Assignment

Types of Matrices

Basic Level

1. If $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & b & 1 \end{bmatrix}$ be a diagonal matrix, then $b =$

(a) 2 (b) 0 (c) 1 (d) 3

2. Which of the following is a diagonal matrix

(a) $\begin{bmatrix} 2 & 0 & 2 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ (c) $\begin{bmatrix} 2 & 2 & 0 \\ 2 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ (d) None of these

3. If I is a unit matrix, then $3I$ will be

(a) A unit matrix (b) A triangular matrix (c) A scalar matrix (d) None of these

4. If $A = \begin{bmatrix} 1 & 2 & -1 \\ 3 & 4 & 7 \\ 5 & 1 & 6 \end{bmatrix}$, then the value of X where $A+X$ is a unit matrix, is

(a) $\begin{bmatrix} 0 & -2 & 1 \\ -3 & -3 & -7 \\ -5 & -1 & -6 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & -3 & 5 \\ -2 & -3 & 1 \\ -1 & -7 & 6 \end{bmatrix}$ (c) $\begin{bmatrix} 0 & -1 & -2 \\ 3 & 3 & 7 \\ 5 & 1 & 6 \end{bmatrix}$ (d) None of these

5. If A is diagonal matrix of order 2×2, then wrong statement is

(a) $AB = BA$, where B is a diagonal matrix of order 2×2 (b) AB is a diagonal matrix

(c) $A^T = A$ (d) A is a scalar matrix

Algebra of Matrices

Basic Level

6. If $M = \begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$ and $M^2 - \lambda M - I_2 = O$, then $\lambda =$ **[MP PET 1990, 2001]**

(a) –2 (b) 2 (c) –4 (d) 4

7. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ and $B = \begin{bmatrix} \cos\beta & -\sin\beta \\ \sin\beta & \cos\beta \end{bmatrix}$, then the correct relation is

(a) $A^2 = B^2$ (b) $A + B = B - A$ (c) $AB = BA$ (d) None of these

8. If $A = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$, then

(a) $AB = BA$ (b) $AB = BA = O$ (c) $AB = O,\ BA \neq O$ (d) $AB \neq BA = O$

9. If $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$, then $A^n =$ **[Rajasthan PET 1995]**

(a) $\begin{bmatrix} 1 & n \\ 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} n & n \\ 0 & n \end{bmatrix}$ (c) $\begin{bmatrix} n & 1 \\ 0 & n \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 1 \\ 0 & n \end{bmatrix}$

10. If $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$, then $A^2 =$

(a) A (b) $2A$ (c) $-A$ (d) $-2A$

11. If $2A + \begin{bmatrix} 2 & -1 \\ 2 & 0 \end{bmatrix} = \begin{bmatrix} -3 & 7 \\ 4 & 3 \end{bmatrix}$, then $A =$

(a) $\begin{bmatrix} -5 & 8 \\ 2 & 3 \end{bmatrix}$ (b) $\begin{bmatrix} -5/2 & 4 \\ 1 & 3/2 \end{bmatrix}$ (c) $\begin{bmatrix} -5 & 6 \\ 2 & 3 \end{bmatrix}$ (d) None of these

12. If $[m \ \ n]\begin{bmatrix} m \\ n \end{bmatrix} = [25]$ and $m < n$, then $(m,n) =$

(a) (2, 3) (b) (3, 4) (c) (4, 3) (d) None of these

13. If $A = \begin{bmatrix} \cos^2\theta & \sin\theta\cos\theta \\ \sin\theta\cos\theta & \sin^2\theta \end{bmatrix}$, $B = \begin{bmatrix} \cos^2\phi & \sin\phi\cos\phi \\ \sin\phi\cos\phi & \sin^2\phi \end{bmatrix}$ and θ and ϕ differs by $\frac{\pi}{2}$, then $AB =$

(a) I (b) O (c) $-I$ (d) None of these

14. If $A = \begin{bmatrix} 0 & r & -q \\ -r & 0 & p \\ q & -p & 0 \end{bmatrix}$ and $B = \begin{bmatrix} p^2 & pq & pr \\ pq & q^2 & qr \\ pr & qr & r^2 \end{bmatrix}$, then $AB =$

(a) $\begin{bmatrix} p & 0 & 0 \\ 0 & q & 0 \\ 0 & 0 & r \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$

15. If $A = \begin{bmatrix} 4 & 1 \\ 3 & 2 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then $A^2 - 6A =$ **[MP PET 1987]**

(a) $3I$ (b) $5I$ (c) $-5I$ (d) None of these

16. If $A = \begin{bmatrix} \lambda & 1 \\ -1 & -\lambda \end{bmatrix}$, then for what value of λ, $A^2 = O$ **[MP PET 1992]**

(a) 0 (b) ± 1 (c) –1 (d) 1

17. If $A = \begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix}$ and $A^n = O$, then the minimum value of n is

(a) 2 (b) 3 (c) 4 (d) 5

18. If $A = \begin{bmatrix} 1/3 & 2 \\ 0 & 2x-3 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 6 \\ 0 & -1 \end{bmatrix}$ and $AB = I$, then $x =$ **[MP PET 1987]**

(a) –1 (b) 1 (c) 0 (d) 2

19. If $2A + B = \begin{bmatrix} 6 & 4 \\ 6 & -11 \end{bmatrix}$ and $A - B = \begin{bmatrix} 0 & 2 \\ 6 & 2 \end{bmatrix}$, then $A =$

(a) $\begin{bmatrix} 2 & 2 \\ 4 & -3 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & 0 \\ 4 & -3 \end{bmatrix}$ (c) $\begin{bmatrix} 2 & 2 \\ 4 & 3 \end{bmatrix}$ (d) None of these

20. If $A=[1\ 2\ 3]$ and $B=\begin{bmatrix} -5 & 4 & 0 \\ 0 & 2 & -1 \\ 1 & -3 & 2 \end{bmatrix}$, then $AB=$ **[MP PET 1988]**

(a) $\begin{bmatrix} -5 & 4 & 0 \\ 0 & 4 & -2 \\ 3 & -9 & 6 \end{bmatrix}$ (b) $\begin{bmatrix} 3 \\ 1 \\ 1 \end{bmatrix}$ (c) $\begin{bmatrix} -2 & -1 & 4 \end{bmatrix}$ (d) $\begin{bmatrix} -5 & 8 & 0 \\ 0 & 4 & -3 \\ 1 & -6 & 6 \end{bmatrix}$

21. If $A=\begin{bmatrix} 1 & 1 & -1 \\ 2 & -3 & 4 \\ 3 & -2 & 3 \end{bmatrix}$ and $B=\begin{bmatrix} -1 & -2 & -1 \\ 6 & 12 & 6 \\ 5 & 10 & 5 \end{bmatrix}$, then AB is

(a) Diagonal matrix (b) Null matrix (c) Unit matrix (d) None of these

22. If $A=\begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$, then $A^5=$

(a) $5A$ (b) $10A$ (c) $16A$ (d) $32A$

23. If $A=\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$ and $AB=O$, then $B=$ **[MP PET 1989]**

(a) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} -1 & 0 \\ 0 & 0 \end{bmatrix}$

24. If $R(t)=\begin{bmatrix} \cos t & \sin t \\ -\sin t & \cos t \end{bmatrix}$,then $R(s)\ R(t)=$ **[Roorkee 1981]**

(a) $R(s)+R(t)$ (b) $R(st)$ (c) $R(s+t)$ (d) None of these

25. If $A=\begin{bmatrix} 0 & 1 & 2 \\ 2 & 3 & 4 \\ 4 & 5 & 6 \end{bmatrix}$ and $3A-4B=\begin{bmatrix} -4 & 3 & 6 \\ 6 & 5 & 12 \\ 12 & 15 & 14 \end{bmatrix}$,then $B=$

(a) $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}$ (d) None of these

26. If $A=\begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$,then A^4 is equal to **[MP PET 1993]**

(a) $\begin{bmatrix} 1 & a^4 \\ 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 4 & 4a \\ 0 & 4 \end{bmatrix}$ (c) $\begin{bmatrix} 4 & a^4 \\ 0 & 4 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 4a \\ 0 & 1 \end{bmatrix}$

27. If $\begin{bmatrix} 3 & 1 \\ 4 & 1 \end{bmatrix}X=\begin{bmatrix} 5 & -1 \\ 2 & 3 \end{bmatrix}$, then $X=$

(a) $\begin{bmatrix} -3 & 4 \\ 14 & -13 \end{bmatrix}$ (b) $\begin{bmatrix} 3 & -4 \\ -14 & 13 \end{bmatrix}$ (c) $\begin{bmatrix} 3 & 4 \\ 14 & 13 \end{bmatrix}$ (d) $\begin{bmatrix} -3 & 4 \\ -14 & 13 \end{bmatrix}$

28. If $A=\begin{bmatrix} 5 & -3 \\ 2 & 4 \end{bmatrix}$ and $B=\begin{bmatrix} 6 & -4 \\ 3 & 6 \end{bmatrix}$, then $A-B=$ **[Rajasthan PET 1995]**

(a) $\begin{bmatrix} 11 & -7 \\ 5 & 10 \end{bmatrix}$ (b) $\begin{bmatrix} -1 & 1 \\ -1 & -2 \end{bmatrix}$ (c) $\begin{bmatrix} 11 & 7 \\ 5 & -10 \end{bmatrix}$ (d) $\begin{bmatrix} 12 & -7 \\ 5 & -10 \end{bmatrix}$

29. If $3X+2Y=I$ and $2X-Y=O$, where I and O are unit and null matrices of order 3 respectively, then **[MP PET 1995]**

(a) $X=\frac{1}{7}, Y=\frac{2}{7}$ (b) $X=\frac{2}{7}, Y=\frac{1}{7}$ (c) $X=\frac{1}{7}I, Y=\frac{2}{7}I$ (d) $X=\frac{2}{7}I, Y=\frac{1}{7}I$

30. If $A=\begin{bmatrix}4 & 2\\ -1 & 1\end{bmatrix}$ and I is the identity matrix of order 2, then $(A-2I)(A-3I)=$ **[Rajasthan PET 2002]**

(a) I (b) O (c) $\begin{bmatrix}1 & 0\\ 0 & 0\end{bmatrix}$ (d) $\begin{bmatrix}0 & 0\\ 0 & 1\end{bmatrix}$

31. If $A=\begin{bmatrix}0 & 1\\ 1 & 0\end{bmatrix}$, then $A^4=$ **[EAMCET 1994]**

(a) $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ (b) $\begin{bmatrix}1 & 1\\ 0 & 0\end{bmatrix}$ (c) $\begin{bmatrix}0 & 0\\ 1 & 1\end{bmatrix}$ (d) $\begin{bmatrix}0 & 1\\ 1 & 0\end{bmatrix}$

32. If $A=\begin{bmatrix}3 & 1\\ -1 & 2\end{bmatrix}$, then $A^2=$ **[Karnataka CET 1994]**

(a) $\begin{bmatrix}8 & -5\\ -5 & 3\end{bmatrix}$ (b) $\begin{bmatrix}8 & -5\\ 5 & 3\end{bmatrix}$ (c) $\begin{bmatrix}8 & -5\\ -5 & -3\end{bmatrix}$ (d) $\begin{bmatrix}8 & 5\\ -5 & 3\end{bmatrix}$

33. If $X=\begin{bmatrix}3 & -4\\ 1 & -1\end{bmatrix}$, then the value of X^n is **[EAMCET 1991]**

(a) $\begin{bmatrix}3n & -4n\\ n & -n\end{bmatrix}$ (b) $\begin{bmatrix}2+n & 5-n\\ n & -n\end{bmatrix}$ (c) $\begin{bmatrix}3^n & (-4)^n\\ 1^n & (-1)^n\end{bmatrix}$ (d) None of these

34. If $A=\begin{bmatrix}i & 0\\ 0 & i\end{bmatrix}$, then $A^2=$ **[EAMCET 1983]**

(a) $\begin{bmatrix}1 & 0\\ 0 & -1\end{bmatrix}$ (b) $\begin{bmatrix}-1 & 0\\ 0 & -1\end{bmatrix}$ (c) $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ (d) $\begin{bmatrix}-1 & 0\\ 0 & 1\end{bmatrix}$

35. If $A+B=\begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix}$ and $A-2B=\begin{bmatrix}-1 & 1\\ 0 & -1\end{bmatrix}$, then $A=$ **[Karnataka CET 1994]**

(a) $\begin{bmatrix}1 & 1\\ 2 & 1\end{bmatrix}$ (b) $\begin{bmatrix}2/3 & 1/3\\ 1/3 & 2/3\end{bmatrix}$ (c) $\begin{bmatrix}1/3 & 1/3\\ 2/3 & 1/3\end{bmatrix}$ (d) None of these

