ABHINAV ACADEMY

UDUPI

CET25M4 DETERMINANTS

Class 12 - Mathematics

Time Allowed: 1 hour and 30 minutes **Maximum Marks: 75**

1. The value of the determinant $\begin{vmatrix} \log_3 512 & \log_4 3 \\ \log_3 8 & \log_4 9 \end{vmatrix}$ is **[1]**

a) 0 b) 15

c) $\frac{15}{2}$ d) 10

2. If A is a non-singular square matrix of order 3 such that $A^2 = 3A$, then value of |A| is **[1]**

a) 3 b) 9

c) -3 d) 27

3. The sum of products of elements of any row with the cofactors of corresponding elements is equal to **[1]**

a) $a_{12} A_{21} + a_{12} A_{21} + a_{21} A_{13}$ b) $a_{11} A_{11} + a_{12} A_{12} + a_{13} A_{13}$

c) $a_{11} A_{11} + a_{12} A_{12} + a_{21} A_{13}$ d) $a_{11} A_{11} + a_{12} A_{13} + a_{13} A_{12}$

4. For non-singular square matrix A,B and C of the same order $(AB^{-1}C)^{-1} =$ **[1]**

a) $C^{-1}BA^{-1}$ b) CBA^{-1}

c) $C^{-1} B^{-1}A^{-1}$ d) $A^{-1}BC^{-1}$

5. If A = $\begin{bmatrix} 1 & 2 \\ 6 & 12 \end{bmatrix}$, then A is **[1]**

a) non-singular b) singular

c) scalar matrix d) diagonal matrix

6. If A is a square matrix of order 2, then det (adj A) = **[1]**

a) $A^2 = O$ b) I

c) $2A^2$ d) |A|

7. A square matrix A is called singular if det. A is **[1]**

a) Non–zero b) 0

c) Negative d) Positive

8. If the value of a third-order determinant is 12, then the value of the determinant formed by replacing each element by its cofactor will be **[1]**

a) -12 b) 12

c) 13 d) 144

[1]

9. For any 2 $\times$ 2 matrix A if A(adj A) = $\begin{pmatrix} 12 & 0 \\ 0 & 12 \end{pmatrix}$, then $|A|^3$ equals

a) 12^4

b) 12^3

c) 12^2

d) 12^5

10. If A = $\begin{vmatrix} 1 & 1 & -2 \\ \lambda & 1 & -3 \\ 5 & 4 & -9 \end{vmatrix}$ then A^{-1} exist if **[1]**

a) λ = 1

b) $\lambda \neq 0$

c) $\lambda \neq 2$

d) λ = 2

11. Let A = $\begin{vmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{vmatrix}$ then A^TA is **[1]**

a) $\begin{vmatrix} 0 & 0 \\ 0 & 0 \end{vmatrix}$

b) $\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix}$

c) $\begin{vmatrix} 1 & 1 \\ 1 & 1 \end{vmatrix}$

d) $\begin{vmatrix} 0 & 1 \\ 1 & 0 \end{vmatrix}$

12. If A = $\begin{bmatrix} 1 & 2 \\ 3 & -1 \end{bmatrix}$, then $M_{12} + C_{22}$ is **[1]**

a) 0

b) -4

c) 1

d) 4

13. If A and B are invertible matrices, then which of the following is not correct? **[1]**

a) $(AB)^{-1} = B^{-1} A^{-1}$

b) $(A + B)^{-1} = B^{-1} + A^{-1}$

c) $\det (A)^{-1} = [\det (A)]^{-1}$

d) adj A = $|A| \cdot A^{-1}$

14. If A is a 3 $\times$ 3 matrix such that |A| =8, then |3 A| equals. **[1]**

a) 8

b) 72

c) 216

d) 24

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

a) O

b) A + B

c) $A^2 + B^2$

d) $A^2 + 2AB + B^2$

16. If A is a 3-rowed square matrix and IAI = 4 then adj (adj A) = ? **[1]**

a) 128A

b) 64A

c) 4A

d) 16A

17. $\begin{vmatrix} 1 & 1 & 1 \\ e & 0 & \sqrt{2} \\ 2 & 2 & 2 \end{vmatrix}$ is equal to **[1]**

