Kulkarni Science Academy

Exam Name :-Mat determinant and CN FL2

Date :-31/08/2025

Time :-90 Minutes

Mark :- 100

MATHEMATICS

1. 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

2. Let $X = \begin{bmatrix} x \\ y \\ z \end{bmatrix}, D = \begin{bmatrix} 3 \\ 5 \\ 11 \end{bmatrix}$ and $A = \begin{bmatrix} 1 & -1 & -2 \\ 2 & 1 & 1 \\ 4 & -1 & -2 \end{bmatrix}$, if $X = A^{-1}D$, then X is equal to :

(a) $\begin{bmatrix} 1 \\ 0 \\ 2 \end{bmatrix}$

(b) $\begin{bmatrix} \frac{8}{3} \\ \frac{-1}{3} \\ 0 \end{bmatrix}$

(c) $\begin{bmatrix} \frac{-8}{3} \\ 1 \\ 0 \end{bmatrix}$

(d) $\begin{bmatrix} \frac{8}{3} \\ \frac{1}{3} \\ -1 \end{bmatrix}$

3. Let $z = \frac{11-3i}{1+i}$. If α is a real number such that $z - i\alpha$ is real, then the value of α is

(a) 4

(b) -4

(c) 7

(d) -7

4. If. $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -2 & -2 \\ 1 & 3 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 3 \\ 4 \end{bmatrix}$, then $2x - y + z =$[MHT-CET 2022]

(a) 2

(b) 1

(c) 3

(d) -3

5. If $\left\{4\begin{bmatrix} 2 & -1 & 3 \\ 1 & 0 & 2 \end{bmatrix} - \begin{bmatrix} 1 & 2 & -1 \\ 2 & -3 & 4 \end{bmatrix}\right\}\begin{bmatrix} 2 \\ -1 \\ 1 \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$ then $(x, y) =$

(a) (3,5)

(b) (5,33)

(c) (-33,-5)

(d) (33,5)

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

(a) $\begin{bmatrix} -4 & 1 & 2 \\ 2 & -1 & 4 \\ 4 & 5 & 2 \end{bmatrix}$ **(b)** $\begin{bmatrix} -4 & -1 & 2 \\ -3 & -1 & 4 \\ 4 & -5 & 2 \end{bmatrix}$

(c) $\begin{bmatrix} -4 & -1 & 2 \\ 3 & -1 & -4 \\ 4 & 5 & -2 \end{bmatrix}$ **(d)** $\begin{bmatrix} -4 & -1 & 2 \\ 2 & -1 & -4 \\ 4 & -5 & 2 \end{bmatrix}$

7. If $z = \frac{-2}{1+\sqrt{3}i}, i = \sqrt{-1}$, then $\arg z =$[MHT-CET 2024]

(a) $\frac{4\pi}{3}$ **(b)** $\frac{2\pi}{3}$

(c) $\frac{\pi}{3}$ **(d)** $-\frac{\pi}{3}$

8. If $A = \begin{bmatrix} 1 & 0 & 2 \\ 2 & 1 & 3 \\ 0 & 3 & -5 \end{bmatrix}$, where A_{ij} is the cofactor of the element a_{ij} of matrix A, then $a_{21} A_{21} + a_{22} A_{22} + a_{23} A_{23} =$ [MHT-CET 2020]

(a) 26 **(b)** -26

(c) 0 **(d)** -2

9. If $\begin{bmatrix} 2x & 0 & p \\ p+q & 3y & q \\ p-q & 0 & 6(x-y) \end{bmatrix}$ is a unit matrix, then the values of x,y, p and q = 0

(a) x = 2, y =3, p=q= 0 **(b)** $x = \frac{1}{2}$, $y = \frac{1}{3}$, p=5= q

(c) $x = \frac{-1}{2}$, $y = \frac{-1}{3}$, p = q = 1 **(d)** $x = \frac{1}{2}$, $y = \frac{1}{3}$, p = q = 0

10. The inverse of the matrix $A = \begin{bmatrix} 1 & 3 & 4 \\ 2 & 1 & 2 \\ 5 & 1 & 1 \end{bmatrix}$ is :

(a) $\frac{1}{11}\begin{bmatrix} -1 & 1 & 2 \\ 8 & -19 & 6 \\ 14 & -3 & -5 \end{bmatrix}$ **(b)** $\frac{1}{11}\begin{bmatrix} -1 & 1 & 2 \\ 8 & -6 & 19 \\ 14 & -3 & -5 \end{bmatrix}$

