CUET Mathematics Test

Chapter: Algebra - Matrices

General Instructions

1. Total Questions: **20**
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 is a matrix of order $m \times n$ and B is a matrix such that AB^T and B^TA are both defined, then the order of matrix B is:
   (A) $m \times n$
   (B) $n \times m$
   (C) $n \times n$
   (D) $m \times m$

2. If $A = \begin{bmatrix} 0 & 2 \\ 3 & -4 \end{bmatrix}$ and $kA = \begin{bmatrix} 0 & 3a \\ 2b & 24 \end{bmatrix}$, then the values of k, a, b are respectively:
   (A) $-6, -4, -9$
   (B) $-6, -4, 9$
   (C) $-6, 4, 9$
   (D) $-6, 12, -18$

3. If A and B are symmetric matrices of the same order, then $AB - BA$ is a:
   (A) Skew-symmetric matrix
   (B) Symmetric matrix
   (C) Zero matrix
   (D) Identity matrix

4. Let A and B be two 2×2 matrices such that $AB = O$ (Zero matrix). Which of the following is necessarily true?
   (A) $A = O$ or $B = O$
   (B) BA must also be O
   (C) Neither A nor B need to be O
   (D) A and B must be diagonal matrices

5. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$, then $A + A^T = I$, if the value of α is:
   (A) $\pi/6$
   (B) $\pi/3$
   (C) π
   (D) $3\pi/2$

6. The number of all possible matrices of order 3×3 with each entry 0 or 1 is:
   (A) 27
   (B) 18
   (C) 81
   (D) 512

7. If A is a square matrix such that $A^2 = A$, then $(I + A)^3 - 7A$ is equal to:
   (A) A
   (B) $I - A$
   (C) I
   (D) $3A$

8. If $A = \begin{bmatrix} a & b \\ c & -a \end{bmatrix}$ and $A^2 = I$, then:
   (A) $1 + a^2 + bc = 0$
   (B) $1 - a^2 + bc = 0$
   (C) $1 - a^2 - bc = 0$
   (D) $a^2 + bc - 1 = 0$

9. Matrices A and B will be inverse of each other only if:
   (A) $AB = BA$
   (B) $AB = BA = O$
   (C) $AB = O, BA = I$
   (D) $AB = BA = I$

10. If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, then A^4 is equal to:
   (A) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$
   (B) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$
   (C) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$
   (D) $\begin{bmatrix} 4 & 0 \\ 0 & 4 \end{bmatrix}$

11. For any square matrix A with real number entries, $A - A^T$ is a:
   (A) Symmetric matrix
   (B) Skew-symmetric matrix
   (C) Diagonal matrix
   (D) Upper triangular matrix

12. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}$ is a matrix satisfying $AA^T = 9I$, then the values of a and b are:
   (A) $a = 1, b = 2$
   (B) $a = -2, b = -1$
   (C) $a = -2, b = 1$
   (D) $a = 2, b = 1$

13. If A is a matrix of order 3×4 and B is a matrix of order 4×3, then the order of $(AB)^T$ is:
   (A) 4×4
   (B) 3×3
   (C) 4×3
   (D) 3×4

14. Total number of elements in a matrix having order $n \times (n + 1)$ is 42. The value of n is:
   (A) 6
   (B) 7
   (C) 5
   (D) 4

15. If $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, then the value of A^k is:
   (A) $\begin{bmatrix} 3k & -4k \\ k & -k \end{bmatrix}$
   (B) $\begin{bmatrix} 1 + 2k & -4k \\ k & 1 - 2k \end{bmatrix}$
   (C) $\begin{bmatrix} k^3 & (-4)^k \\ 1^k & (-1)^k \end{bmatrix}$

(D) $\begin{bmatrix} 1+2k & -4k \\ k & 1+2k \end{bmatrix}$

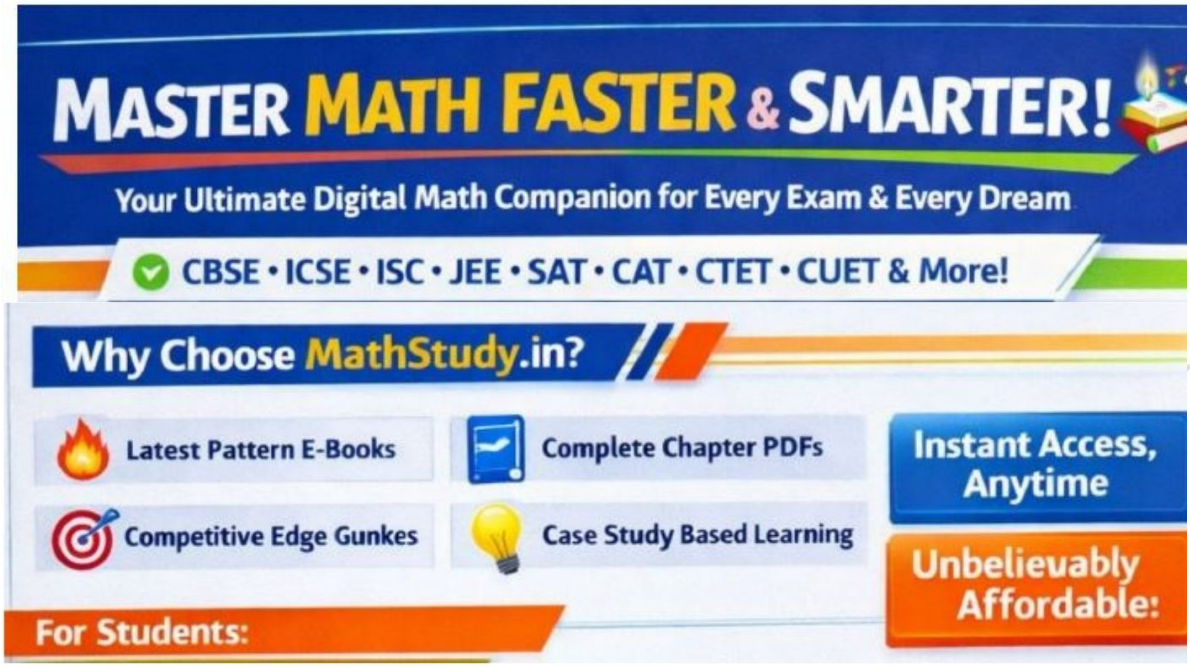
16. If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$, then the value of α for which $A^2 = B$ is:
    (A) 1
    (B) -1
    (C) 4
    (D) No real value

17. Assume X, Y, Z, W and P are matrices of orders $2 \times n, 3 \times k, 2 \times p, n \times 3$ and $p \times k$ respectively. The restriction on n, k and p so that $PY + WY$ will be defined is:
    (A) $k = 3, p = n$
    (B) k is arbitrary, $p = 2$
    (C) p is arbitrary, $k = 3$
    (D) $k = 2, p = 3$

18. If A is a square matrix such that $A^T A = I$, then A is said to be:
    (A) Symmetric
    (B) Orthogonal
    (C) Idempotent
    (D) Involutory

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

20. If A and B are square matrices of order n such that $A^2 - B^2 = (A - B)(A + B)$, then which of the following must be true?
    (A) $A = B$
    (B) $AB = BA$
    (C) Either A or B is a zero matrix
    (D) Either A or B is an identity matrix



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