CUET Mathematics Test - Set 14

Chapter: Algebra - Matrices (Intermediate Level)

General Instructions

1. Total Questions: **15**
2. Duration: **60 Minutes**
3. All questions are compulsory.
4. Each question carries **5 marks**.
5. For each correct answer: **+5 marks**.
6. For each incorrect answer: **-1 mark**.
7. No negative marking for unanswered questions.
8. Use of calculator or electronic devices is strictly prohibited.
9. Choose the most appropriate answer from the given options.

1. If $A = [a_{ij}]$ is a 3×3 matrix such that $a_{ij} = i^2 - j^2$, then A is a:
   (A) Symmetric matrix
   (B) Skew-symmetric matrix
   (C) Diagonal matrix
   (D) Identity matrix

2. If A and B are square matrices of the same order such that $A^2 = A$ and $B^2 = B$, and $(A + B)^2 = A + B$, then:
   (A) $AB = BA = I$
   (B) $AB = BA = O$
   (C) $AB = BA$
   (D) $A = B$

3. If $A = \begin{bmatrix} 0 & 5 \\ -5 & 0 \end{bmatrix}$, then A^{2026} is a:
   (A) Skew-symmetric matrix
   (B) Identity matrix
   (C) Scalar matrix
   (D) Zero matrix

4. The trace of a square matrix A (denoted by $Tr(A)$) is the sum of its diagonal elements. If A and B are two $n \times n$ matrices, which of the following is false?
   (A) $Tr(A + B) = Tr(A) + Tr(B)$
   (B) $Tr(kA) = k \cdot Tr(A)$
   (C) $Tr(AB) = Tr(BA)$
   (D) $Tr(AB) = Tr(A) \cdot Tr(B)$

5. If A is a square matrix, then $A + A^T$ is always:
   (A) Skew-symmetric
   (B) Symmetric
   (C) Unitary
   (D) Diagonal

6. If $A = \begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix}$ and $A^3 = 125I$, then the value of α is:
   (A) 3
   (B) 5
   (C) ± 3
   (D) 0

7. If A is a skew-symmetric matrix of order 3, then the value of $Tr(A)$ is:
   (A) 3
   (B) 1
   (C) 0
   (D) Cannot be determined

8. If $AB = A$ and $BA = B$, then B^2 is equal to:
   (A) A
   (B) B
   (C) I
   (D) O

9. Let $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ a & b & -1 \end{bmatrix}$. Then A^2 is equal to:

(A) A
(B) $-I$
(C) I
(D) O

10. If $A = \begin{bmatrix} \lambda & 0 & 0 \\ 0 & \lambda & 0 \\ 0 & 0 & \lambda \end{bmatrix}$, then A^n is:
(A) $\lambda^n I$
(B) $n\lambda I$
(C) λI^n
(D) $\lambda^n A$

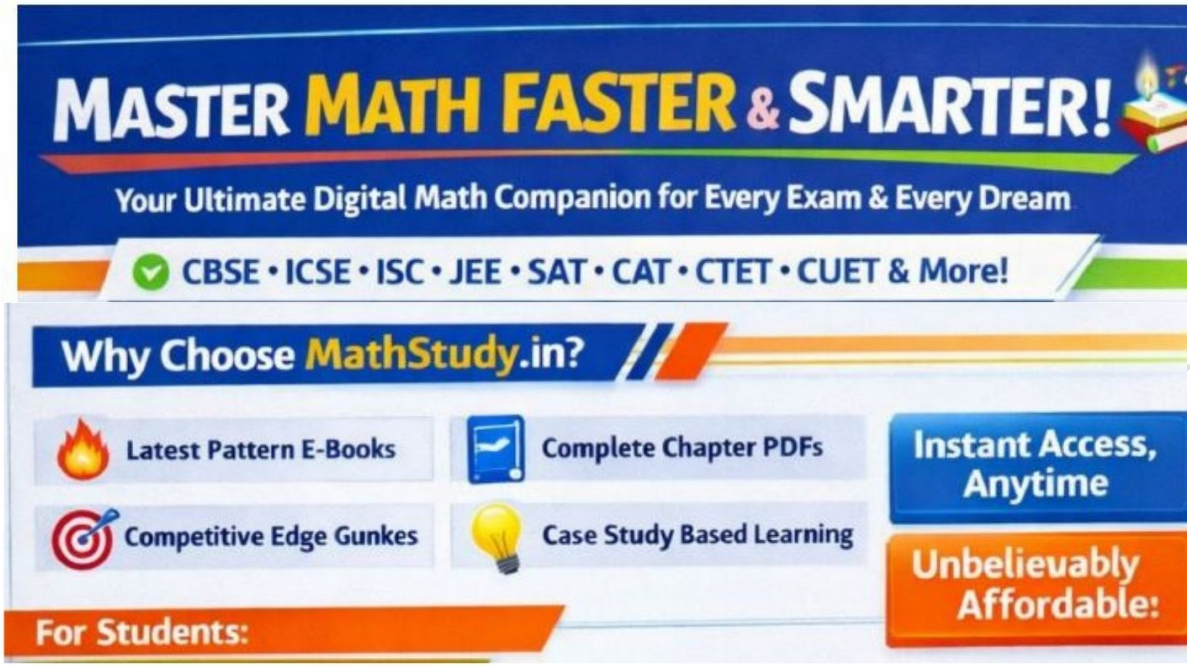
11. The number of symmetric matrices of order 3 that can be formed using elements from the set $\{0, 1, 2\}$ is:
(A) 3^3
(B) 3^6
(C) 3^9
(D) 2^6

12. If A is a square matrix of order n, and $A^k = O$ for some positive integer k, then A is called:
(A) Idempotent
(B) Nilpotent
(C) Involutory
(D) Periodic

13. If $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$, then $A^n - (n-1)A$ is:
(A) nI
(B) $(n-1)I$
(C) $(2-n)I$
(D) I

14. If A is an invertible matrix of order n, then $(A^T)^{-1}$ is equal to:
(A) A^{-1}
(B) $(A^{-1})^T$
(C) A^T
(D) I

15. If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ such that $A^2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$, then:
(A) $\alpha = a^2 + b^2, \beta = ab$
(B) $\alpha = a^2 + b^2, \beta = 2ab$
(C) $\alpha = a^2 - b^2, \beta = 2ab$
(D) $\alpha = 2ab, \beta = a^2 + b^2$



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