CUET (UG) – MATHEMATICS

Chapter Test - Algebra (Matrices and Determinants)

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 $A = [a_{ij}]$ is a square matrix of order $n \times n$ such that $a_{ij} = 0$ for $i \neq j$ and $a_{ij} = k$ (where k is a non-zero constant) for $i = j$, then A is called a:
   (A) Identity matrix
   (B) Scalar matrix
   (C) Diagonal matrix
   (D) Unit matrix

2. 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) $3A$

3. Let A and B be two 3×3 non-zero skew-symmetric matrices and C be a 3×3 non-zero symmetric matrix. Which of the following is a skew-symmetric matrix?
   (A) $A^4B^3 - B^3A^4$
   (B) $A^9 - B^9$
   (C) C^2
   (D) $A^{23} + B^{23}$

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

5. If A is an invertible matrix of order 3 and $|A| = 5$, then $|adj(A)|$ is:
   (A) 5
   (B) 125
   (C) 25
   (D) 625

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 $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, then $A^2 - 5A$ is equal to:
   (A) $2I$
   (B) $-2I$
   (C) I
   (D) 0

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

9. If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, then A^4 is:

(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) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$

10. For what value of k the following system of equations has no solution?
$x + y + z = 2$
$x + 2y + 3z = 5$
$x + 3y + kz = 8$
(A) 4
(B) 5
(C) 6
(D) 0

11. If A is a square matrix of order 3 such that $|adj(adj(A))| = |A|^k$, then the value of k is:
(A) 2
(B) 4
(C) 8
(D) 9

12. If $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$, then A^{-1} is:
(A) $\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$

(B) $\begin{bmatrix} -\cos\theta & \sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$

(C) $\begin{bmatrix} \sin\theta & \cos\theta \\ \cos\theta & -\sin\theta \end{bmatrix}$

(D) $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$

13. Total number of elements in a matrix having 12 elements can be represented by how many possible orders?
(A) 4
(B) 6
(C) 5
(D) 3

14. If $A = \begin{bmatrix} 2 & -3 \\ -4 & 7 \end{bmatrix}$, then $adj(A)$ is:
(A) $\begin{bmatrix} 7 & 3 \\ 4 & 2 \end{bmatrix}$

(B) $\begin{bmatrix} 7 & -3 \\ -4 & 2 \end{bmatrix}$

(C) $\begin{bmatrix} 2 & 4 \\ 3 & 7 \end{bmatrix}$

(D) $\begin{bmatrix} -7 & -3 \\ -4 & -2 \end{bmatrix}$

15. Let A be a 3×3 matrix such that $|A| = 2$. Then $|3A|$ is:
    (A) 6
    (B) 18
    (C) 54
    (D) 27

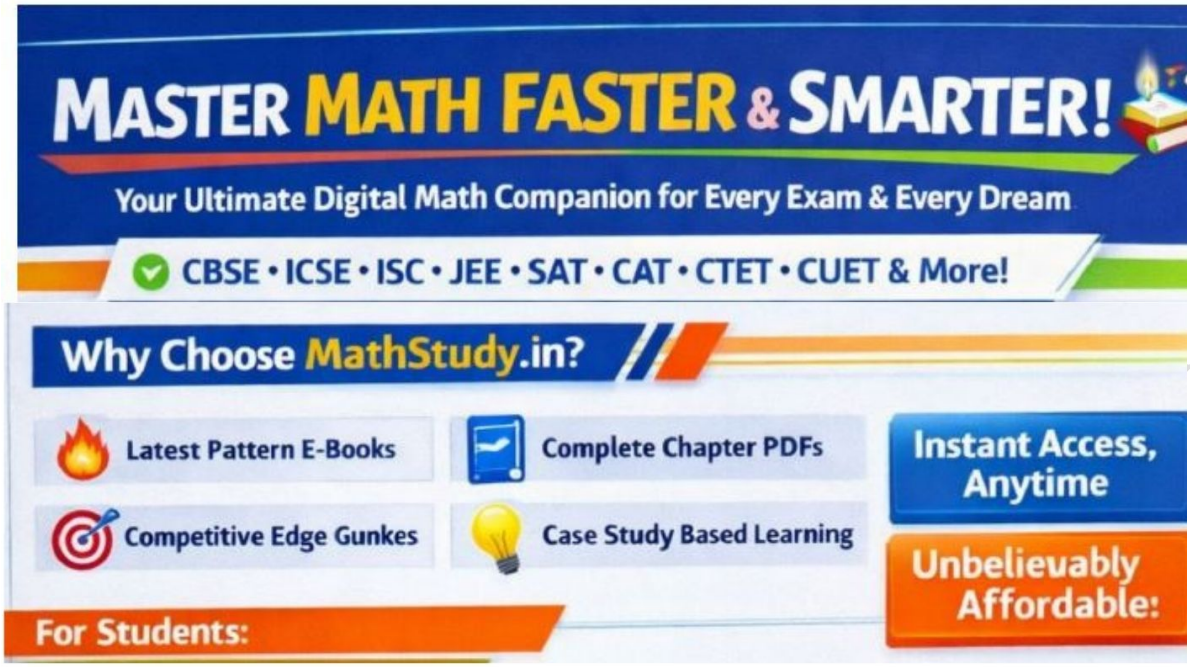
16. If A is a skew-symmetric matrix of order 3, then $|A|$ is:
    (A) 1
    (B) -1
    (C) 0
    (D) Any non-zero real number

17. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ a & b & -1 \end{bmatrix}$, then A^2 is:
    (A) Unit matrix
    (B) Null matrix
    (C) A
    (D) $-I$

18. Given $2x - y + 3z = 9$, $x + y + z = 6$, $x - y + z = 2$. The value of y using Matrix method is:
    (A) 1
    (B) 2
    (C) 3
    (D) 4

19. If A and B are square matrices of order 3 such that $|A| = -1$ and $|B| = 3$, then $|3AB|$ is:
    (A) -9
    (B) -81
    (C) -27
    (D) 81

20. 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) $\begin{bmatrix} n\lambda & n \\ 0 & n\lambda \end{bmatrix}$



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