MATRICES

1. A matrix is a
   (a) collection of real numbers
   (b) an array of real numbers
   (c) a rectangular array of real or complex numbers
   (d) a collection of real or complex numbers.

2. If A' is the transpose of a square matrix A, then
   (a) $|A| \neq |A'|$
   (b) $|A| = |A'|$
   (c) $|A| + |A'| = 0$
   (d) $|A| = |A'|$ only when A is symmetrix.

3. In an upper triangular matrix A = $[aij]_{n\times n}$ the elements $aij=0$ for
   (a) $i<j$ (b) $i=j$
   (c) $i>j$ (d) $i\leq j$

4. Which of the following matrices is not invertible
   (a) $\begin{bmatrix}1 & 1\\ 0 & 1\end{bmatrix}$ (b) $\begin{bmatrix}2 & 3\\ 4 & 6\end{bmatrix}$
   (c) $\begin{bmatrix}-1 & -1\\ -1 & 2\end{bmatrix}$ (d) $\begin{bmatrix}2 & -2\\ 1 & 1\end{bmatrix}$

5. If I_n is the identity matrix of order n, then $(I_n)^{-1}$
   (a) does not exist (b) $= I_n$
   (c) =O (d) $= nI_n$

6. If $A = \begin{bmatrix} i & 0\\ 0 & i\end{bmatrix}, n \in N$ then A^{4n} equals
   (a) $\begin{bmatrix}0 & i\\ i & 0\end{bmatrix}$ (b) $\begin{bmatrix}0 & 0\\ 0 & 0\end{bmatrix}$
   (c) $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ (d) $\begin{bmatrix}0 & i\\ i & 0\end{bmatrix}$

7. If $[1 \quad x \quad 1]\begin{bmatrix}1 & 3 & 2\\ 0 & 5 & 1\\ 0 & 3 & 2\end{bmatrix}\begin{bmatrix}1\\ 1\\ x\end{bmatrix} = 0$ then x is equal to
   (a) 1 (b) -1
   (c) $\dfrac{-9\pm\sqrt{53}}{2}$ (d) None of these

8. If the system of equation $\lambda x + 2y - 2z = 1, 4x + 2\lambda y - z = 2$ *and* $6x + 6y + \lambda z = 3$ has a unique solution then.
   (a) $\lambda \neq 1$ (b) $\lambda \neq 2$
   (c) $\lambda \neq 3$ (d) None of these.

9. If A & B are two matrices such that AB=B and BA=A then $A^2 + B^2 =$
   (a) 2AB (b) 2BA
   (c) A+B (d) AB

10. The system of linear equations
    x+y+z=2,
    2x+y-z=3 and
    3x+2y+kz=4
    has a unique solution if
    (a) $K \neq 0$ (b) -1<K<1
    (c) -2<K<2 (d) k=0

11. Let
    $A = \begin{bmatrix}1 & -1 & 1\\ 2 & 1 & -3\\ 1 & 1 & 1\end{bmatrix}$ *and* $10B = \begin{bmatrix}4 & 2 & 2\\ -5 & 0 & \alpha\\ 1 & -2 & 3\end{bmatrix}$
    if B is inverse of matrix A then α is
    (a) 2 (b) -1
    (c) -2 (d) 5

12. If w be the complex cube root of unity and $A = \begin{bmatrix}w & 0\\ 0 & w\end{bmatrix}$ then A^{70} is equal to
    (a) 0 (b) A
    (c) -A (d) None

13. If

$$A=\begin{bmatrix} a+ib & c+id \\ -c+id & a-ib \end{bmatrix} where\ a^2+b^2+c^2+d^2=1$$

then A^{-1} is equal to

(a) $\begin{bmatrix} a-ib & -c+id \\ c+id & a+ib \end{bmatrix}$

(b) $\begin{bmatrix} a-ib & c-id \\ -c-id & a+ib \end{bmatrix}$

(c) $\begin{bmatrix} a-ib & -c-id \\ c-id & a+ib \end{bmatrix}$

(d) None of these

14. If $A=\begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix} \& B=\begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$ whenever

$A^2=B$ then value of α is

(a) 1 (b) -1

(c) 4 (d) None of these.

