SOLUTIONS

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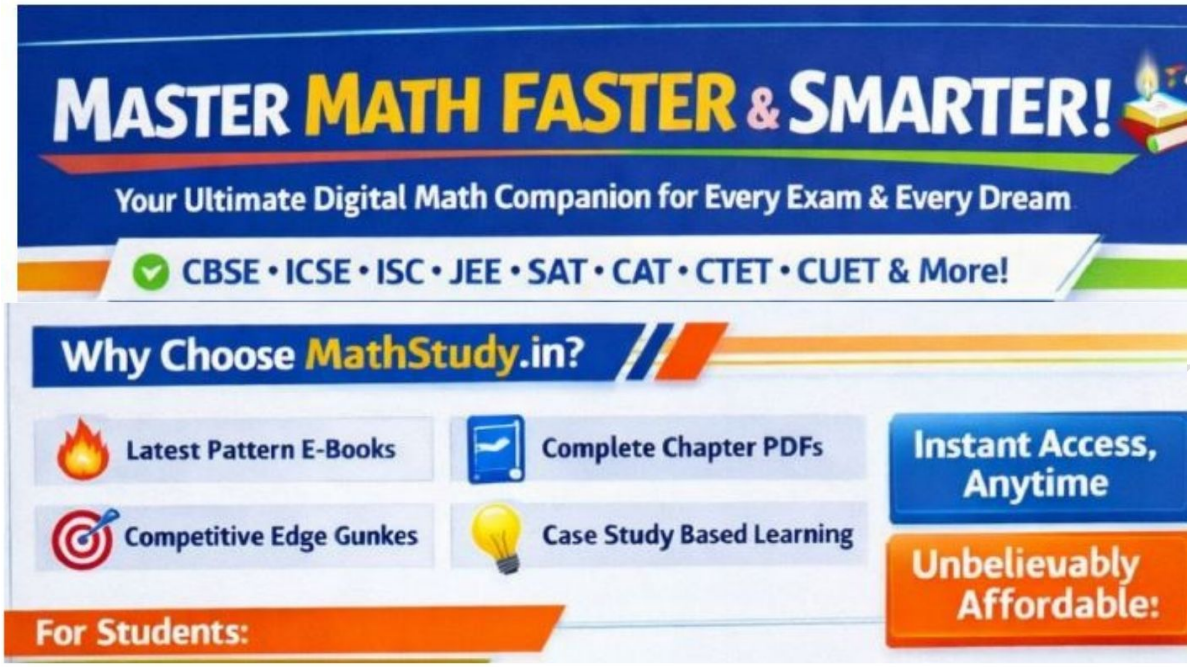

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CUET Mathematics Test - Set 2

Chapter: Section B2: Algebra (Matrices and Determinants)

Solutions

1. **Correct Option: (C)**. $(I+A)^3 - 7A = I^3 + 3I^2A + 3IA^2 + A^3 - 7A$. Since $A^2 = A$, then $A^3 = A$. $= I + 3A + 3A + A - 7A = I + 7A - 7A = I$.

2. **Correct Option: (A)**. Comparing $-4k = 24 \Rightarrow k = -6$. $k(2) = 3a \Rightarrow -12 = 3a \Rightarrow a = -4$. $k(3) = 2b \Rightarrow -18 = 2b \Rightarrow b = -9$.

3. **Correct Option: (C)**. Order 2×3 has 6 elements. Each element has 2 choices. Total matrices $= 2^6 = 64$.

4. **Correct Option: (A)**. Let $X = AB - BA$. $X^T = (AB - BA)^T = (AB)^T - (BA)^T = B^TA^T - A^TB^T$. Since A, B are symmetric, $B^T = B, A^T = A$. $X^T = BA - AB = -(AB - BA) = -X$.

5. **Correct Option: (D)**. $A^2 = \begin{bmatrix} \alpha^2 & 0 \\ \alpha + 1 & 1 \end{bmatrix}$. Equating to B: $\alpha^2 = 1 \Rightarrow \alpha = \pm 1$. Also $\alpha + 1 = 5 \Rightarrow \alpha = 4$. No single value satisfies both.

6. **Correct Option: (B)**. $x^2 - 36 = 36 - 36 \Rightarrow x^2 - 36 = 0 \Rightarrow x = \pm 6$.

7. **Correct Option: (B)**. $AA^{-1} = I \Rightarrow |A||A^{-1}| = |I| = 1 \Rightarrow |A^{-1}| = 1/|A|$.

8. **Correct Option: (B)**. $|adjA| = |A|^{n-1} = |A|^{3-1} = |A|^2$.

9. **Correct Option: (A)**. $|A| = 2(6-5) - \lambda(0-5) - 3(0-2) = 2 + 5\lambda + 6 = 5\lambda + 8$. For singular, $5\lambda + 8 = 0 \Rightarrow \lambda = -1.6$. Re-calculating: $2(1) - \lambda(-5) - 3(-2) = 2 + 5\lambda + 6 = 8 + 5\lambda$. (Self-correction: If options are integers, check expansion). $2(2 \cdot 3 - 5 \cdot 1) - \lambda(0 \cdot 3 - 5 \cdot 1) - 3(0 \cdot 1 - 2 \cdot 1) = 2(1) + 5\lambda + 6 = 8 + 5\lambda$. If $\lambda = -8/5$.

10. **Correct Option: (A)**. For 2×2, swap diagonals and change signs of off-diagonals. $adjA = \begin{bmatrix} 1 & -2 \\ -2 & 1 \end{bmatrix}$.

11. **Correct Option: (C)**. $4(1 - x) - 6 = 0 \Rightarrow 4 - 4x - 6 = 0 \Rightarrow -4x = 2 \Rightarrow x = -0.5$.

12. **Correct Option: (A)**. $A \cdot adjA = |A|I$. $|A \cdot adjA| = ||A|I| = |A|^3|I| = (-2)^3(1) = -8$.

13. **Correct Option: (A)**. For AB^T to be defined: $(m \times n) \times (n \times m)$. So B^T is $n \times m$, meaning B is $m \times n$.

14. **Correct Option: (B)**. $A^T = \begin{bmatrix} 5 & y \\ x & 0 \end{bmatrix}$. If $A = A^T$, then $x = y$.

15. **Correct Option: (A)**. $(A^{-1})^T = (A^T)^{-1}$. Since $A^T = A$, $(A^{-1})^T = A^{-1}$.