36. If $A=\begin{bmatrix}1 & 1\\ 0 & 1\end{bmatrix}$, $B=\begin{bmatrix}0 & 1\\ 1 & 0\end{bmatrix}$, then $AB=$ **[EAMCET 1984]**

(a) $\begin{bmatrix}0 & 0\\ 0 & 0\end{bmatrix}$ (b) $\begin{bmatrix}1 & 1\\ 1 & 0\end{bmatrix}$ (c) $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ (d) $\begin{bmatrix}0 & 1\\ 1 & 0\end{bmatrix}$

37. If $A=\begin{bmatrix}1 & 3 & 0\\ -1 & 2 & 1\\ 0 & 0 & 2\end{bmatrix}$, $B=\begin{bmatrix}2 & 3 & 4\\ 1 & 2 & 3\\ -1 & 1 & 2\end{bmatrix}$, then $AB=$ **[EAMCET1987]**

(a) $\begin{bmatrix}5 & 9 & 13\\ -1 & 2 & 4\\ -1 & 2 & 4\end{bmatrix}$ (b) $\begin{bmatrix}5 & 9 & 13\\ -1 & 2 & 4\\ -2 & 2 & 4\end{bmatrix}$ (c) $\begin{bmatrix}1 & 2 & 4\\ -1 & 2 & 4\\ -2 & 2 & 4\end{bmatrix}$ (d) None of these

38. If $\begin{bmatrix}x & 0\\ 1 & y\end{bmatrix}+\begin{bmatrix}-2 & 1\\ 3 & 4\end{bmatrix}=\begin{bmatrix}3 & 5\\ 6 & 3\end{bmatrix}-\begin{bmatrix}2 & 4\\ 2 & 1\end{bmatrix}$, then **[Rajasthan PET 1994]**

(a) $x=-3, y=-2$ (b) $x=3, y=-2$ (c) $x=3, y=2$ (d) $x=-3, y=2$

39. If $A=\begin{bmatrix}1 & -2\\ 3 & 0\end{bmatrix}$, $B=\begin{bmatrix}-1 & 4\\ 2 & 3\end{bmatrix}$, $C=\begin{bmatrix}0 & -1\\ 1 & 0\end{bmatrix}$, then $5A-3B-2C=$

(a) $\begin{bmatrix}8 & 20\\ 7 & 9\end{bmatrix}$ (b) $\begin{bmatrix}8 & -20\\ 7 & -9\end{bmatrix}$ (c) $\begin{bmatrix}-8 & 20\\ -7 & 9\end{bmatrix}$ (d) $\begin{bmatrix}8 & 7\\ -20 & -9\end{bmatrix}$

40. If $A=\begin{bmatrix}0 & 1\\ 0 & 0\end{bmatrix}$, I is the unit matrix of order 2 and *a*, *b* are arbitrary constants, then $(aI+bA)^2$ is equal to

(a) a^2I+abA (b) $a^2I+2abA$ (c) a^2I+b^2A (d) None of these

41. If $U=[2\ \ -3\ \ 4]$, $X=[0\ \ 2\ \ 3]$, $V=\begin{bmatrix}3\\ 2\\ 1\end{bmatrix}$ and $Y=\begin{bmatrix}2\\ 2\\ 4\end{bmatrix}$, then $UV+XY=$ **[MP PET 1997]**

(a) 20 (b) [–20] (c) –20 (d) [20]

42. Which one of the following is not true **[Kurukshetra CEE 1998]**

(a) Matrix addition is commutative (b) Matrix addition is associative

(c) Matrix multiplication is commutative (d) Matrix multiplication is associative

43. If $A=[1\ \ 2\ \ 3]$, $B=\begin{bmatrix}2\\ 3\\ 4\end{bmatrix}$ and $C=\begin{bmatrix}1 & 5\\ 0 & 2\end{bmatrix}$, then which of the following is defined **[Rajasthan PET 1996]**

(a) AB (b) BA (c) $(AB).C$ (d) $(AC).B$

44. If $A=\begin{bmatrix}1 & 2 & 3\\ -2 & 3 & -1\\ 3 & 1 & 2\end{bmatrix}$ and I is a unit matrix of 3rd order, then (A^2+9I) equals **[Rajasthan PET 1999]**

(a) $2A$ (b) $4A$ (c) $6A$ (d) None of these

45. If $A=\begin{pmatrix}i & 1\\ 0 & i\end{pmatrix}$, then A^4 equals **[AMU 1999]**

(a) $\begin{pmatrix}1 & -4i\\ 0 & 1\end{pmatrix}$ (b) $\begin{pmatrix}-1 & 4i\\ 0 & -1\end{pmatrix}$ (c) $\begin{pmatrix}-i & 4\\ 0 & i\end{pmatrix}$ (d) $\begin{pmatrix}1 & 4\\ 0 & 1\end{pmatrix}$

46. $\begin{bmatrix}1\\ -1\\ 2\end{bmatrix}[2\ 1\ -1]=$ **[MP PET 2000]**

(a) [–1] (b) $\begin{bmatrix}2\\ -1\\ -2\end{bmatrix}$ (c) $\begin{bmatrix}2 & 1 & -1\\ -2 & -1 & 1\\ 4 & 2 & -2\end{bmatrix}$ (d) Not defined

47. If $2X-\begin{bmatrix}1 & 2\\ 7 & 4\end{bmatrix}=\begin{bmatrix}3 & 2\\ 0 & -2\end{bmatrix}$, then X is equal to **[Rajasthan PET 2001]**

(a) $\begin{bmatrix}2 & 2\\ 7 & 4\end{bmatrix}$ (b) $\begin{bmatrix}1 & 2\\ 7/2 & 2\end{bmatrix}$ (c) $\begin{bmatrix}2 & 2\\ 7/2 & 1\end{bmatrix}$ (d) None of these

48. 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 **[EAMCET 2001]**

(a) –6, –12, –18 (b) –6, 4, 9 (c) –6, –4, –9 (d) –6, 12, 18

49. If $A=\begin{bmatrix}1 & 2\\ 0 & 1\end{bmatrix}$, then $A^n=$ **[Kerala (Engg.) 2001]**

(a) $\begin{bmatrix} 1 & 2n \\ 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & n \\ 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 2n \\ 0 & -1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & n \\ 0 & 1 \end{bmatrix}$

50. If matrix $A = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$, then $A^{16} =$ **[Karnataka CET 2002]**

(a) $\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} -1 & 0 \\ 0 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

51. If $A = \begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$, then $A^2 - 5A =$ **[Rajasthan PET 2002]**

(a) I (b) $14I$ (c) 0 (d) None of these

52. If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$, then $A^{100} =$ **[UPSEAT 2002]**

(a) $2^{100} A$ (b) $2^{99} A$ (c) $2^{101} A$ (d) None of these

53. Which is true about matrix multiplication **[UPSEAT 2002]**

(a) It is commutative (b) It is associative (c) Both (a) and (b) (d) None of these

54. If $P = \begin{pmatrix} i & 0 & -i \\ 0 & -i & i \\ -i & i & 0 \end{pmatrix}$ and $Q = \begin{pmatrix} -i & i \\ 0 & 0 \\ i & -i \end{pmatrix}$, then PQ is equal to **[Kerala (Engg.) 2002]**

(a) $\begin{pmatrix} -2 & 2 \\ 1 & -1 \\ 1 & -1 \end{pmatrix}$ (b) $\begin{pmatrix} 2 & -2 \\ -1 & 1 \\ -1 & 1 \end{pmatrix}$ (c) $\begin{pmatrix} 2 & -2 \\ -1 & 1 \end{pmatrix}$ (d) $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$

55. $\begin{bmatrix} 7 & 1 & 2 \\ 9 & 2 & 1 \end{bmatrix}\begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix} + 2\begin{bmatrix} 4 \\ 2 \end{bmatrix}$ is equal to

(a) $\begin{bmatrix} 43 \\ 44 \end{bmatrix}$ (b) $\begin{bmatrix} 43 \\ 45 \end{bmatrix}$ (c) $\begin{bmatrix} 45 \\ 44 \end{bmatrix}$ (d) $\begin{bmatrix} 44 \\ 45 \end{bmatrix}$

56. If $A = \begin{bmatrix} 1 & 2 & -1 \\ 3 & 0 & 2 \\ 4 & 5 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$, then AB is **[MP PET 2003]**

(a) $\begin{bmatrix} 5 & 1 & -3 \\ 3 & 2 & 6 \\ 14 & 5 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 11 & 4 & 3 \\ 1 & 2 & 3 \\ 0 & 3 & 3 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 8 & 4 \\ 2 & 9 & 6 \\ 0 & 2 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 1 & 2 \\ 5 & 4 & 3 \\ 1 & 8 & 2 \end{bmatrix}$

57. For 2×2 matrices A, B and I, if $A + B = I$ and $2A - 2B = I$, then A equals

(a) $\begin{bmatrix} \frac{1}{4} & 0 \\ 0 & \frac{1}{4} \end{bmatrix}$ (b) $\begin{bmatrix} \frac{1}{2} & 0 \\ 0 & \frac{1}{2} \end{bmatrix}$ (c) $\begin{bmatrix} \frac{3}{4} & 0 \\ 0 & \frac{3}{4} \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

58. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, then $A^2 + 2A$ equals **[AMU 1988]**

(a) A (b) $2A$ (c) $3A$ (d) $4A$

59. If $A=\begin{bmatrix}1 & -6 & 2\\0 & -1 & 5\end{bmatrix}$ and $B=\begin{bmatrix}2\\2\\1\end{bmatrix}$, then AB equals **[AMU 1987]**

(a) $\begin{bmatrix}-8 & 3\end{bmatrix}$ (b) $\begin{bmatrix}-8\\3\end{bmatrix}$ (c) $\begin{bmatrix}2 & -12 & 2\\0 & -2 & 5\end{bmatrix}$ (d) $\begin{bmatrix}2 & 12 & 4\\0 & -2 & -10\end{bmatrix}$

60. Let $A=\begin{bmatrix}1 & 0\\2 & 0\end{bmatrix}$, $B=\begin{bmatrix}0 & 0\\1 & 12\end{bmatrix}$, then **[DCE 1999]**

(a) $AB=O, BA=O$ (b) $AB=O, BA\neq O$ (c) $AB\neq O, BA=O$ (d) $AB\neq O, BA\neq O$

61. If A, B are square matrices of order $n\times n$, then $(A-B)^2$ is equal to

(a) A^2-B^2 (b) $A^2-2BA+B^2$ (c) $A^2-AB-BA+B^2$ (d) $A^2-2AB+B^2$

62. If $A=\begin{bmatrix}3 & 5\\-2 & 4\end{bmatrix}$ and $B=\begin{bmatrix}1 & -3\\2 & -7\end{bmatrix}$, then $2A-3B$ is equal to **[Rajasthan PET 1989,90]**

(a) $\begin{bmatrix}3 & -19\\10 & 29\end{bmatrix}$ (b) $\begin{bmatrix}3 & 19\\-10 & 29\end{bmatrix}$ (c) $\begin{bmatrix}-3 & 19\\10 & 29\end{bmatrix}$ (d) None of these

63. If $A=\begin{bmatrix}2 & 4\\0 & 3\end{bmatrix}$, $B=\begin{bmatrix}1 & 2\\0 & 5\end{bmatrix}$, then $4A-3B$ is equal to **[Rajasthan PET 1993]**

(a) $\begin{bmatrix}1 & 2\\0 & -2\end{bmatrix}$ (b) $\begin{bmatrix}7 & 14\\0 & 7\end{bmatrix}$ (c) $\begin{bmatrix}5 & 10\\0 & -3\end{bmatrix}$ (d) $\begin{bmatrix}-1 & -2\\0 & -12\end{bmatrix}$

64. If $A=\begin{pmatrix}1 & -2\\3 & 4\end{pmatrix}$, $B=\begin{pmatrix}2 & 1\\-4 & 3\end{pmatrix}$ and $C=\begin{pmatrix}2 & 12\\-17 & 9\end{pmatrix}$, then $5A-3B+C$ equals **[Rajasthan PET 1993]**

(a) $\begin{pmatrix}1 & 10\\-1 & 20\end{pmatrix}$ (b) $\begin{pmatrix}1 & -1\\10 & 20\end{pmatrix}$ (c) $\begin{pmatrix}1 & 1\\-10 & 20\end{pmatrix}$ (d) $\begin{pmatrix}-1 & 1\\1 & 20\end{pmatrix}$

65. If $A=\begin{bmatrix}2 & -1\\4 & 2\end{bmatrix}$, $B=\begin{bmatrix}2 & 3\\1 & 2\end{bmatrix}$ and $C=\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$, then $A+B-C$ equals