(c) $\frac{1}{11}\begin{bmatrix} -1 & 1 & 2 \\ 8 & -6 & 19 \\ -3 & 14 & -5 \end{bmatrix}$ **(d)** $\frac{1}{11}\begin{bmatrix} -1 & 1 & 2 \\ 8 & -19 & 6 \\ -3 & 14 & -5 \end{bmatrix}$

11. If $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then $A =$[MHT-CET 2022]

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

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

12. If $A = \begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix}$, and $A^2 = I$, then A^{-1} is equal to :

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

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

13. Let A be skew- symmetric matrix of odd order , then $|A| =$

(a) 0 **(b)** 1

(c) -1 **(d)** 2

14. If matrix $A=\begin{bmatrix}1 & 2\\4 & 3\end{bmatrix}$ is such that $AX=I$, where I is 2×2 unit matrix, then X =[MHT-CET 2022]

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

15. If $z=x+iy$ is a variable complex number such that $\arg\frac{z-1}{z+1}=\frac{\pi}{4}$, then

(a) $x^2-y^2-2x=1$
(b) $x^2+y^2-2x=1$
(c) $x^2+y^2-2y=1$
(d) $x^2+y^2+2x=1$

16. If A = $\begin{bmatrix}5 & x\\y & -2\end{bmatrix}$ and A is symmetric matrix then

(a) $x=5, y=-2$
(b) $x=-2, y=5$
(c) $x=y$
(d) $x=3, y=2$

17. For an invertible matrix A, if $A(\text{adj}A)=\begin{bmatrix}20 & 0\\0 & 20\end{bmatrix}$, then $|A|$ =[MHT-CET 2021]

(a) 200
(b) -2
(c) -200
(d) 20

18. If $A^{-1}=\begin{bmatrix}2 & -3\\-1 & 2\end{bmatrix}$ and $B^{-1}=\begin{bmatrix}1 & 0\\-3 & 1\end{bmatrix}$, then $(\text{AB})^{-1}$ =[MHT-CET 2021]

(a) $\begin{bmatrix}2 & 3\\7 & -11\end{bmatrix}$
(b) $\begin{bmatrix}2 & 7\\3 & -1\end{bmatrix}$
(c) $\begin{bmatrix}2 & -7\\-3 & 11\end{bmatrix}$
(d) $\begin{bmatrix}2 & -3\\-7 & 11\end{bmatrix}$

19. If A = $\begin{bmatrix}1 & 1 & 1\\2 & 1 & -3\\-1 & 2 & 3\end{bmatrix}$, then $A_{31}+A_{32}+A_{33}$ = where A_{ij} is cofactor of a_{ij}, where $A=[a_{ij}]_{3\times 3}$[MHT-CET 2022]

(a) 1
(b) 11
(c) 0
(d) 10

20. If the matrix AB is zero, then

(a) If is not necessary that either A = 0 or B = 0
(b) A = 0 or B = 0
(c) A = 0 and B = 0
(d) All the above statements are wrong

21. If A = $\begin{bmatrix}1 & -1 & 1\\0 & 2 & -3\\2 & 1 & 0\end{bmatrix}$ and B = adjA, C = 5 A, then $\frac{|\text{adjB}|}{|\text{C}|}$ =[MHT-CET 2022]

(a) 1
(b) 25
(c) 5
(d) -1

22. If AB=C then the matrices A,B,C are

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

23. If matrix B is the inverse of $A=\begin{bmatrix}2 & 0 & -1\\2 & 1 & 2\\3 & 1 & 2\end{bmatrix}$, then $B(\text{adj } B)=$ [MHT-CET 2019]

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

24. If $A^{-1}=\begin{bmatrix}1 & 2 & -2\\-1 & 3 & 0\\0 & -2 & 1\end{bmatrix}$, then adj $A=$ [MHT-CET 2019]

(a) A
(b) I
(c) A^{-1}
(d) $2\,A^{-1}$

25. If A is a square matrix such that $A(\text{adj } A) = \begin{bmatrix} 4 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & 4 \end{bmatrix}$, then $\frac{|\text{adj}(\text{adj } A)|}{|\text{adj } A|}$ is equal to:

(a) 256
(b) 16
(c) 32
(d) 34

26. If $A = [x \quad y \quad z], B = \begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}, C = \begin{bmatrix} x \\ y \\ z \end{bmatrix}$, then $ABC =$ [MHT-CET 2004]

(a) $[ax^2 + by^2 + cz^2 + 2hxy + 2gxz + 2fyz]$
(b) $[ax^2 + by^2 + cz^2 + hxy + gxz + fyz]$
(c) $[ax^2 + by^2 + cz^2]$
(d) None of these

27. The complex numbers z having positive argument and satisfying $|2 - 3i| < |z|$, is

(a) $\frac{12}{5} + \frac{16}{5}i$
(b) $\frac{4}{5} + \frac{6}{5}i$
(c) $\frac{6}{5} - \frac{5}{2}i$
(d) None of these

28. If A is a square matrix of order, n, where |A| = 5 and |A(adj A)| = 125, then n =

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

29. If A is a singular matrix, then adj A is :

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

30. For a 3×3 matrix A,
if $A(\text{adj}A) = \begin{bmatrix} -10 & 0 & 0 \\ 0 & -10 & 2 \\ 0 & 0 & -10 \end{bmatrix}$,
then the value of determinant of A is[MHT-CET 2021]

(a) 20
(b) 100
(c) -1000
(d) -10

31. if $\sqrt{x + iy} = \pm(a + ib)$, then $\sqrt{-x - iy}$ is equal to

(a) $\pm(b + ia)$
(b) $\pm(a - ib)$
(c) $(ai + b)$
(d) $\pm(b - ia)$

32. If A is non-singular matrix and $(A + I)(A - I) = 0$, then $A + A^{-1} =$

(a) I
(b) 2 A
(c) 0
(d) 3I

33. If A $\begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$, n ∊ N, then $A^{4n} =$

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

34. In a lower triangular matrix, the elements, $a_{ij} = 0$ for

(a) i > j
(b) i =j
(c) i < j
(d) i ≥ j

35. In which quadrant of the complex plane, the point $\frac{1+2i}{1-i}$ lies?

(a) Fourth
(b) First

(c) Second **(d)** Third

36. Let $X = \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$ $A = \begin{bmatrix} 1 & -1 & 2 \\ 2 & 0 & 1 \\ 3 & 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 \\ 1 \\ 4 \end{bmatrix}$. If $AX = B$, then X =

(a) $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ **(b)** $\begin{bmatrix} -1 \\ 2 \\ 3 \end{bmatrix}$

(c) $\begin{bmatrix} -1 \\ -2 \\ 3 \end{bmatrix}$ **(d)** $\begin{bmatrix} -1 \\ -2 \\ -3 \end{bmatrix}$

37. Matrix A is of order $m \times n$; matrix B is of order $p \times q$, such that AB exists, then [MHT-CET 2007]

(a) $m = n$ **(b)** $p = n$

(c) $m = q$ **(d)** $p = q$

38. If $x = \frac{1}{x} = 2\sin\alpha, y = y + \frac{1}{y} = 2\cos\beta$, then $x^3y^3 + \frac{1}{x^3y^3}$ is

(a) $2\cos 3(\beta - \alpha)$ **(b)** $2\cos 3(\beta + \alpha)$

(c) $2\sin 3(\beta - \alpha)$ **(d)** $2\sin 3(\beta + \alpha)$

39. Given $A = \begin{bmatrix} x & 3 & 2 \\ 1 & y & 4 \\ 2 & 2 & z \end{bmatrix}$, if $xyz = 60$ and $8x + 4y + 3z = 20$, then $A \cdot (\text{adj}A)$ is equal to[MHT-CET 2022]

(a) $\begin{bmatrix} 60 & 0 & 0 \\ 0 & 60 & 0 \\ 0 & 0 & 60 \end{bmatrix}$ **(b)** $\begin{bmatrix} 68 & 0 & 0 \\ 0 & 68 & 0 \\ 0 & 0 & 68 \end{bmatrix}$