a) 0

b) 3e

c) 2e

d) 2

18. If area of triangle is 35 sq units with vertices (2, -6), (5, 4) and (k, 4). Then k is **[1]**

a) 12

b) 2, -2

c) -12, -2

d) -2

19. If A = $\begin{vmatrix} 1 & 2 \\ 4 & 2 \end{vmatrix}$, then the value of |2A | is **[1]**

a) 3|A|

b) 4|A|

c) |A|

d) 2|A|

20. If the area of a $\triangle$ABD is 3 sq. units with vertices A(1, 3), B(0, 0) and D(k, 0), then k is equal to **[1]**

a) 3

b) 2

c) ± 2

d) ± 3

21. 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 is equal to **[1]**

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

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

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

d) $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$

22. If A is an invertible square matrix and k is a non-negative real number then$(kA)^{-1}$ = ? **[1]**

a) $\frac{1}{k} \cdot A^{-1}$

b) $-k.A^{-1}$

c) $k.A^{-1}$

d) $2k.A^{-1}$

23. If $\Delta = \begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$, then the minor M_{31} is **[1]**

a) $c(a^2 + b^2)$

b) $-c(a^2 - b^2)$

c) $c(a^2 - b^2)$

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

24. If f(x) = $\begin{vmatrix} 0 & x-1 & x-2 \\ x+1 & 0 & x-c \\ x+2 & x+c & 0 \end{vmatrix}$, then **[1]**

a) f(1) = 0

b) f(3) = 0

c) f(0) = 0

d) f(2) = 0

25. If A, B are two n $\times$ n non - singular matrices, then what can you infer about AB? **[1]**

a) AB is singular

b) $(AB)^{-1}$ does not exist

c) AB is non-singular

d) $(AB)^{-1} = A^{-1}B^{-1}$

26. The determinant $\begin{vmatrix} x & \sin\theta & \cos\theta \\ -\sin\theta & -x & 1 \\ \cos\theta & 1 & x \end{vmatrix}$ is **[1]**

a) independent of both θ and x

b) independent of x only

c) independent of -x only

d) independent of θ only

27. The system of equations, x + 2y = 5 , 4x + 8y = 20 has **[1]**

a) no solution

b) Two solution

c) a unique solution

d) infinitely many solutions

28. If A = $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ B = $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then value of adj(AB) is **[1]**

a) $\begin{vmatrix} d & b \\ a & c \end{vmatrix}$

b) $\begin{vmatrix} d & -b \\ -c & a \end{vmatrix}$

c) $\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix}$

d) $\begin{vmatrix} 0 & 0 \\ 0 & 0 \end{vmatrix}$

29. If $A = \begin{bmatrix} 2x & 0 \\ x & x \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1 & 0 \\ -1 & 2 \end{bmatrix}$ then x = ?. **[1]**

a) 1

b) -2

c) $\frac{1}{2}$

d) 2

30. Let a, b, c $\in$ R^+ then the following system of equation in x, y, z given by $\frac{x^2}{a^2} + \frac{y^2}{b^2} - \frac{z^2}{c^2}$ = 1, $\frac{x^2}{a^2} - \frac{y^2}{b^2} + \frac{z^2}{c^2}$ = 1 and - $\frac{x^2}{a^2} + \frac{y^2}{b^2} + \frac{z^2}{c^2}$ = 1 has **[1]**

a) No solution

b) Finitely many solutions

c) Unique solution

d) Infinitely many solution

31. For the system of equations: **[1]**

x + 2y + 3z =1

2x + y + 3z = 2

5x + 5y + 9z = 4

a) there exists infinitely many solution

b) there is only one solution

c) there is no solution

d) there is two solution

32. If A is a square matrix such that A^2 = I, then $(A - I)^3 + (A + I)^3 - 7A$ is equal to **[1]**

a) I - A

b) A

c) 3A

d) I + A

33. If A is skew symmetric matrix of order 3, then the value of |A| is: **[1]**

a) 9

b) 3

c) 0

d) 27

34. If A is an invertible matrix of order 2, then det (A^{-1}) is equal to **[1]**

a) 0

b) $\frac{1}{\det(A)}$

c) det (A)