(a) $\begin{bmatrix}3 & 2\\5 & 3\end{bmatrix}$ (b) $\begin{bmatrix}5 & 2\\5 & 5\end{bmatrix}$ (c) $\begin{bmatrix}5 & 2\\3 & 5\end{bmatrix}$ (d) $\begin{bmatrix}3 & 2\\5 & 5\end{bmatrix}$

66. If $\begin{bmatrix}x & y\\-2 & 2\end{bmatrix}+\begin{bmatrix}x & 1\\4 & 0\end{bmatrix}=\begin{bmatrix}2 & 3\\y & 2\end{bmatrix}$, then x and y are **[Rajasthan PET 1994]**

(a) 1, 1 (b) 1, 2 (c) 2, 2 (d) 2, 1

67. If $X=\begin{bmatrix}1 & a\\0 & 1\end{bmatrix}$ and $3X-\begin{bmatrix}2 & 3\\0 & 2\end{bmatrix}=\begin{bmatrix}1 & 3\\0 & 1\end{bmatrix}$, then the value of a is

(a) –2 (b) 0 (c) 2 (d) 1

68. If $A=\begin{bmatrix}0 & 1\\1 & 0\end{bmatrix}$ and $B=\begin{bmatrix}0 & -i\\i & 0\end{bmatrix}$, then **[Rajasthan PET 1985]**

(a) $AB=BA$ (b) $AB=B^2$ (c) $AB=-BA$ (d) None of these

69. If $A=\begin{bmatrix}2 & 3\\1 & 2\end{bmatrix}$ and $B=\begin{bmatrix}1 & 3 & 2\\2 & 3 & 4\end{bmatrix}$, then AB is equal to **[Rajasthan PET 1989, 90, 98]**

(a) $\begin{bmatrix} 8 & 15 & 16 \\ 5 & 9 & 10 \end{bmatrix}$ (b) $\begin{bmatrix} 8 & 5 \\ 15 & 9 \\ 16 & 10 \end{bmatrix}$ (c) $\begin{bmatrix} 8 & 5 \\ 15 & 9 \end{bmatrix}$ (d) None of these

70. If $A = \begin{pmatrix} 5 & 2 \\ 2 & 1 \end{pmatrix}$ and $B = \begin{pmatrix} 1 & -2 \\ -2 & 5 \end{pmatrix}$, then AB equals **[Rajasthan PET 1991]**

(a) $\begin{pmatrix} 0 & 0 \\ 1 & 1 \end{pmatrix}$ (b) $\begin{pmatrix} 0 & 1 \\ 1 & 0 \end{pmatrix}$ (c) $\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ (d) $\begin{pmatrix} 1 & 1 \\ 0 & 0 \end{pmatrix}$

71. $A \begin{bmatrix} -1 & 2 \\ 3 & 1 \end{bmatrix} = \begin{bmatrix} -4 & 1 \\ 7 & 7 \end{bmatrix}$, then A equals **[EAMCET 1996]**

(a) $\begin{bmatrix} 1 & 1 \\ 2 & 3 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 1 \\ -2 & 3 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$ (d) $\begin{bmatrix} -1 & 1 \\ 2 & 3 \end{bmatrix}$

72. If $A = \begin{bmatrix} 4 & 6 & -1 \\ 3 & 0 & 2 \\ 1 & -2 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 4 \\ 0 & 1 \\ -1 & 2 \end{bmatrix} \begin{bmatrix} 2 & 4 \\ 0 & 1 \\ -1 & 2 \end{bmatrix}$ and $C = \begin{bmatrix} 3 \\ 1 \\ 2 \end{bmatrix}$, then which of the following is not defined

(a) AB (b) $B'C$ (c) CC' (d) $A^2 + 2B - 2A$

73. If a matrix B is obtained by multiplying each element of a matrix A of order 2×2 by 3, then relation between A and B is

[Rajasthan PET 1986]

(a) $A = 3B$ (b) $3A = B$ (c) $9A = B$ (d) $A = 9B$

Advance Level

74. For each real number x such that $-1 < x < 1$, let $A(x)$ be the matrix $(1-x)^{-1}\begin{bmatrix} 1 & -x \\ -x & 1 \end{bmatrix}$ and $z = \dfrac{x+y}{1+xy}$. Then

(a) $A(z) = A(x) + A(y)$ (b) $A(z) = A(x)[A(y)]^{-1}$ (c) $A(z) = A(x)A(y)$ (d) $A(z) = A(x) - A(y)$

75. If $A = \begin{bmatrix} 0 & i \\ -i & 0 \end{bmatrix}$, then the value of A^{40} is **[Rajasthan PET 1999]**

(a) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} -1 & 1 \\ 0 & -1 \end{bmatrix}$

76. If $A = \begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & -1 \\ 3 & -1 & 1 \end{bmatrix}$, then **[Kurukshetra CEE 2002]**

(a) $A^3 + 3A^2 + A - 9I_3 = 0$ (b) $A^3 - 3A^2 + A + 9I_3 = 0$ (c) $A^3 + 3A^2 - A + 9I_3 = 0$ (d) $A^3 - 3A^2 - A + 9I_3 = 0$

77. If $A = \begin{pmatrix} 2 & -1 \\ -1 & 2 \end{pmatrix}$ and I is the unit matrix of order 2, then A^2 equals

(a) $4A - 3I$ (b) $3A - 4I$ (c) $A - I$ (d) $A + I$

78. If $A = \begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$, then $A^n =$

(a) $\begin{bmatrix} na & 0 & 0 \\ 0 & nb & 0 \\ 0 & 0 & nc \end{bmatrix}$ (b) $\begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$ (c) $\begin{bmatrix} a^n & 0 & 0 \\ 0 & b^n & 0 \\ 0 & 0 & c^n \end{bmatrix}$ (d) None of these

79. If $A_\alpha = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then which of following statement is true

(a) $A_\alpha . A_\beta = A_{\alpha\beta}$ and $(A_\alpha)^n = \begin{bmatrix} \cos^n\alpha & \sin^n\alpha \\ -\sin^n\alpha & \cos^n\alpha \end{bmatrix}$ (b) $A_\alpha . A_\beta = A_{\alpha\beta}$ and $(A_\alpha)^n = \begin{bmatrix} \cos n\alpha & \sin n\alpha \\ -\sin n\alpha & \cos n\alpha \end{bmatrix}$

(c) $A_\alpha . A_\beta = A_{\alpha+\beta}$ and $(A_\alpha)^n = \begin{bmatrix} \cos^n\alpha & \sin^n\alpha \\ -\sin^n\alpha & \cos^n\alpha \end{bmatrix}$ (d) $A_\alpha . A_\beta = A_{\alpha+\beta}$ and $(A_\alpha)^n = \begin{bmatrix} \cos n\alpha & \sin n\alpha \\ -\sin n\alpha & \cos n\alpha \end{bmatrix}$

Properties of Matrices

Basic Level

80. $AB = 0$, if and only if **[MNR 1981; Karnataka CET 1993]**

(a) $A \neq 0, B \neq 0$ (b) $A = 0, B \neq 0$ (c) $A = 0$ or $B = 0$ (d) None of these

81. If $A \times \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 1 & 2 \end{bmatrix}$, then the order of A is

(a) 1×1 (b) 2×1 (c) 1×2 (d) 2×2

82. If $AB = C$, then matrices A, B, C are **[MP PET 1991]**

(a) $A_{2\times3}, B_{3\times2}, C_{2\times3}$ (b) $A_{3\times2}, B_{2\times3}, C_{3\times2}$ (c) $A_{3\times3}, B_{2\times3}, C_{3\times3}$ (d) $A_{3\times2}, B_{2\times3}, C_{3\times3}$

83. $A = [a_{ij}]_{m\times n}$ is a square matrix, if

(a) $m < n$ (b) $m > n$ (c) $m = n$ (d) None of these

84. If $A = \begin{bmatrix} 0 & 2 & 0 \\ 0 & 0 & 3 \\ -2 & 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 3 \\ 3 & 4 & 5 \\ 5 & -4 & 0 \end{bmatrix}$, then the element of 3rd row and third column in AB will be

(a) –18 (b) 4 (c) –12 (d) None of these

85. If A and B be symmetric matrices of the same order, then $AB - BA$ will be a

(a) Symmetric matrix (b) Skew-symmetric matrix (c) Null matrix (d) None of these

86. If A and B are square matrices of order 2, then $(A+B)^2 =$

(a) $A^2 + 2AB + B^2$ (b) $A^2 + AB + BA + B^2$ (c) $A^2 + 2BA + B^2$ (d) None of these

87. If the order of the matrices A and B be 2×3 and 3×2 respectively, then the order of $A+B$ will be

(a) 2×2 (b) 3×3 (c) 2×3 (d) None of these

88. In a lower triangular matrix element $a_{ij} = 0$, if

(a) $i \leq j$ (b) $i \geq j$ (c) $i > j$ (d) $i < j$

89. If A is a square matrix of order n and $A = kB$, where k is a scalar, then $|A| =$ **[Karnataka CET 1992]**

(a) $|B|$ (b) $k|B|$ (c) $k^n|B|$ (d) $n|B|$

90. Let $A = \begin{bmatrix} 4 & 6 & -1 \\ 3 & 0 & 2 \\ 1 & -2 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 2 & 4 \\ 0 & 1 \\ -1 & 2 \end{bmatrix}$ and $C = \begin{bmatrix} 3 & 1 & 2 \end{bmatrix}$. The expression which is not defined is

(a) $B'B$ (b) CAB (c) $A+B'$ (d) A^2+A

91. If $A=[a \ \ b]$, $B=[-b \ \ -a]$ and $C=\begin{bmatrix} a \\ -a \end{bmatrix}$, then the correct statement is **[AMU 1987]**

(a) $A=-B$ (b) $A+B=A-B$ (c) $AC=BC$ (d) $CA=CB$

92. If A and B are two matrices and $(A+B)(A-B)=A^2-B^2$, then

(a) $AB=BA$ (b) $A^2+B^2=A^2-B^2$ (c) $A'B'=AB$ (d) None of these

93. If A and B are square matrices of same order, then **[Roorkee 1995]**

(a) $A+B=B+A$ (b) $A+B=A-B$ (c) $A-B=B-A$ (d) $AB=BA$

94. Which of the following is incorrect

(a) $A^2-B^2=(A+B)(A-B)$ (b) $(A^T)^T=A$

(c) $(AB)^n=A^nB^n$, where A,B commute (d) $(A-I)(I+A)=0 \Leftrightarrow A^2=I$

95. Which of the following is/are incorrect

(i) Adjoint of a symmetric matrix is symmetric,

(ii) Adjoint of unit matrix is a unit matrix,

(iii) $A(adj\,A)=(adj\,A)A=|A|\,I$ and

(iv) Adjoint of a diagonal matrix is a diagonal matrix

(a) (i) (b) (ii) (c) (iii) and (iv) (d) None of these

96. Let $A=[a_{ij}]_{n\times n}$ be a square matrix and let c_{ij} be cofactor of a_{ij} in A. If $C=[c_{ij}]$, then

(a) $|C|=|A|$ (b) $|C|=|A|^{n-1}$ (c) $|C|=|A|^{n-2}$ (d) None of these

97. *A, B* are *n*-rowed square matrices such that $AB=0$ and B is non-singular. Then

(a) $A\neq 0$ (b) $A=0$ (c) $A=I$ (d) None of these

98. If A and B are two matrices such that $AB=B$ and $BA=A$, then $A^2+B^2=$ **[EAMCET 1994]**

(a) 2 AB (b) 2 BA (c) $A+B$ (d) AB

99. If A and B are two matrices such that $A+B$ and AB are both defined, then **[Pb. CET 1990]**

(a) A and B are two matrices not necessarily of same order

(b) A and B are square matrices of same order

(c) Number of columns of A= number of rows of B

(d) None of these

100. If $A=\begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix}$ and A^2 is the identity matrix, then x = **[EAMCET 1993]**

(a) 1 (b) 2 (c) 3 (d) 0

101. If $A=\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, $B=\begin{bmatrix} 0 & -i \\ i & 0 \end{bmatrix}$, then $(A+B)^2$ equals **[Rajasthan PET 1994]**

(a) A^2+B^2 (b) A^2+B^2+2AB (c) $A^2+B^2+AB-BA$ (d) None of these

102. If $A=\begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$ and $B=\begin{bmatrix} 0 & -i \\ -i & 0 \end{bmatrix}$, then $(A+B)(A-B)$ is equal to **[Rajasthan PET 1994]**

(a) A^2-B^2 (b) A^2+B^2 (c) $A^2-B^2+BA+AB$ (d) None of these

103. If A is 3×4 matrix and B is a matrix such that $A'B$ and BA' are both defined. Then B is of the type **[Himachal Pradesh**

(a) 3×4 (b) 3×3 (c) 4×4 (d) 4×3

104. Which of the following is not true

(a) Every skew-symmetric matrix of odd order is non-singular

(b) If determinant of a square matrix is non-zero, then it is non-singular

(c) Adjoint of a symmetric matrix is symmetric

(d) Adjoint of a diagonal matrix is diagonal

105. Which one of the following statements is true **[MP PET 1996]**

(a) Non-singular square matrix does not have a unique inverse (b) Determinant of a non-singular matrix is zero

(c) If $A' = A$, then A is a square matrix (d) If $|A| \neq 0$, then $|A.adj\, A| = |A|^{(n-1)}$, where $A = (a_{ij})_{n \times n}$

106. If matrix $A = \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}$, then

(a) $A' = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix}$ (b) $A^{-1} = \begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}$

(c) $A.\begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix} = 2I$ (d) $\lambda A = \begin{bmatrix} \lambda & -\lambda \\ 1 & 1 \end{bmatrix}$, where λ is a non-zero scalar

107. If $A = \begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 0 \\ 2 & 3 \end{bmatrix}$, then **[MP PET 1996]**

(a) $A^2 = A$ (b) $B^2 = B$ (c) $AB \neq BA$ (d) $AB = BA$

108. Which one of the following is correct **[Kurukshetra CEE 1998]**

(a) Skew-symmetric matrix of odd order is non-singular. (b) Skew-symmetric matrix of odd order is singular

(c) Skew-symmetric matrix of even order is always singular (d) None of these

109. Choose the correct answer

(a) Every identity matrix is a scalar matrix

(b) Every scalar matrix is an identity matrix

(c) Every diagonal matrix is an identity matrix

(d) A square matrix whose each element is 1 is an identity matrix.