(c) $\begin{bmatrix} 108 & 0 & 0 \\ 0 & 108 & 0 \\ 0 & 0 & 108 \end{bmatrix}$ **(d)** $\begin{bmatrix} 20 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 20 \end{bmatrix}$

40. If $F(x) = \begin{bmatrix} \cos\alpha & -\sin\alpha & 0 \\ \sin\alpha & \cos\alpha & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $G(y) = \begin{bmatrix} \cos y & 0 & \sin y \\ 0 & 1 & 0 \\ -\sin y & 0 & \cos y \end{bmatrix}$, then $[F(x)G(-y)]^{-1}$ is equal to

(a) F(-x) G (-y) **(b)** G (-y) F (-x)

(c) $F(x^{-1})\ G(y^{-1})$ **(d)** $G(y^{-1})\ F(x^{-1})$

41. If the inverse of $\begin{bmatrix} 1 & 2 & x \\ 4 & -1 & 7 \\ 2 & 4 & -6 \end{bmatrix}$ does not exist, then x =

(a) 3 **(b)** -3

(c) 0 **(d)** 2

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

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

(c) $\begin{bmatrix} -1 & 1 & -1 \\ 4 & -3 & 1 \\ -5 & 3 & -1 \end{bmatrix}$ **(d)** $\begin{bmatrix} 1 & -1 & 1 \\ -4 & 3 & -1 \\ 5 & -3 & 1 \end{bmatrix}$

43. If $A = \begin{bmatrix} 1 & 2 & 4 \\ 2 & 4 & 3 \end{bmatrix}, B = \begin{bmatrix} 2 & 1 & 3 \\ 1 & -1 & 2 \end{bmatrix}$ And A-C-3B=0,Then C=

(a) $\begin{bmatrix} -1 & 1 & 1 \\ 1 & 5 & 1 \end{bmatrix}$
(b) $\begin{bmatrix} -5 & -1 & -5 \\ -1 & 7 & -3 \end{bmatrix}$
(c) $\begin{bmatrix} -1 & -5 & -7 \\ -5 & -13 & -7 \end{bmatrix}$
(d) $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 1 & 0 \end{bmatrix}$

44. If A^T is a skew symmetric matrix and n is a positive integer, then A^n is

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

45. if $F(\theta) = \begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $G(\theta) = \begin{bmatrix} \cos\theta & 0 & \sin\theta \\ 0 & 1 & 0 \\ -\sin\theta & 0 & \cos\theta \end{bmatrix}$, then $[F(\alpha).G(\beta)]^{-1}$ is:

(a) $G(-\beta).F(-\alpha)$
(b) $G(\beta).F(\alpha)$
(c) $F(\alpha).F(-\alpha)$
(d) $G(-\beta).F(\alpha)$

46. If $\frac{3}{2+\cos\theta+i\sin\theta} = a + ib$, then $[(a-2)^2 + b^2]$ is equal to

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

47. If $\left\{3\begin{bmatrix} 4 & 1 & 3 \\ 1 & -1 & -3 \end{bmatrix} - 2\begin{bmatrix} 3 & 2 & 4 \\ -6 & 1 & -3 \end{bmatrix}\right\}\begin{bmatrix} 1 \\ 3 \\ 2 \end{bmatrix} = \begin{bmatrix} x \\ y \end{bmatrix}$ then $(x, y) =$

(a) (-5,6)
(b) (5,5)
(c) (5,-6)
(d) (3,2)

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

(a) $(AB)^{-1}$ not exit
(b) $(AB)^{-1}$ is null matrix
(c) $(AB)^{-1}$ exists
(d) $(AB)^{-1}$ unit matrix

49. The modulus and amplitude of $\frac{1+2i}{1-(1-i)^2}$ are

(a) $\sqrt{2}$ and $\frac{\pi}{6}$
(b) 1 and 0
(c) 1 and $\frac{\pi}{3}$
(d) 1 and $\frac{\pi}{4}$

50. If $x = 1 + 2i$, then the value of $x^3 + 7x^2 - x + 16$ is[MHT-CET 2021]

(a) $-17 - 24i$
(b) $-17 + 24i$
(c) $17 - 24i$
(d) $17 + 24i$