d) 1

35. Let M and N be two 3 $\times$ 3 non-singular skew-symmetric matrices such that MN = NM. If P' denotes the transpose of the matrix P, then $M^2 N^2 (M'N)^{-1} (MN^{-1})'$ is equal to **[1]**

a) MN

b) M^2

c) $-M^2$

d) $-N^2$

[1]

36. There are two values of λ such that $\begin{vmatrix} 0 & 2 & 0 \\ \lambda & 3 & \lambda \\ \lambda & 5 & 6 \end{vmatrix}$ = - 16 then the sum of two values of λ is

a) 0

b) 5

c) 6

d) 3

37. If $A = \begin{bmatrix} 2 & -1 \\ 1 & 3 \end{bmatrix}$, then A^{-1} = ? **[1]**

a) $\begin{bmatrix} \frac{3}{7} & \frac{1}{7} \\ \frac{-1}{7} & \frac{2}{7} \end{bmatrix}$

b) $\begin{bmatrix} \frac{3}{7} & \frac{-1}{7} \\ \frac{1}{7} & \frac{2}{7} \end{bmatrix}$

c) $\begin{bmatrix} \frac{1}{5} & \frac{2}{7} \\ \frac{1}{7} & \frac{3}{7} \end{bmatrix}$

d) $\begin{bmatrix} \frac{1}{3} & \frac{1}{7} \\ \frac{1}{7} & \frac{2}{7} \end{bmatrix}$

38. The number of solutions of 2x + y = 4, x – 2y = 2, 3x + 5y = 6 is **[1]**

a) Two solution

b) Infinitely many solution

c) One solution

d) No solution

39. If A is a skew-symmetric matrix of odd order n, then **[1]**

a) |A| = |A'|

b) |A| = -1

c) |A| = 1

d) |A| = 0

40. If $A = \begin{bmatrix} 3 & -4 \\ -1 & 2 \end{bmatrix}$ and B is square matrix of order 2 such that AB = I then B =? **[1]**

a) $\begin{bmatrix} 1 & \frac{1}{2} \\ 2 & \frac{3}{2} \end{bmatrix}$

b) $\begin{bmatrix} 1 & 2 \\ \frac{1}{2} & \frac{3}{2} \end{bmatrix}$

c) $\begin{bmatrix} 1 & 4 \\ 2 & 4 \end{bmatrix}$

d) $\begin{bmatrix} 1 & 2 \\ 2 & 3 \end{bmatrix}$

41. If $A = \begin{bmatrix} 2 & 2 \\ 4 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 \\ 2 & 0 \end{bmatrix}$, then **[1]**

a) |A| = 2|B|

b) |A| = |B|

c) |A| = -|B|

d) $|A| = 2^2|B|$

42. If A and B are square matrices of order 3, such that Det.A = –1, Det.B =3 then, the determinant of 3AB is equal to **[1]**

a) –27

b) -81

c) –9

d) 81

43. The system AX = B of n equations in n unknowns has infinitely many solutions if **[1]**

a) if det.A = 0, (adj A)B$\neq$O

b) det. A$\neq$0

c) if det. A$\neq$ 0, (adjA)B$\neq$ O

d) if det. A = 0 , (adj A) B =O

44. If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ be such that A^{-1} = kA, then k equals **[1]**

a) -19

b) 1/19

c) -1/19

d) 19

45. The value of $(A^{-1})^T$ is **[1]**

a) A^T

b) $\left(A^T\right)^{-1}$

c) A^{-1}

d) I

46. The pair of equations 3x - 5y = 7 and 6x - 10y = 14 have: **[1]**

a) a unique solution

b) two solutions

c) no solution

d) infinitely many solution

47. A(adj A) is equal to **[1]**

a) A

b) I

c) |A|I

d) O

48. If $A = \begin{vmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} \\ -\frac{1}{2} & \frac{\sqrt{3}}{2} \end{vmatrix}$ then A^3 is equal to **[1]**