110. If A and B are two square matrices such that $B = -A^{-1}BA$, then $(A+B)^2 =$ **[EAMCET 2000]**

(a) 0 (b) $A^2 + B^2$ (c) $A^2 + 2AB + B^2$ (d) $A + B$

111. For a matrix A, $AI = A$ and $AA^T = I$ is true for **[Rajasthan PET 2000]**

(a) If A is a square matrix (b) If A is a non singular matrix (c)If A is a symmetric matrix

112. If two matrices A and B are of order $p \times q$ and $r \times s$ respectively, can be subtracted only, if

(a) $p = q$ (b) $p = q, r = s$ (c) $p = r, q = s$ (d) None of these

113. The set of all 2×2 matrices over the real numbers is not a group under matrix multiplication because

(a) Identity element does not exist (b) Closure property is not satisfied

(c) Association property is not satisfied (d) Inverse axiom may not be satisfied

114. If the matrix $AB = O$, then **[Pb. CET 2000; Kurukshetra CEE 1998; Rajasthan PET 2001]**

(a) $A = O$ or $B = O$ (b) $A = O$ and $B = O$

(c) It is not necessary that either $A = O$ or $B = O$ (d) $A \neq O$, $B \neq O$

115. If $a_{ij} = \frac{1}{2}(3i - 2j)$ and $A = [a_{ij}]_{2 \times 2}$, then A is equal to **[Rajasthan PET 2001]**

(a) $\begin{bmatrix} 1/2 & 2 \\ -1/2 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1/2 & -1/2 \\ 2 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 2 & 1 \\ 1/2 & -1/2 \end{bmatrix}$ (d) None of these

116. Assuming that the sums and products given below are defined, which of the following is not true for matrices [Karnat

(a) $A+B=B+A$ (b) $AB=AC$ does not imply $B=C$

(c) $AB=O$ implies $A=O$ or $B=O$ (d) $(AB)'=B'A'$

117. Which of the following is true for matrix AB **[Rajasthan PET 2003]**

(a) $(AB)^{-1}=A^{-1}B^{-1}$ (b) $(AB)^{-1}=B^{-1}A^{-1}$ (c) $AB=BA$ (d) All of these

118. If A and B are 3×3 matrices such that $AB=A$ and $BA=B$, then

(a) $A^2=A$ and $B^2\ne B$ (b) $A^2\ne A$ and $B^2=B$ (c) $A^2=A$ and $B^2=B$ (d) $A^2\ne A$ and $B^2\ne B$

119. If A and B are symmetric matrices of order $n(A\ne B)$, then

(a) $A+B$ is skew symmetric (b) $A+B$ is symmetric

(c) $A+B$ is a diagonal matrix (d) $A-B$ is a zero matrix

120. The possible number of different order which a matrix can have when it has 24 elements is

(a) 6 (b) 8 (c) 4 (d) 10

121. If $A=\begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix}$ and $A^n=0$, then minimum value of n is

(a) 2 (b) 4 (c) 5 (d) 3

122. If A, B, C are square matrices of the same order, then which of the following is true **[JMIEE 1997]**

(a) $AB=AC$ (b) $(AB)^2=A^2B^2$ (c) $AB=0\Rightarrow A=0$ or $B=0$ (d) $AB=I\Rightarrow AB=BA$

123. If a matrix has 13 elements, then the possible dimensions (order) it can have are **[MNR 1985]**

(a) $1\times 13,\ 13\times 1$ (b) $1\times 26,\ 26\times 1$ (c) $2\times 13,\ 13\times 2$ (d) None of these

Transpose of Matrices

Basic Level

124. If A, B, C are three $n\times n$ matrices, then $(ABC)'=$ **[MP PET 1988]**

(a) $A'B'C'$ (b) $C'B'A'$ (c) $B'C'A'$ (d) $B'A'C'$

125. If $A=\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$, then $AA'=$ **[MP PET 1992]**

(a) 14 (b) $\begin{bmatrix} 1 \\ 4 \\ 3 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 3 & 6 & 9 \end{bmatrix}$ (d) None of these

126. If $A=\begin{bmatrix} 1 & -2 \\ 5 & 3 \end{bmatrix}$, then $A+A^T$ equals **[Rajasthan PET 1994]**

(a) $\begin{bmatrix} 2 & 3 \\ 3 & 6 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & -4 \\ 10 & 6 \end{bmatrix}$ (c) $\begin{bmatrix} 2 & 4 \\ -10 & 6 \end{bmatrix}$ (d) None of these

127. If $A=\begin{bmatrix} 1 & -2 & 1 \\ 2 & 1 & 3 \end{bmatrix}$ and $B=\begin{bmatrix} 2 & 1 \\ 3 & 2 \\ 1 & 1 \end{bmatrix}$, then $(AB)^T=$ **[Rajasthan PET 1996, 2001]**

(a) $\begin{bmatrix} -3 & -2 \\ 10 & 7 \end{bmatrix}$ (b) $\begin{bmatrix} -3 & 10 \\ -2 & 7 \end{bmatrix}$ (c) $\begin{bmatrix} -3 & 10 \\ 7 & -2 \end{bmatrix}$ (d) $\begin{bmatrix} 3 & 10 \\ 2 & 7 \end{bmatrix}$

128. If $A = \begin{pmatrix} 1 & -2 & 1 \\ 2 & 1 & 3 \end{pmatrix}$ and $B = \begin{pmatrix} 2 & 1 \\ 3 & 2 \\ 1 & 1 \end{pmatrix}$, then $(AB)^T$ is equal to **[Rajasthan PET 2001]**

(a) $\begin{pmatrix} -3 & -2 \\ 10 & 7 \end{pmatrix}$ (b) $\begin{pmatrix} -3 & 10 \\ -2 & 7 \end{pmatrix}$ (c) $\begin{pmatrix} -3 & 7 \\ 10 & 2 \end{pmatrix}$ (d) None of these

129. If $A = \begin{bmatrix} 0 & 1 & -2 \\ -1 & 0 & 5 \\ 2 & 5 & 0 \end{bmatrix}$, then **[MNR 1982]**

(a) $A' = A$ (b) $A' = -A$ (c) $A' = 2A$ (d) None of these

130. Transpose of a row matrix is a

(a) Row matrix (b) Column matrix (c) A square matrix (d) A scalar matrix

131. If $A = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 \\ -1 & 1 \end{bmatrix}$, then correct statement is **[Rajasthan PET 1987]**

(a) $AB = BA$ (b) $AA^T = A^2$ (c) $AB = B^2$ (d) None of these

132. If matrix A is of order $m \times n$ and B is of order $n \times p$, then order of $(AB)^T$ is equal to

(a) Order of AB (b) Order of BA (c) Order of $A^T B^T$ (d) Order of $B^T A^T$

133. If $A = \begin{pmatrix} 4 & 2 & 7 \\ 6 & 0 & 8 \end{pmatrix}$, then AA^T is **[Rajasthan PET 1991]**

(a) $\begin{pmatrix} 69 & 80 \\ 80 & 100 \end{pmatrix}$ (b) $\begin{pmatrix} 69 & 80 \\ 100 & 69 \end{pmatrix}$ (c) $\begin{pmatrix} 69 & 80 \\ 80 & 69 \end{pmatrix}$ (d) $\begin{pmatrix} 69 & 100 \\ 100 & 69 \end{pmatrix}$

134. Let A is a skew-symmetric matrix and C is a column matrix, then $C^T AC$ is **[Rajasthan PET 1995]**

(a) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (b) $[0]$ (c) $[1]$ (d) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

135. If A and B are matrices of suitable order and k is any number, then correct statement is

(a) $(AB)^T = A^T B^T$ (b) $(A+B)^T = A^T + B^T$ (c) $(AB)^{-1} = A^{-1}B^{-1}$ (d) $(kA)^T \neq kA^T$

136. If A and B are matrices of suitable order, then wrong statement is

(a) $(AB)^T = A^T B$ (b) $(A^T)^T = A$ (c) $(A-B)^T = A^T - B^T$ (d) $(A^T)^{-1} = (A^{-1})^T$

137. If A is a square matrix such that $|A| = 2$, then $|A'|$, where A' is transpose of A, is equal to

(a) 0 (b) –2 (c) 1/2 (d) 2

Special types of Matrices

Basic Level

138. An orthogonal matrix is

(a) $\begin{bmatrix} \cos\alpha & 2\sin\alpha \\ -2\sin\alpha & \cos\alpha \end{bmatrix}$ (b) $\begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ (c) $\begin{bmatrix} \cos\alpha & \sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$

139. Matrix $\begin{bmatrix} 0 & -4 & 1 \\ 4 & 0 & -5 \\ -1 & 5 & 0 \end{bmatrix}$ is

(a) Orthogonal (b) Idempotent (c) Skew-symmetric (d) Symmetric

140. The inverse of a symmetric matrix is

(a) Symmetric (b) Skew-symmetric (c) Diagonal matrix (d) None of these

141. If A is a symmetric matrix and $n \in N$, then A^n is

(a) Symmetric (b) Skew-symmetric (c) A diagonal matrix (d) None of these

142. If A is a skew-symmetric matrix and n is a positive integer, then A^n is

(a) A symmetric matrix (b) Skew-symmetric matrix (c) Diagonal matrix (d) None of these

143. If $A = \begin{bmatrix} 4 & x+2 \\ 2x-3 & x+1 \end{bmatrix}$ is symmetric, then $x =$ **[Karnataka CET 1994]**

(a) 3 (b) 5 (c) 2 (d) 4

144. If A is a square matrix, then $A + A^T$ is **[Rajasthan PET 2001]**

(a) Non-singular matrix (b) Symmetric matrix (c) Skew-symmetric matrix (d) Unit matrix

145. For any square matrix A, AA^T is a **[Rajasthan PET 2000]**

(a) Unit matrix (b) Symmetric matrix (c) Skew-symmetric matrix (d) Diagonal matrix

146. If A is a square matrix for which $a_{ij} = i^2 - j^2$, then A is **[Rajasthan PET 1999]**

(a) Zero matrix (b) Unit matrix (c) Symmetric matrix (d) Skew-symmetric matrix

147. If A is a square matrix and $A + A^T$ is symmetric matrix, then $A - A^T =$

(a) Unit matrix (b) Symmetric matrix (c) Skew-symmetric matrix (d) Zero matrix

148. The value of a for which the matrix $A = \begin{pmatrix} a & 2 \\ 2 & 4 \end{pmatrix}$ is singular if

(a) $a \neq 1$ (b) $a = 1$ (c) $a = 0$ (d) $a = -1$

149. The matrix $A = \begin{bmatrix} i & 1-2i \\ -1-2i & 0 \end{bmatrix}$ is which of the following **[Kurukshetra CEE 2002]**

(a) Symmetric (b) Skew-symmetric (c) Hermitian (d) Skew-hermitian

150. The matrix, $A = \begin{bmatrix} 1 & -3 & -4 \\ -1 & 3 & 4 \\ 1 & -3 & -4 \end{bmatrix}$ is nilpotent of index **[Kurukshetra CEE 2002]**

