1024 \end{bmatrix}$ (4) $\begin{bmatrix} 4 & -1 \\ 6 & -1 \end{bmatrix}$

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- Q.10** 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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- Q.11** Let $A = \begin{bmatrix} \frac{1}{\sqrt{2}} & -2 \\ 0 & 1 \end{bmatrix}$ and $P = \begin{bmatrix} \cos \theta & -\sin \theta \\ \sin \theta & \cos \theta \end{bmatrix}$, $\theta > 0$. If $B = PAP^T$, $C = P^T B^{10} P$ and the sum of the diagonal elements of C is $\frac{m}{n}$, where $\gcd(m, n) = 1$, then $m + n$ is :

[JEE Main 2025 (Online) 28th January Evening Shift]

- (1) 127 (2) 2049 (3) 258 (4) 65

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Section B (Numerical) — 8 questions

- Q.12** Consider the matrices $A = \begin{bmatrix} 2 & -2 \\ 4 & -2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 9 \\ 1 & 3 \end{bmatrix}$. If matrices P and Q are such that $PA = B$ and $AQ = B$, then the absolute value of the sum of the diagonal elements of $2(P + Q)$ is _____.

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

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- Q.13** 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.14** 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 _____.

[JEE Main 2026 (Online) 24th January Morning Shift]

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- Q.15** 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 _____.

[JEE Main 2026 (Online) 23rd January Evening Shift]

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- Q.16** 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]

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- Q.17** 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.18** 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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- Q.19** Let M denote the set of all real matrices of order 3×3 and let $S = \{-3, -2, -1, 1, 2\}$. Let $S_1 = \{A = [a_{ij}] \in M : A = A^T \text{ and } a_{ij} \in S, \forall i, j\}$, $S_2 = \{A = [a_{ij}] \in M : A = -A^T \text{ and } a_{ij} \in S, \forall i, j\}$, $S_3 = \{A = [a_{ij}] \in M : a_{11} + a_{22} + a_{33} = 0 \text{ and } a_{ij} \in S, \forall i, j\}$. If $n(S_1 \cup S_2 \cup S_3) = 125\alpha$, then α equals _____.

[JEE Main 2025 (Online) 28th January Morning Shift]

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ANSWER KEY**Section A (MCQ) — 11 questions**

Ques.	1	2	3	4	5	6	7	8	9	10	11
Ans.	3	2	4	2	3	4	3	4	2	2	4

Section B (Numerical) — 8 questions

Ques.	12	13	14	15	16	17	18
Ans.	34	0	312	3	225	6	2
Ques.	19						
Ans.	1613						