a) $\begin{vmatrix} 0 & 1 \\ -1 & 0 \end{vmatrix}$

b) $\begin{vmatrix} 1 & 0 \\ 0 & -1 \end{vmatrix}$

c) $\begin{vmatrix} \frac{3\sqrt{3}}{2} & \frac{1}{8} \\ -\frac{1}{8} & \frac{3\sqrt{3}}{8} \end{vmatrix}$

d) $\begin{vmatrix} 0 & -1 \\ 1 & 0 \end{vmatrix}$

49. If A is a square matrix such that A^2 = A, then, det.(A) = ______ **[1]**

a) 2 or -2

b) 0 or - 1

c) 1 or - 1

d) 0 or 1

50. $A = \begin{bmatrix} -2 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & -2 \end{bmatrix}$, then the value of |adj A| is **[1]**

a) 16

b) -8

c) 0

d) 64

51. The system of linear equations x + y + z = 2, 2x + y - z = 3, 3x + 2y - kz = 4 has a unique solution if , **[1]**

a) k = 0

b) -1 < k < 1

c) -2 < k < 2

d) $k \neq 0$

52. If A is a matrix of order 3 and |A| = 8, then |adj A| = **[1]**

a) 2

b) 1

c) 2^6

d) 2^3

53. If cos 2θ = 0, then $\begin{vmatrix} 0 & \cos\theta & \sin\theta \\ \cos\theta & \sin\theta & 0 \\ \sin\theta & 0 & \cos\theta \end{vmatrix}^2$ is equal to **[1]**

a) $\frac{1}{2}$

b) -1

c) $\frac{-1}{2}$

d) 1

54. The equations x + 2y + 2z = 1 and 2x + 4y + 4z = 9 have **[1]**

a) no solution

b) only one solution

c) only two solutions

d) infinitely many solutions

55. If $A=\begin{bmatrix}1 & 2 & -1\\ -1 & 1 & 2\\ 2 & -1 & 1\end{bmatrix}$ then det.(adj (adj A)) = [1]

a) 13

b) 14^4

c) 14^2

d) 14^3

56. If $S=\begin{bmatrix}a & b\\ c & d\end{bmatrix}$, then adj A is [1]

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

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

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

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

57. Let $\begin{vmatrix}x^2+x & 2x-1 & x+3\\ 3x+1 & 2+x^2 & x^3-3\\ x-3 & x^2+4 & 2x\end{vmatrix}$ = $px^7 + qx^6 + rx^5 + sx^4 + tx^3 + ux^2 + vx + w$ then which of the following is not true? [1]

a) w = 21, v = 75

b) p = - 1, t = 8

c) p = q = -1

d) q = 0, s = - 4

58. The system of equations, x + y = 2 and 2x + 2y = 3 has [1]

a) a unique solution

b) finitely many solutions

c) no solution

d) infinitely many solutions

59. The inverse of the matrix X = $\begin{bmatrix}2 & 0 & 0\\ 0 & 3 & 0\\ 0 & 0 & 4\end{bmatrix}$ is: [1]

a) $\frac{1}{24}\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$

b) $\frac{1}{24}\begin{bmatrix}2 & 0 & 0\\ 0 & 3 & 0\\ 0 & 0 & 4\end{bmatrix}$

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

d) $24\begin{bmatrix}\frac{1}{2} & 0 & 0\\ 0 & \frac{1}{3} & 0\\ 0 & 0 & \frac{1}{4}\end{bmatrix}$