(a) 2 (b) 3 (c) 4 (d) 6

151. If $\begin{bmatrix} x & y \\ u & v \end{bmatrix}$ is symmetric matrix, then

(a) $x + v = 0$ (b) $x - v = 0$ (c) $y + u = 0$ (d) $y - u = 0$

152. The matrix $\begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ is a

(a) Non-singular (b) Idempotent (c) Nilpotent (d) Orthogonal

153. For any square matrix A, which statement is wrong

(a) $(adj\, A)^{-1} = adj(A^{-1})$ (b) $(A^T)^{-1} = (A^{-1})^T$ (c) $(A^3)^{-1} = (A^{-1})^3$ (d) None of these

154. If $A=\begin{bmatrix}1&0&0&0\\2&3&0&0\\4&5&6&0\\7&8&9&10\end{bmatrix}$, then A is

(a) An upper triangular matrix (b) A null matrix
(c) A lower triangular matrix (d) None of these

155. If A is a square matrix, then A will be non-singular if

(a) $|A|=0$ (b) $|A|>0$ (c) $|A|<0$ (d) $|A|\neq 0$

156. The matrix $\begin{bmatrix}a&h&g\\h&b&f\\g&f&c\end{bmatrix}$ is

(a) Symmetric (b) Skew-symmetric (c) Scalar (d) None of these

157. If $A=\begin{bmatrix}-1&0&0\\0&-1&0\\0&0&-1\end{bmatrix}$, then A^2 is [**MNR 1980**]

(a) Null matrix (b) Unit matrix (c) A (d) $2A$

158. If A is a symmetric matrix, then matrix $M'AM$ is [**MP PET 1990**]

(a) Symmetric (b) Skew-symmetric (c) Hermitian (d) Skew-Hermitian

159. If A is a square matrix, then which of the following matrices is not symmetric

(a) $A+A'$ (b) AA' (c) $A'A$ (d) $A-A'$

160. Square matrix $[a_{ij}]_{n\times n}$ will be an upper triangular matrix, if

(a) $a_{ij}\neq 0$ for $i>j$ (b) $a_{ij}=0$ for $i>j$ (c) $a_{ij}=0$ for $i<j$ (d) None of these

161. If the matrix $\begin{bmatrix}0&1&-2\\-1&0&3\\\lambda&-3&0\end{bmatrix}$ is singular, then $\lambda=$ [**MP PET 1989**]

(a) –2 (b) –1 (c) 1 (d) 2

162. In order that the matrix $\begin{bmatrix}1&2&3\\4&5&6\\3&\lambda&5\end{bmatrix}$ be non-singular, λ should not be equal to [**Kurukshetra CEE 1998**]

(a) 1 (b) 2 (c) 3 (d) 4

163. If A is involutory matrix and and I is unit matrix of same order, then $(I-A)(I+A)$ is

(a) Zero matrix (b) A (c) I (d) $2A$

164. If $A=\begin{bmatrix}1&0&1\\0&1&1\\1&0&0\end{bmatrix}$, then A is

(a) Symmetric (b) Skew-symmetric (c) Non-singular (d) Singular

165. If $A=\begin{bmatrix}1&0&0\\0&1&0\\a&b&-1\end{bmatrix}$, then $A^2=$ [**MNR 1980; Pb. CET 1990**]

(a) Unit matrix (b) Null matrix (c) A (d) – A

166. If the matrix $\begin{bmatrix} 1 & 3 & \lambda+2 \\ 2 & 4 & 8 \\ 3 & 5 & 10 \end{bmatrix}$ is singular, then $\lambda =$ **[MP PET 1990; Pb. CET 2000]**

(a) –2 (b) 4 (c) 2 (d) –4

167. Out of the following a skew-symmetric matrix is **[MP PET 1992]**

(a) $\begin{bmatrix} 0 & 4 & 5 \\ -4 & 0 & -6 \\ -5 & 6 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 4 & 5 \\ -4 & 1 & -6 \\ -5 & 6 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 4 & 5 \\ -4 & 2 & -6 \\ -5 & 6 & 3 \end{bmatrix}$ (d) $\begin{bmatrix} i+1 & 4 & 5 \\ -4 & i & -6 \\ -5 & 6 & i \end{bmatrix}$

168. If $A = \begin{bmatrix} 1 & 3 & 2 \\ 2 & 4 & 4 \\ 3 & 5 & 6 \end{bmatrix}$, then A is

(a) Singular (b) Non-singular (c) Unitary (d) Symmetric

169. If *A, B, C* are three square matrices such that $AB = AC$ implies $B = C$, then the matrix A is always **[MP PET 1989; Karnataka CET 1992]**

(a) A singular matrix (b) A Non-singular matrix (c) An orthogonal matrix (d) A diagonal matrix

170. The matrix $A = \begin{bmatrix} 1/\sqrt{2} & 1/\sqrt{2} \\ -1/\sqrt{2} & -1/\sqrt{2} \end{bmatrix}$ is **[MP PET 1988]**

(a) Unitary (b) Orthogonal (c) Nilpotent (d) Involutary

171. If a matrix A is symmetric as well as skew symmetric, then

(a) A is a diagonal matrix (b) A is a null matrix (c) A is a unit matrix (d)

172. A and B are any two square matrices. Which one of the following is a skew symmetric matrix

(a) $\frac{A+A'}{2}$ (b) $\frac{A+B}{2}$ (c) $\frac{A'-A}{2}$ (d) None of the above.

173. Choose the correct answer

(a) Every scalar matrix is an identity matrix

(b) Every identity matrix is a scalar matrix

(c) Every diagonal matrix is an identity matrix

(d) A Square matrix whose each element is 1 is an identity matrix

174. For a square matrix *A,* it is given that $AA' = I$, then A is a **[DCE 1998]**

(a) Orthogonal matrix (b) Diagonal matrix (c) Symmetric matrix (d) None of these

175. A square matrix can always be expressed as a **[DCE1998]**

(a) Sum of a symmetric matrix and a skew-symmetric matrix (b) Sum of a diagonal matrix and a symmetric matrix

(c) Skew matrix (d) Skew- symmetric matrix

176. If A is a skew-symmetric matrix and n is odd positive integer, then A^n is

(a) A symmetric matrix (b) A skew-symmetric matrix (c) A diagonal matrix (d) None of these

177. If *A*, B symmetric matrices of the same order then *AB* – *BA* is

(a) Symmetric matrix (b) Skew-symmetric matrix (c) Null matrix (d) Unit matrix

Adjoint of Matrix

Basic Level

178. If k is a scalar and I is a unit matrix of order 3, then $adj(kI) =$

(a) $k^3 I$ (b) $k^2 I$ (c) $-k^3 I$ (d) $-k^2 I$

179. If $A = \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$, then $adj\, A =$

(a) A (b) I (c) O (d) A^2

180. If A is a $n \times n$ matrix, then $adj(adj\, A) =$

(a) $|A|^{n-1} A$ (b) $|A|^{n-2} A$ (c) $|A|^n n$ (d) None of these

181. Adjoint of the matrix $N = \begin{bmatrix} -4 & -3 & -3 \\ 1 & 0 & 1 \\ 4 & 4 & 3 \end{bmatrix}$ is **[MP PET 1989]**

(a) N (b) $2N$ (c) $-N$ (d) None of these

182. If A is a non-singular matrix, then $A(adj\, A) =$

(a) A (b) I (c) $|A|\, I$ (d) $|A|^2\, I$

183. If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ and $A\, adj\, A = \begin{bmatrix} k & 0 \\ 0 & k \end{bmatrix}$, then k is equal to

(a) 0 (b) 1 (c) $\sin\alpha \cos\alpha$ (d) $\cos 2\alpha$

184. Let $A = \begin{bmatrix} 1 & 0 & 0 \\ 5 & 2 & 0 \\ -1 & 6 & 1 \end{bmatrix}$, then the adjoint of A is **[MNR 1982]**

(a) $\begin{bmatrix} 2 & -5 & 32 \\ 0 & 1 & -6 \\ 0 & 0 & 2 \end{bmatrix}$ (b) $\begin{bmatrix} -1 & 0 & 0 \\ -5 & -2 & 0 \\ 1 & -6 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} -1 & 0 & 0 \\ -5 & -2 & 0 \\ 1 & -6 & -1 \end{bmatrix}$ (d) None of these

185. If $A = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$, then $A(adj\, A) =$ **[MP PET 1995; Rajasthan PET 1997]**

(a) $\begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & 10 \\ 10 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} 10 & 1 \\ 1 & 10 \end{bmatrix}$ (d) None of these

186. If A is a singular matrix, then $adj\, A$ is **[Karnataka CET 1993]**

(a) Singular (b) Non-singular (c) Symmetric (d) Not defined

187. The adjoint of $\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$ is

(a) $\begin{bmatrix} 3 & -9 & -5 \\ -4 & 1 & 3 \\ -5 & 4 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 3 & -4 & -5 \\ -9 & 1 & 4 \\ -5 & 3 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} -3 & 4 & 5 \\ 9 & -1 & -4 \\ 5 & -3 & -1 \end{bmatrix}$ (d) None of these

188. $Adj.(AB) - (Adj.B)(Adj.A) =$ **[MP PET 1997]**

(a) $Adj.A - Adj.B$ (b) I (c) O (d) None of these

189. If $A=\begin{pmatrix}1 & 2 & 0\\ 0 & 1 & 2\\ 2 & 0 & 1\end{pmatrix}$, then $adj\,A=$ **[Rajasthan PET 1996]**

(a) $\begin{pmatrix}1 & 4 & -2\\ -2 & 1 & 4\\ 4 & -2 & 1\end{pmatrix}$ (b) $\begin{pmatrix}1 & -2 & 4\\ 4 & 1 & -2\\ -2 & 4 & 1\end{pmatrix}$ (c) $\begin{pmatrix}1 & 2 & 4\\ -4 & 1 & 2\\ -4 & -2 & 1\end{pmatrix}$ (d) None of these

190. If $A=\begin{bmatrix}1 & 2 & 3\\ 1 & 4 & 9\\ 1 & 8 & 27\end{bmatrix}$, then the value of $|adj\,A|$ is **[Rajasthan PET 1999]**

(a) 36 (b) 72 (c) 144 (d) None of these

191. If A is a matrix of order 3 and $|A|=8$, then $|adj\,A|=$ **[DCE 1999; Karnataka CET 2002]**

(a) 1 (b) 2 (c) 2^3 (d) 2^6

192. If A and B are non-singular square matrices of same order, then $adj(AB)$ is equal to **[AMU 1999]**

(a) $(adj\,A)(adj\,B)$ (b) $(adj\,B)(adj\,A)$ (c) $(adj\,B^{-1})(adj\,A^{-1})$ (d) $(adj\,A^{-1})(adj\,B^{-1})$

193. If d is the determinant of a square matrix A of order n, then the determinant of its adjoint is

(a) d^n (b) d^{n-1} (c) d^{n+1} (d) d

194. If $A=\begin{bmatrix}1 & -1\\ 2 & 3\end{bmatrix}$, then $adj\,A$ is equal to **[Rajasthan PET 2001]**

(a) $\begin{bmatrix}-3 & -1\\ 2 & -1\end{bmatrix}$ (b) $\begin{bmatrix}3 & 1\\ -2 & 1\end{bmatrix}$ (c) $\begin{bmatrix}3 & -2\\ 1 & 1\end{bmatrix}$ (d) $\begin{bmatrix}3 & -1\\ -2 & 1\end{bmatrix}$

195. If $A=\begin{bmatrix}3 & 4\\ 5 & 7\end{bmatrix}$, then $A.(adj\,A)=$ **[Rajasthan PET 2002]**

(a) I (b) $|A|$ (c) $|A|I$ (d) None of these

196. If $A=\begin{bmatrix}-2 & 6\\ -5 & 7\end{bmatrix}$, then $adj(A)$ is

(a) $\begin{bmatrix}7 & -6\\ 5 & -2\end{bmatrix}$ (b) $\begin{bmatrix}2 & -6\\ 5 & -7\end{bmatrix}$ (c) $\begin{bmatrix}7 & -5\\ 6 & -2\end{bmatrix}$ (d) None of these

197. The adjoint matrix of $\begin{bmatrix}3 & -3 & 4\\ 2 & -3 & 4\\ 0 & -1 & 1\end{bmatrix}$ is **[MP PET 2003]**

(a) $\begin{bmatrix}4 & 8 & 3\\ 2 & 1 & 6\\ 0 & 2 & 1\end{bmatrix}$ (b) $\begin{bmatrix}1 & -1 & 0\\ -2 & 3 & -4\\ -2 & 3 & -3\end{bmatrix}$ (c) $\begin{bmatrix}11 & 9 & 3\\ 1 & 2 & 8\\ 6 & 9 & 1\end{bmatrix}$ (d) $\begin{bmatrix}1 & -2 & 1\\ -1 & 3 & 3\\ -2 & 3 & -3\end{bmatrix}$