15. If $A=\begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$ then the value of $|adjA|$

(a) a^{27} (b) a^9

(c) a^6 (d) a^2

16. For any 2 X 2 matrix A, if

A[adj(A)] = $\begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$ then | A | is equal to

(a) 20 (b) 100

(c) 10 (d) 0

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

(a) $(14)^4$

(b) $(14)^3$

(c) $(14)^2$

(d) $(14)^1$

18. If A = [*aij*] is a scalar matrix of order n x n such that $a_{ii}=k$ for all i, then trace of A =

(a) k^n (b) $\frac{n}{k}$

(c) nk (d) *none*

19. 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 the matrix A is equal to

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

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

20. If A = $\begin{bmatrix} 1 & -1 \\ 2 & 1 \end{bmatrix}, B=\begin{bmatrix} a & 1 \\ b & -1 \end{bmatrix}$ and

$(A+B)^2=A^2+B^2+2AB$, then values of a and b are

(a) *a=1, b=-2* *(b)* *a=1, b=2*

(c) *a=-1, b=2* *(d)* *a=-1, b=-2*

21. If the matrix $\begin{bmatrix} 0 & 2\beta & \gamma \\ \alpha & \beta & -\gamma \\ \alpha & -\beta & \gamma \end{bmatrix}$ is

orthogonal, then

(a) $\alpha=\pm\frac{1}{\sqrt{2}}$ (b) $\beta=\pm\frac{1}{\sqrt{6}}$

(c) $\gamma=\pm\frac{1}{\sqrt{3}}$ (d) *all of these*

22. If A = $\begin{bmatrix} \alpha & 2 \\ 2 & \alpha \end{bmatrix} and\ |A^3|=125$, then α =

(a) ±3 (b) ±2

(c) ±5 (d) 0

23. If A = $\begin{bmatrix} 3 & 2 \\ 0 & 1 \end{bmatrix}$, then $\left(A^{-1}\right)^3$ is equal to

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

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

24. If [ ] denotes the greatest integer less than or equal to the real number under consideration and $-1 \le x \le 0; 0 \le y < 1; 1 \le z \le 2,$ then the value of the determinant

$$\begin{bmatrix} [x]+1 & [y] & [z] \\ [x] & [y]+1 & [z] \\ [x] & [y] & [z]+1 \end{bmatrix} \text{ is}$$

(a) [x] (b) [y]

(c) [z] (d) None of these

25. If A is a skew-symmetric matrix, then trace of A is

(a) 1 (b) -1

(c) 0 (d) none

26. If each element of a 3 x 3 matrix is multiplied by 3, then the determinant of the newly formed matrix is

(a) 3 | A | (b) 9 | A |

(c) 27 | A | (d) $|A|^3$

27. Matrix $A_\lambda = \begin{bmatrix} \lambda & \lambda-1 \\ \lambda-1 & \lambda \end{bmatrix}, \lambda \in N$.

The value of $|A_1| + |A_2| + ... + |A_{300}|$ is

(a) $(299)^2$ (b) $(300)^2$

(c) $(301)^2$ (d) none

28. If $\begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is to be square root of the two rowed unit matrix, then α, β and γ should satisfy the relation

(a) $1+\alpha^2+\beta\gamma=0$ (b) $1-\alpha^2-\beta\gamma=0$

(c) $1-\alpha^2+\beta\gamma=0$ (d) $1+\alpha^2-\beta\gamma=0$

29. If D = diag $[d_1, d_2, ...d_n]$ where $d_i \neq 0 \forall i = 1,2,3....,n$ *then* D^{-1} is equal to

(a) D

(b) I_n

(c) $diag\left(d_1^{-1}, d_2^{-1}, ...d_n^{-1}\right)$

(d) none

30. $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & -2 & 4 \end{bmatrix}, I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$A^{-1} = \frac{1}{6}\left(A^2 + CA + DI\right)$ then C and D equal to