60. If A is a square matrix, B is singular matrix of same order, then for a positive integer n, $(A^{-1} BA)^n$ equals to [1]

a) $n(A^{-1} BA)$

b) $A^n B^n A^{-n}$

c) $A^{-n} B^n A^n$

d) $A^{-1}B^n A$

61. If $A=\begin{bmatrix}1 & 0 & 1\\ 0 & 0 & 1\\ a & b & 2\end{bmatrix}$, then $aI + bA + 2A^2$ equals. [1]

a) -A

b) none of these

c) adj A

d) A

62. If $\Delta=\begin{vmatrix}a & h & g\\ h & b & f\\ g & f & c\end{vmatrix}$, then the cofactor A_{21} is [1]

a) -(hc + fg)   b) hc - fg

c) fg + hc   d) fg - hc

63. If $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ then A^{-1} = ? **[1]**

a) -adj A   b) adj A

c) -A   d) A

64. If A is a non singular matrix of order 3 , then $|adj(A^3)|$= **[1]**

a) $|A|^7$ b) $|A|^8$

c) $|A|^6$ d) $|A|^9$

65. If, A = $\begin{bmatrix} 1 & 4 \\ 3 & 15 \end{bmatrix}$, then $|A^{-1}|$ is equal to **[1]**

a) $\frac{2}{3}$ b) $\frac{4}{3}$

c) $\frac{1}{3}$ d) $-\frac{1}{3}$

66. The number of solutions of the system of equations: **[1]**

2x + y - z = 7,

x - 3y + 2z = 1,

x + 4y - 3z = 5, is

a) 0   b) 1

c) 2   d) 3

67. If d is the determinant of a square matrix A of order n, then the determinant of its adjoint is **[1]**

a) d   b) d^{n-1}

c) d^n d) d^{n+1}

68. The vertices of a a ABC are A(-2, 4), B(2, -6) and C(5, 4). The area of a ABC is **[1]**

a) 17.5 sq units   b) 32 sq units

c) 35 sq units   d) 28 sq units

69. Let A = $\begin{vmatrix} 4 & 2 & -1 \\ 3 & 5 & 7 \\ 1 & 2 & 1 \end{vmatrix}$ then **[1]**

a) Tr(A - A') = 20   b) Tr(A + A') = 10

c) Tr(A - A) = 10   d) Tr(A + A') = 20

70. If A is a 3×3 matrix and |A| = -2, then value of |A (adj A)| is **[1]**

a) -2   b) 8

c) 2   d) -8

71. If A = $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{vmatrix}$, then A^2 is: **[1]**

a) 27A   b) 3A

c) 2A

d) I

72. The value of the determinant $\begin{vmatrix} 2 & 7 & 1 \\ 1 & 1 & 1 \\ 10 & 8 & 1 \end{vmatrix}$ is: **[1]**

a) 49

b) -51

c) -79

d) 47

73. If the trace of the matrix **[1]**

A = $\begin{vmatrix} x-5 & 0 & 2 & 4 \\ 3 & x^2-10 & 6 & 1 \\ -2 & 3 & x-7 & 1 \\ 1 & 2 & 0 & -2 \end{vmatrix}$ assumes the value zero, then the value of x equals to

a) 6, 4

b) -6, 4

c) 6, -4

d) -6, -4

74. Let P = $\begin{vmatrix} 3 & -1 & -2 \\ 2 & 0 & \alpha \\ 3 & -5 & 0 \end{vmatrix}$, where $\alpha \in$ R, Suppose Q$[a_{ij}]$ is a matrix such that PQ = kI where k $\in$ R, k $\neq$ 0 and I is the identity matrix of order 3. If $q_{23} = -\frac{k}{8}$ and let det (Q) = $\frac{k^2}{2}$, then **[1]**

a) 4α - k + 8 = 0

b) 4α - k + 8 = 0 and det(P adj Q) = 2^9

c) α = 0, k = 8

d) det(P adj Q) = 2^9

75. If the adjoint of a 3 $\times$ 3 matrix P is $\begin{vmatrix} 1 & 4 & 4 \\ 2 & 1 & 7 \\ 1 & 1 & 3 \end{vmatrix}$, then the possible values of the determinant of P is/are **[1]**

a) ± 1

b) -1

c) 1

d) ± 2