198. If $A=\begin{bmatrix}\cos x & \sin x\\ -\sin x & \cos x\end{bmatrix}$, then $A.(adj(A))=$ **[Rajasthan PET 2003]**

(a) $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ (b) $\begin{bmatrix}0 & 1\\ 1 & 0\end{bmatrix}$ (c) $\begin{bmatrix}1 & 1\\ 0 & 0\end{bmatrix}$ (d) $\begin{bmatrix}-2 & 0\\ 0 & -2\end{bmatrix}$

199. If $A=\begin{bmatrix}a & 0 & 0\\ 0 & a & 0\\ 0 & 0 & a\end{bmatrix}$, then the value of $|A||Adj\,A|$ is **[AMU 1987]**

(a) a^3 (b) a^6 (c) a^9 (d) a^{27}

200. If $A = \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$, then the value of $|adj\ A|$ is **[AMU 1989]**

(a) a^3 (b) a^6 (c) a^9 (d) a^{27}

201. If $A = \begin{bmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$, then determinant $(adj(adj\ A))$ is

(a) $(14)^1$ (b) $(14)^2$ (c) $(14)^3$ (d) $(14)^4$

202. If A is a square matrix, then $adj(A') - (adj\ A)'$ is equal to

(a) $2|A|$ (b) $2|A|\ I$ (c) Null matrix (d) Unit matrix

203. If $A = \begin{bmatrix} 1 & -2 & 3 \\ 4 & 0 & -1 \\ -3 & 1 & 5 \end{bmatrix}$, then $(adj\ A)_{23}$ is equal to **[Rajasthan PET 1984]**

(a) 13 (b) – 13 (c) 5 (d) – 5

204. For a third order non-singular matrix A, $|A(adj\ A)|$ equals

(a) $|A|$ (b) $|A|^2$ (c) $|A|^3$ (d) None of these

Advance Level

205. If A be a square matrix of order n and if $|A| = D$ and $|adj\ A| = D'$, then **[Rajasthan PET 2000]**

(a) $DD' = D^2$ (b) $DD' = D^{n-1}$ (c) $DD' = D^n$ (d) None of these

Inverse of a Matrix

Basic Level

206. Inverse of the matrix $\begin{bmatrix} 3 & -2 & -1 \\ -4 & 1 & -1 \\ 2 & 0 & 1 \end{bmatrix}$ is **[MP PET 1990]**

(a) $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 3 & 7 \\ -2 & -4 & -5 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & -3 & 5 \\ 7 & 4 & 6 \\ 4 & 2 & 7 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 7 \\ -2 & -4 & -5 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 2 & -4 \\ 8 & -4 & -5 \\ 3 & 5 & 2 \end{bmatrix}$

207. If A and B are non-singular matrices, then **[MP PET 1991; Kurukshetra CEE 1998]**

(a) $(AB)^{-1} = A^{-1}B^{-1}$ (b) $AB = BA$ (c) $(AB)' = A'B'$ (d) $(AB)^{-1} = B^{-1}A^{-1}$

208. If $A = \begin{bmatrix} i & 0 \\ 0 & i/2 \end{bmatrix}, (i = \sqrt{-1})$, then $A^{-1} =$ **[MP PET 1992]**

(a) $\begin{bmatrix} i & 0 \\ 0 & i/2 \end{bmatrix}$ (b) $\begin{bmatrix} -i & 0 \\ 0 & -2i \end{bmatrix}$ (c) $\begin{bmatrix} i & 0 \\ 0 & 2i \end{bmatrix}$ (d) $\begin{bmatrix} 0 & i \\ 2i & 0 \end{bmatrix}$

209. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$, then $A^{-1} =$

(a) $\begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ (b) $\begin{bmatrix} \cos\alpha & \sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ (c) $\begin{bmatrix} -\cos\alpha & \sin\alpha \\ \sin\alpha & -\cos\alpha \end{bmatrix}$ (d) None of these

210. If $A = \begin{bmatrix} a & c \\ d & b \end{bmatrix}$, then $A^{-1} =$ **[MP PET 1988]**

(a) $\frac{1}{ab-cd}\begin{bmatrix} b & -c \\ -d & a \end{bmatrix}$ (b) $\frac{1}{ad-bc}\begin{bmatrix} b & -c \\ -d & a \end{bmatrix}$ (c) $\frac{1}{ab-cd}\begin{bmatrix} b & d \\ c & a \end{bmatrix}$ (d) None of these

211. The element of second row and third column in the inverse of $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix}$ is **[MP PET 1992]**

(a) – 2 (b) – 1 (c) 1 (d) 2

212. The inverse of the matrix $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is **[MP PET 1989; Pb. CET 1989, 93]**

(a) $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix}$

213. The inverse of $\begin{bmatrix} 2 & -3 \\ -4 & 2 \end{bmatrix}$ is

(a) $\frac{-1}{8}\begin{bmatrix} 2 & 3 \\ 4 & 2 \end{bmatrix}$ (b) $\frac{-1}{8}\begin{bmatrix} 3 & 2 \\ 2 & 4 \end{bmatrix}$ (c) $\frac{1}{8}\begin{bmatrix} 2 & 3 \\ 4 & 2 \end{bmatrix}$ (d) $\frac{1}{8}\begin{bmatrix} 3 & 2 \\ 2 & 4 \end{bmatrix}$

214. The inverse of the matrix $\begin{bmatrix} 3 & -2 \\ 1 & 4 \end{bmatrix}$ is **[MP PET 1994]**

(a) $\begin{bmatrix} \frac{4}{14} & \frac{2}{14} \\ \frac{-1}{14} & \frac{3}{14} \end{bmatrix}$ (b) $\begin{bmatrix} \frac{3}{14} & \frac{-2}{14} \\ \frac{1}{14} & \frac{4}{14} \end{bmatrix}$ (c) $\begin{bmatrix} \frac{4}{14} & \frac{-2}{14} \\ \frac{1}{14} & \frac{3}{14} \end{bmatrix}$ (d) $\begin{bmatrix} \frac{3}{14} & \frac{2}{14} \\ \frac{1}{14} & \frac{4}{14} \end{bmatrix}$

215. If a matrix A is such that $3A^3 + 2A^2 + 5A + I = 0$, then its inverse is

(a) $-(3A^2 + 2A + 5I)$ (b) $3A^2 + 2A + 5I$ (c) $3A^2 - 2A - 5I$ (d) None of these

216. If $F(\alpha) = \begin{bmatrix} \cos\alpha & -\sin\alpha & 0 \\ \sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $G(\beta) = \begin{bmatrix} \cos\beta & 0 & \sin\beta \\ 0 & 1 & 0 \\ -\sin\beta & 0 & \cos\beta \end{bmatrix}$, then $[F(\alpha)\,G(\beta)]^{-1} =$

(a) $F(\alpha) - G(\beta)$ (b) $-F(\alpha) - G(\beta)$ (c) $[F(\alpha)]^{-1}[G(\beta)]^{-1}$ (d) $[G(\beta)]^{-1}[F(\alpha)]^{-1}$

217. If $A = \begin{bmatrix} 1 & \tan\theta/2 \\ -\tan\theta/2 & 1 \end{bmatrix}$ and $AB = I$, then $B =$ **[MP PET 1995, 98]**

(a) $\cos^2\frac{\theta}{2}.A$ (b) $\cos^2\frac{\theta}{2}.A^T$ (c) $\cos^2\frac{\theta}{2}.\,I$ (d) None of these

218. If $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$, then the matrix $A =$

(a) $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix}$

219. If A is an invertible matrix, then which of the following is correct

(a) A^{-1} is multivalued (b) A^{-1} is singular (c) $(A^{-1})^T \neq (A^T)^{-1}$ (d) $|A| \neq 0$

220. If $A = \begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$, then $A^{-1} =$ **[AMU 1988]**

(a) $\begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$ (b) $\begin{bmatrix} -a & 0 & 0 \\ 0 & -b & 0 \\ 0 & 0 & -c \end{bmatrix}$ (c) $\begin{bmatrix} 1/a & 0 & 0 \\ 0 & 1/b & 0 \\ 0 & 0 & 1/c \end{bmatrix}$ (d) None of these

221. $\begin{bmatrix} 1 & 3 \\ 3 & 10 \end{bmatrix}^{-1} =$ **[EAMCET 1994; DCE 1999]**

(a) $\begin{bmatrix} 10 & 3 \\ 3 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 10 & -3 \\ -3 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 3 \\ 3 & 10 \end{bmatrix}$ (d) $\begin{bmatrix} -1 & -3 \\ -3 & -10 \end{bmatrix}$

222. If $A = \begin{bmatrix} 5 & 2 \\ 3 & 1 \end{bmatrix}$, then $A^{-1} =$ **[EAMCET 1988]**

(a) $\begin{bmatrix} 1 & -2 \\ -3 & 5 \end{bmatrix}$ (b) $\begin{bmatrix} -1 & 2 \\ 3 & -5 \end{bmatrix}$ (c) $\begin{bmatrix} -1 & -2 \\ -3 & -5 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix}$

223. $\begin{bmatrix} -6 & 5 \\ -7 & 6 \end{bmatrix}^{-1} =$ **[Karnataka CET 1994]**

(a) $\begin{bmatrix} -6 & 5 \\ -7 & 6 \end{bmatrix}$ (b) $\begin{bmatrix} 6 & -5 \\ -7 & 6 \end{bmatrix}$ (c) $\begin{bmatrix} 6 & 5 \\ 7 & 6 \end{bmatrix}$ (d) $\begin{bmatrix} 6 & -5 \\ 7 & -6 \end{bmatrix}$

224. The inverse of matrix $A = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ is **[Karnataka CET 1993]**

(a) A (b) A^T (c) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$

225. The inverse of $\begin{bmatrix} 3 & 5 & 7 \\ 2 & -3 & 1 \\ 1 & 1 & 2 \end{bmatrix}$ is **[EAMCET 1989]**

(a) $\begin{bmatrix} 7 & 3 & -26 \\ 3 & 1 & -11 \\ -5 & -2 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 7 & 3 & -26 \\ 3 & 1 & 11 \\ -5 & -2 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 3 & 1 & 11 \\ 7 & 3 & -26 \\ -5 & 2 & 1 \end{bmatrix}$ (d) None of these

226. The inverse of $\begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$ is

(a) $\begin{bmatrix} 1 & -2 & 1 \\ 0 & 1 & -2 \\ 0 & 0 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & -2 & 1 \\ 0 & 1 & -2 \\ 0 & 0 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & 2 & 1 \\ 0 & 1 & 2 \\ 0 & 0 & 1 \end{bmatrix}$ (d) None of these

227. The matrix $\begin{bmatrix} \lambda & -1 & 4 \\ -3 & 0 & 1 \\ -1 & 1 & 2 \end{bmatrix}$ is invertible, if **[Kurukshetra CEE 1996]**

(a) $\lambda \neq -15$ (b) $\lambda \neq -17$ (c) $\lambda \neq -16$ (d) $\lambda \neq -18$

228. If $A = \begin{pmatrix} 3 & 2 \\ 0 & 1 \end{pmatrix}$, then $(A^{-1})^3$ is equal to **[MP PET 1997]**

(a) $\frac{1}{27}\begin{pmatrix}1 & -26\\0 & 27\end{pmatrix}$ (b) $\frac{1}{27}\begin{pmatrix}-1 & 26\\0 & 27\end{pmatrix}$ (c) $\frac{1}{27}\begin{pmatrix}1 & -26\\0 & -27\end{pmatrix}$ (d) $\frac{1}{27}\begin{pmatrix}-1 & -26\\0 & -27\end{pmatrix}$

229. The matrix $\begin{bmatrix}1 & a & 2\\1 & 2 & 5\\2 & 1 & 1\end{bmatrix}$ is not invertible, if 'a' has the value

(a) 2 (b) 1 (c) 0 (d) – 1

230. Inverse matrix of $\begin{bmatrix}4 & 7\\1 & 2\end{bmatrix}$ **[Rajasthan PET 1996, 2001]**

(a) $\begin{bmatrix}2 & -7\\-1 & 4\end{bmatrix}$ (b) $\begin{bmatrix}2 & -1\\-7 & 4\end{bmatrix}$ (c) $\begin{bmatrix}-2 & 7\\1 & -4\end{bmatrix}$ (d) $\begin{bmatrix}-2 & 1\\7 & -4\end{bmatrix}$

231. If the multiplicative group of 2×2 matrices of the form $\begin{pmatrix}a & a\\a & a\end{pmatrix}$, for $a\neq0$ and $a\in R$, then the inverse of $\begin{pmatrix}2 & 2\\2 & 2\end{pmatrix}$ is **[Karnataka CET 1999]**

(a) $\begin{pmatrix}\frac{1}{8} & \frac{1}{8}\\\frac{1}{8} & \frac{1}{8}\end{pmatrix}$ (b) $\begin{pmatrix}\frac{1}{4} & \frac{1}{4}\\\frac{1}{4} & \frac{1}{4}\end{pmatrix}$ (c) $\begin{pmatrix}\frac{1}{2} & \frac{1}{2}\\\frac{1}{2} & \frac{1}{2}\end{pmatrix}$ (d) Does not exist

232. The element in the first row and third column of the inverse of the matrix $\begin{bmatrix}1 & 2 & -3\\0 & 1 & 2\\0 & 0 & 1\end{bmatrix}$ is

(a) – 2 (b) 0 (c) 1 (d) 7

233. If I_3 is the identity matrix of order 3, then I_3^{-1} is **[Pb. CET 2000]**

(a) 0 (b) $3I_3$ (c) I_3 (d) Does not exist

234. If a matrix A is such that $4A^3+2A^2+7A+I=O$, then A^{-1} equals

(a) $(4A^2+2A+7I)$ (b) $-(4A^2+2A+7I)$ (c) $-(4A^2-2A+7I)$ (d) $(4A^2+2A-7I)$

235. If $A=\begin{bmatrix}2 & 2\\-3 & 2\end{bmatrix}$ and $B=\begin{bmatrix}0 & -1\\1 & 0\end{bmatrix}$, then $(B^{-1}A^{-1})^{-1}=$ **[EAMCET 2001]**

(a) $\begin{bmatrix}2 & -2\\2 & 3\end{bmatrix}$ (b) $\begin{bmatrix}3 & -2\\2 & 2\end{bmatrix}$ (c) $\frac{1}{10}\begin{bmatrix}2 & 2\\-2 & 3\end{bmatrix}$ (d) $\frac{1}{10}\begin{bmatrix}3 & 2\\-2 & 2\end{bmatrix}$

236. If $A^2-A+I=0$, then $A^{-1}=$ **[Kerala (Engg.) 2001]**

(a) A^{-2} (b) $A+I$ (c) $I-A$ (d) $A-I$

237. If $A=\begin{bmatrix}2 & 3\\4 & 6\end{bmatrix}$, then $A^{-1}=$ **[Karnataka CET 2001]**

(a) $\begin{bmatrix}1 & 2\\-3/2 & 3\end{bmatrix}$ (b) $\begin{bmatrix}2 & -3\\4 & 6\end{bmatrix}$ (c) $\begin{bmatrix}-2 & 4\\-3 & 6\end{bmatrix}$ (d) Does not exist

238. If for the matrix A, $A^3=I$, then $A^{-1}=$ **[Rajasthan PET 2002]**

(a) A^2 (b) A^3 (c) A (d) None of these

239. For two invertible matrices A and B of suitable orders, the value of $(AB)^{-1}$ is **[Rajasthan PET 2000, 02; Karnataka CET 2001]**

(a) $(BA)^{-1}$ (b) $B^{-1}A^{-1}$ (c) $A^{-1}B^{-1}$ (d) $(AB')^{-1}$

240. If $A=\begin{bmatrix}-1 & 2\\2 & -1\end{bmatrix}$ and $B=\begin{bmatrix}3\\1\end{bmatrix}$, $AX=B$, then $X=$ **[MP PET 2002]**

(a) $[5\ \ 7]$ (b) $\frac{1}{3}\begin{bmatrix}5\\7\end{bmatrix}$ (c) $\frac{1}{3}[5\ \ 7]$ (d) $\begin{bmatrix}5\\7\end{bmatrix}$

241. If $A = \begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$, then $A^{-1} =$

(a) $\begin{bmatrix} -5 & -2 \\ -3 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} \frac{5}{11} & \frac{2}{11} \\ \frac{3}{11} & -\frac{1}{11} \end{bmatrix}$ (c) $\begin{bmatrix} -\frac{5}{11} & -\frac{2}{11} \\ -\frac{3}{11} & -\frac{1}{11} \end{bmatrix}$ (d) $\begin{bmatrix} 5 & 2 \\ 3 & -1 \end{bmatrix}$

242. If $A = \begin{bmatrix} 0 & 3 \\ 2 & 0 \end{bmatrix}$ and $A^{-1} = \lambda(adj(A))$, then $\lambda =$ **[UPSEAT 2002]**

(a) $\frac{-1}{6}$ (b) $\frac{1}{3}$ (c) $\frac{-1}{3}$ (d) $\frac{1}{6}$

243. The multiplicative inverse of matrix $\begin{bmatrix} 2 & 1 \\ 7 & 4 \end{bmatrix}$ is **[DCE 2002]**

(a) $\begin{bmatrix} 4 & -1 \\ -7 & -2 \end{bmatrix}$ (b) $\begin{bmatrix} -4 & -1 \\ 7 & -2 \end{bmatrix}$ (c) $\begin{bmatrix} 4 & -7 \\ 7 & 2 \end{bmatrix}$ (d) $\begin{bmatrix} 4 & -1 \\ -7 & 2 \end{bmatrix}$

244. The inverse matrix of $\begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$ is **[MP PET 2003]**

(a) $\begin{bmatrix} \frac{1}{2} & -\frac{1}{2} & \frac{1}{2} \\ -4 & \frac{2}{3} & -1 \\ \frac{5}{2} & \frac{-3}{2} & \frac{1}{2} \end{bmatrix}$ (b) $\begin{bmatrix} \frac{1}{2} & -4 & \frac{5}{2} \\ 1 & -6 & \frac{2}{3} \\ 1 & 2 & -1 \end{bmatrix}$ (c) $\frac{1}{2}\begin{bmatrix} 1 & 2 & 3 \\ 3 & 2 & 1 \\ 4 & 2 & 3 \end{bmatrix}$ (d) $\frac{1}{2}\begin{bmatrix} 1 & -1 & -1 \\ -8 & 6 & -2 \\ 5 & -3 & 1 \end{bmatrix}$

245. Inverse of the matrix $\begin{bmatrix} 1 & -2 \\ 3 & 4 \end{bmatrix}$ is

(a) $\frac{1}{10}\begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$ (b) $\frac{1}{10}\begin{bmatrix} 1 & -2 \\ 3 & 4 \end{bmatrix}$ (c) $\frac{1}{10}\begin{bmatrix} 4 & -2 \\ -3 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$

246. If A is an orthogonal matrix, then A^{-1} is equal to

(a) A (b) A' (c) A^2 (d) None of these

247. The multiplicative inverse of the matrix $A = \begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ is

(a) $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & 1 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$ (c) $\begin{bmatrix} -1 & 0 & 0 \\ 0 & -1 & 0 \\ 1 & 0 & -1 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$

248. Let A be an invertible matrix. Which of the following is not true

(a) $A^{-1} =| A|^{-1}$ (b) $(A^2)^{-1} = (A^{-1})^2$ (c) $(A')^{-1} = (A^{-1})'$ (d) None of these

249. Inverse of $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 6 \end{bmatrix}$ is **[Kurukshetra CEE 1995]**

(a) $\begin{bmatrix} 2 & 0 & -1 \\ 0 & -3 & 2 \\ -1 & 2 & -1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 6 \end{bmatrix}$ (c) $\begin{bmatrix} -2 & 0 & 1 \\ 0 & 3 & -2 \\ 1 & -2 & 1 \end{bmatrix}$ (d) None of these

250. If $A = \begin{bmatrix} 1 & 2 \\ -4 & -1 \end{bmatrix}$, then $A^{-1} =$ **[Karnataka CET 1997]**

(a) $\frac{1}{7}\begin{bmatrix} 1 & 2 \\ -4 & -1 \end{bmatrix}$ (b) $\begin{bmatrix} -1 & -2 \\ 4 & 1 \end{bmatrix}$ (c) $\frac{1}{9}\begin{bmatrix} 1 & 2 \\ 4 & 1 \end{bmatrix}$ (d) $\frac{1}{7}\begin{bmatrix} -1 & -2 \\ 4 & 1 \end{bmatrix}$

251. If $A = \begin{bmatrix} 0 & -1 & 2 \\ 2 & -2 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 1 \\ 1 & 0 \\ 1 & 1 \end{bmatrix}$ and $M = AB$, then M^{-1} is equal to

(a) $\begin{bmatrix} 2 & -2 \\ 2 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 1/3 & 1/3 \\ -1/3 & 1/6 \end{bmatrix}$ (c) $\begin{bmatrix} 1/3 & -1/3 \\ 1/3 & 1/6 \end{bmatrix}$ (d) $\begin{bmatrix} 1/3 & -1/3 \\ -1/3 & 1/6 \end{bmatrix}$

252. If for a square matrix A, $AA^{-1} = I$, then A is [**DCE 1998**]

(a) Orthogonal matrix (b) Symmetric matrix (c) Diagonal matrix (d) Invertible matrix

253. If matrix $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 3 & \lambda & 5 \end{bmatrix}$ is invertible, then [**Kurukshetra CEE 1998**]

(a) $\lambda \neq 4$ (b) $\lambda \neq 3$ (c) $\lambda \neq 2$ (d) $\lambda \neq 0$

254. If $\begin{bmatrix} 1 & -\tan\theta \\ \tan\theta & 1 \end{bmatrix}\begin{bmatrix} 1 & \tan\theta \\ -\tan\theta & 1 \end{bmatrix}^{-1} = \begin{bmatrix} a & -b \\ b & a \end{bmatrix}$, then

(a) $a = 1, b = 1$ (b) $a = \cos 2\theta, b = \sin 2\theta$ (c) $a = \sin 2\theta, b = \cos 2\theta$ (d) None of these

Advance Level

255. If $A = \begin{bmatrix} 1 & -2 & 3 \\ 0 & -1 & 4 \\ -2 & 2 & 1 \end{bmatrix}$, then $(A')^{-1} =$

(a) $\begin{bmatrix} -9 & -8 & -2 \\ 8 & 7 & 2 \\ -5 & -4 & -1 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 0 & -2 \\ -2 & -1 & 2 \\ 3 & 4 & 1 \end{bmatrix}$ (c) $\begin{bmatrix} -9 & 8 & -5 \\ -8 & 7 & -4 \\ 2 & 2 & -1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

256. If ω is a cube root of unity and $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & \omega & \omega^2 \\ 1 & \omega^2 & \omega \end{bmatrix}$, then $A^{-1} =$

(a) $\begin{bmatrix} 1 & \omega & \omega^2 \\ \omega^2 & 1 & \omega \\ \omega & \omega^2 & 1 \end{bmatrix}$ (b) $\frac{1}{3}\begin{bmatrix} 1 & 1 & 1 \\ 1 & \omega^2 & \omega \\ 1 & \omega & \omega^2 \end{bmatrix}$ (c) $\begin{bmatrix} 1 & \omega & \omega^2 \\ 1 & \omega^2 & \omega \\ 1 & 1 & 1 \end{bmatrix}$ (d) $\frac{1}{2}\begin{bmatrix} 1 & \omega & \omega^2 \\ 1 & \omega^2 & \omega \\ 1 & 1 & 1 \end{bmatrix}$

257. If $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$, then $A^{-1} =$ [**DCE 1999**]

(a) A (b) A^2 (c) A^3 (d) A^4

258. If $D = \text{diag}\,(d_1, d_2, d_3, ..., d_n)$, where $d_i \neq 0$ for all $i = 1, 2, ..., n$, then D^{-1} is equal to

(a) D (b) $\text{diag}\,(d_1^{-1}, d_2^{-1}, ...d_n^{-1})$ (c) I (d) None of these

259. If $A = \text{diag}\,(d_1, d_2, d_3, ..., d_n)$, then A^n is equal to

(a) $\text{diag}\,(d_1^{n-1}, d_2^{n-1}, d_3^{n-1}, ...d_n^{n-1})$ (b) $\text{diag}\,(d_1^n, d_2^n, d_3^n, ...d_n^n)$

(c) A (d) None of these

Relation between Determinants and Matrices

Basic Level

260. If A is a square matrix of order 3, then true statement is (where I is unit matrix) **[MP PET 1992]**
(a) det $(-A) = -\det A$ (b) det A = 0 (c) det $(A+I) = 1 + \det A$ (d) det $2A$ = 2 det A

261. If $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 1 & 3 \\ 0 & 0 & 2 \end{bmatrix}$, then $|AB|$ is equal to **[Rajasthan PET 1995]**
(a) 4 (b) 8 (c) 16 (d) 32

262. If A and B are square matrices of order 3 such that $|A| = -1, |B| = 3$, then $|3AB| =$ **[IIT 1988; MP PET 1995, 99]**
(a) – 9 (b) – 81 (c) – 27 (d) 81

263. Which of the following is correct
(a) Determinant is a square matrix (b) Determinant is a number associated to a matrix
(c) Determinant is a number associated to a square matrix (d) None of these

264. Let A be a skew-symmetric matrix of odd order, then $|A|$ is equal to
(a) 0 (b) 1 (c) –1 (d) None of these

265. Let A be a skew-symmetric matrix of even order, then $|A|$
(a) Is a perfect square (b) Is not a perfect square (c) Is always zero (d) None of these

266. For any 2×2 matrix A, if $A(adj. A) = \begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$, then $|A| =$ **[MP PET 1999]**
(a) 0 (b) 10 (c) 20 (d) 100

267. If $A = \begin{bmatrix} 1 & 3 \\ 2 & 1 \end{bmatrix}$, then determinant of $A^2 - 2A$ is **[EAMCET 2000]**
(a) 5 (b) 25 (c) – 5 (d) – 25

268. If $\begin{bmatrix} 2+x & 3 & 4 \\ 1 & -1 & 2 \\ x & 1 & -5 \end{bmatrix}$ is a singular matrix, then x is **[Kerala (Engg.) 2001]**
(a) $\frac{13}{25}$ (b) $-\frac{25}{13}$ (c) $\frac{5}{13}$ (d) $\frac{25}{13}$

269. The product of a matrix and its transpose is an identity matrix. The value of determinant of this matrix is
(a) – 1 (b) 0 (c) ± 1 (d) 1

270. If $A = \begin{bmatrix} 1 & 0 & 1 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$, then det A =
(a) 2 (b) 3 (c) 4 (d) 5

271. If $A \neq O$ and $B \neq O$ are $n \times n$ matrix such that $AB = O$, then
(a) $Det\,(A) = 0$ or $Det\,(B) = 0$ (b) $Det(A) = 0$ and $Det(B) = 0$
(c) $Det\,(A) = Det\,(B) \neq 0$ (d) $A^{-1} = B^{-1}$

272. If A is a square matrix such that $A^2 = A$, then det (A) equals
(a) 0 or 1 (b) – 2 or 2 (c) – 3 or 3 (d) None of these

273. If A is a square matrix such that $|A| = 2$, then for any +ve integer n, $|A^n|$ is equal to
(a) 0 (b) $2n$ (c) 2^n (d) n^2

274. If A is a square matrix of order 3 and entries of A are positive integers, then $|A|$ is
(a) Different from zero (b) 0 (c) Positive (d) An arbitrary integer.

275. If A and B are any 2×2 matrix, then $\det(A+B) = 0$ implies
(a) $DetA + DetB = 0$ (b) $DetA = 0$ or $DetB = 0$ (c) $DetA = 0$ and $DetB = 0$ (d) None of these

System of Linear Equations

Basic Level

276. If $\begin{bmatrix} x+y+z \\ x+y \\ y+z \end{bmatrix} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$, then (*x*, *y*, *z*) =

(a) (4, 3, 2) (b) (3, 2, 4) (c) (2, 3, 4) (d) None of these

277. The solution of the equation $\begin{bmatrix} 1 & 0 & 1 \\ -1 & 1 & 0 \\ 0 & -1 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix}$ is (*x*, *y*, *z*) =

(a) (1, 1, 1) (b) (0, –1, 2) (c) (–1, 2, 2) (d) (–1, 0, 2)

278. If $AX = B$, $B = \begin{bmatrix} 9 \\ 52 \\ 0 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 3 & -\frac{1}{2} & -\frac{1}{2} \\ -4 & \frac{3}{4} & \frac{5}{4} \\ 2 & -\frac{1}{4} & -\frac{3}{4} \end{bmatrix}$, then *X* is equal to

(a) $\begin{bmatrix} 1 \\ 3 \\ 5 \end{bmatrix}$ (b) $\begin{bmatrix} -\frac{1}{2} \\ -\frac{1}{2} \\ 2 \end{bmatrix}$ (c) $\begin{bmatrix} -4 \\ 2 \\ 3 \end{bmatrix}$ (d) $\begin{bmatrix} 3 \\ \frac{3}{4} \\ -\frac{3}{4} \end{bmatrix}$

Rank of a Matrix

Basic Level

279. If *A* is a non-zero column matrix of order $m \times 1$ and *B* is a non-zero row matrix of order $1 \times n$, then rank of *AB* is equal to

(a) *m* (b) *n* (c) 1 (d) None of these

280. If $A = \begin{bmatrix} 1 & 2 & -1 \\ 1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$, then

(a) $\rho(A) = 2$ (b) $\rho(A) = 1$ (c) $\rho(A) = 3$ (d) None of these

281. If I_n is the identity matrix of order *n*, then rank of I_n is

(a) 1 (b) *n* (c) 0 (d) None of these

282. The rank of a null matrix is

(a) 0 (b) 1 (c) Does not exist (d) None of these

283. If *A* is a non-singular square matrix of order *n*, then the rank of *A* is

(a) Equal to *n* (b) Less then *n* (c) Greater then *n* (d) None of these

284. If *A* and *B* are two matrices such that rank of $A = m$ and rank of $B = n$, then

(a) rank (*AB*) = *mn* (b) rank (*AB*) ≥ rank (*A*)

(c) rank (*AB*) ≥ rank (*B*) (d) rank (*AB*) ≤ min (rank *A*, rank *B*

285. If *A* is an inevitable matrix and *B* is a matrix, then

(a) rank (*AB*) = rank (*A*) (b) rank (*AB*) = rank (*B*) (c) rank (*AB*) > rank (*A*) (d) rank (*AB*) > rank (*B*)

Advance Level

286. If the points $(x_1, y_1), (x_2, y_2)$ and (x_3, y_3) are collinear, then the rank of the matrix $\begin{bmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{bmatrix}$ will always be less than

[Orissa JEE 2003]

(a) 3 (b) 2 (c) 1 (d) None of these

287. If A is a matrix such that there exists a square submatrix of order r which is non-singular and every square submatrix of order $r+1$ or more is singular, then

(a) rank $(A) = r+1$ (b) rank $(A) = r$ (c) rank $(A) > r$ (d) rank $(A) \geq r+1$

288. The rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 0 \\ 2 & 4 & 3 & 2 \\ 3 & 2 & 1 & 3 \\ 6 & 8 & 7 & 5 \end{bmatrix}$ is

(a) 1 (b) 2 (c) 3 (d) 4

289. The system of equations $AX = B$ of n equations in n unknown has infinitely many solutions if

(a) $\det A \neq 0$ (b) $\det A \neq 0, (adj\, A)B = 0$ (c) $\det A = 0, (adj\, A)B \neq 0$ (d) $\det A = 0, (adj\, A)B \neq 0$

290. The trace of skew symmetric matrix of order $n \times n$ is

(a) 0 (b) 1 (c) n (d) n^2

Miscellaneous Problems

Basic Level

291. If $A = \begin{bmatrix} -2 & 1 \\ 0 & 3 \end{bmatrix}$ and $f(x) = 2x^2 - 3x$,then $f(A)$ equals

(a) $\begin{bmatrix} 14 & 1 \\ 0 & -9 \end{bmatrix}$ (b) $\begin{bmatrix} -14 & 1 \\ 0 & 9 \end{bmatrix}$ (c) $\begin{bmatrix} 14 & -1 \\ 0 & 9 \end{bmatrix}$ (d) $\begin{bmatrix} -14 & -1 \\ 0 & -9 \end{bmatrix}$

292. The construction of 3×4 matrix A whose element a_{ij} is given by $\frac{(i+j)^2}{2}$ is **[IIT 1988]**

(a) $\begin{bmatrix} 2 & 9/2 & 8 & 25 \\ 9 & 4 & 5 & 18 \\ 8 & 25 & 18 & 49 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & 9/2 & 25/2 \\ 9/2 & 5/2 & 5 \\ 25 & 18 & 25 \end{bmatrix}$

(c) $\begin{bmatrix} 2 & 9/2 & 8 & 25/2 \\ 9/2 & 8 & 25/2 & 18 \\ 8 & 25/2 & 18 & 49/2 \end{bmatrix}$ (d) None of these

293. If A is a square matrix of order n such that its elements are polynomial in x and its r-rows become identical for $x = k$, then

(a) $(x-k)^r$ is a factor of $|A|$ (b) $(x-k)^{r-1}$ is a factor of $|A|$

(c) $(x-k)^{r+1}$ is a factor of $|A|$ (d) $(x-k)^r$ is a factor of A

294. If $A = [a_{ij}]$ is a scalar matrix of order $n \times n$ such that $a_{ij} = k$ for all i, then trace of A is equal to

(a) nk (b) $n+k$ (c) n/k (d) None of these

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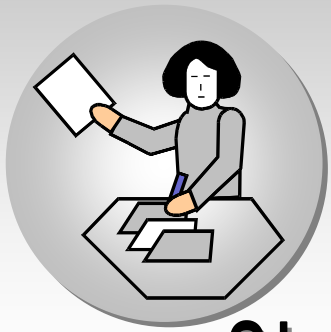

Answer Sheet

Matrices ***Assignment (Basic and Advance Level)***

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**
b	b	c	d	d	d	c	c	a	b	b	b	b	c	c	b	a	b	a	c
21	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**	**31**	**32**	**33**	**34**	**35**	**36**	**37**	**38**	**39**	**40**
b	c	d	c	b	d	a	b	c	b	a	d	d	b	c	b	b	b	b	b
41	**42**	**43**	**44**	**45**	**46**	**47**	**48**	**49**	**50**	**51**	**52**	**53**	**54**	**55**	**56**	**57**	**58**	**59**	**60**
d	c	a,b	d	a	c	c	c	a	d	b	b	b	b	a	a	c	c	b	b
61	**62**	**63**	**64**	**65**	**66**	**67**	**68**	**69**	**70**	**71**	**72**	**73**	**74**	**75**	**76**	**77**	**78**	**79**	**80**
c	b	c	b	a	b	c	c	a	c	c	d	b	c	b	d	a	c	d	d
81	**82**	**83**	**84**	**85**	**86**	**87**	**88**	**89**	**90**	**91**	**92**	**93**	**94**	**95**	**96**	**97**	**98**	**99**	**100**
c	d	c	b	b	b	d	d	c	c	c	a	a	a	d	b	b	c	b	d
101	**102**	**103**	**104**	**105**	**106**	**107**	**108**	**109**	**110**	**111**	**112**	**113**	**114**	**115**	**116**	**117**	**118**	**119**	**120**
a	a	a	a	c	c	c	b	a	b	a	c	d	c	b	c	b	c	b	b
121	**122**	**123**	**124**	**125**	**126**	**127**	**128**	**129**	**130**	**131**	**132**	**133**	**134**	**135**	**136**	**137**	**138**	**139**	**140**
a	d	a	b	c	a	b	b	b	b	d	d	a	b	b	a	d	b	c	a
141	**142**	**143**	**144**	**145**	**146**	**147**	**148**	**149**	**150**	**151**	**152**	**153**	**154**	**155**	**156**	**157**	**158**	**159**	**160**
a	d	b	b	b	c,d	c	b	d	a	d	b	d	c	d	a	b	a	d	b
161	**162**	**163**	**164**	**165**	**166**	**167**	**168**	**169**	**170**	**171**	**172**	**173**	**174**	**175**	**176**	**177**	**178**	**179**	**180**
d	d	a	c	a	b	a	a	b	c	b	c	b	a	a	b	b	b	a	b
181	**182**	**183**	**184**	**185**	**186**	**187**	**188**	**189**	**190**	**191**	**192**	**193**	**194**	**195**	**196**	**197**	**198**	**199**	**200**
a	c	b	d	a	a	b	c	b	c	d	b	b	b	c	a	b	a	c	b
201	**202**	**203**	**204**	**205**	**206**	**207**	**208**	**209**	**210**	**211**	**212**	**213**	**214**	**215**	**216**	**217**	**218**	**219**	**220**
d	c	a	c	c	c	d	b	a	a	b	b	a	a	a	d	b	a	d	c
221	**222**	**223**	**224**	**225**	**226**	**227**	**228**	**229**	**230**	**231**	**232**	**233**	**234**	**235**	**236**	**237**	**238**	**239**	**240**
b	b	a	a	d	b	b	a	b	a	d	d	c	b	a	c	d	a	b	b
241	**242**	**243**	**244**	**245**	**246**	**247**	**248**	**249**	**250**	**251**	**252**	**253**	**254**	**255**	**256**	**257**	**258**	**259**	**260**
b	a	d	a	a	b	d	a	c	d	c	d	a	b	a	b	c	b	b	a
261	**262**	**263**	**264**	**265**	**266**	**267**	**268**	**269**	**270**	**271**	**272**	**273**	**274**	**275**	**276**	**277**	**278**	**279**	**280**
c	b	c	a	a	b	b	b	c	a	a	a	c	d	d	c	d	a	c	c
281	**282**	**283**	**284**	**285**	**286**	**287**	**288**	**289**	**290**	**291**	**292**	**293**	**294**						
b	c	a	d	b	b	b	c	c	a	c	c	a	a						