(a) -11, 6 (b) -6, 11

(c) 6, 11 (d) -6, -11

31. The equations $x+2y+3z=1$, $2x+y+3z=2$, $5x+5y+9z=4$ have

(a) unique solutions (b) inconsistent

(c) infinite many solutions (d) none

32. $\begin{vmatrix} a-b & b-c & c-a \\ x-y & y-z & z-x \\ p-q & q-r & r-p \end{vmatrix}$

(a) abc (b) $p+q+r$

(c) $x^2y^2z^2$ (d) 0

33. Let $\omega = -\frac{1}{2} + i\frac{\sqrt{3}}{2}$. Then the value of the determinant $\begin{vmatrix} 1 & 1 & 1 \\ 1 & -1-\omega^2 & \omega^2 \\ 1 & \omega^2 & \omega^4 \end{vmatrix}$ is

(a) 3ω (b) $3\omega(\omega-1)$

(c) $3\omega(1-\omega)$ (d) $3\omega^2$

34. If $\Delta_1 = \begin{vmatrix} 7 & x & 2 \\ -5 & x+1 & 3 \\ 4 & x & 7 \end{vmatrix}$ and

$\Delta_2 = \begin{vmatrix} x & 2 & 7 \\ x+1 & 3 & -5 \\ x & 7 & 4 \end{vmatrix}$ then $\Delta_1 - \Delta_2$ for values of x equal to

(a) 0 (b) 2

(c) $x \in R$ (d) none

35. If $\Delta_1 = \begin{vmatrix} a & b & 2c \\ p & q & 2r \\ x & y & 2z \end{vmatrix}$ and $\Delta_2 = \begin{vmatrix} r & 2p & q \\ 2z & 4x & 2y \\ c & 2a & b \end{vmatrix}$

then Δ_1 / Δ_2 is equal to

(a) 1 (b) 2

(c) -1 (d) ½

36. If $A+B+C=\pi$, then the value of $\begin{vmatrix} \sin(A+B+C) & \sin B & \cos C \\ -\sin B & 0 & \tan A \\ \cos(A+B) & -\tan A & 0 \end{vmatrix}$ is equal to

(a) 0 (b) 1

(c) 2 *sinBtanAcosC* (d) *none*

37. The value of the determinant

$$\Delta = \begin{vmatrix} \log x & \log y & \log z \\ \log 2x & \log 2y & \log 2z \\ \log 3x & \log 3y & \log 3z \end{vmatrix} \text{ is}$$

(a) 0 (b) log*xyz*

(c) *log(6 xyz)* (d) *6 log (xyz)*

38. If A, B, C be the angles of a triangle, then

$$\Delta = \begin{vmatrix} -1+\cos B & \cos C+\cos B & \cos B \\ \cos C+\cos A & -1+\cos A & \cos A \\ -1+\cos B & -1+\cos A & -1 \end{vmatrix} \text{ is}$$

(a) -1 (b) 0

(c) 1 (d) 2

39. If $\begin{vmatrix} b+c & c & b \\ c & c+a & a \\ b & a & a+b \end{vmatrix} = K\,abc$, then K is equal to

(a) 1 (b) 2

(c) 3 (d) 4

40. If *a, b, c* are in A.P., then the value of the determinant $\begin{vmatrix} x+1 & x+2 & x+a \\ x+2 & x+3 & x+b \\ x+3 & x+4 & x+c \end{vmatrix}$ is

(a) *x* *(b)* *2x*

(c) *0* *(d)* *none*

41. If $\Delta_r = \begin{vmatrix} r-1 & n & 6 \\ (r-1)^2 & 2n^2 & 4n-2 \\ (r-1)^3 & 3n^2 & 3n^3-3n \end{vmatrix}$, then $\sum_{r=1}^{n} \Delta_r$ is equal to

(a) 1 (b) 2

(c) 3 (d) 0

42. If *a, b, c* are the pth, qth and rth terms respectively of a geometric progression, then $\begin{vmatrix} \log a & p & 1 \\ \log b & q & 1 \\ \log c & r & 1 \end{vmatrix}$ is equal to

(a) 0

(b) 1

(c) -1

(d) none

43. The value of the determinant

$$\begin{vmatrix} 1^2 & 2^2 & 3^2 & 4^2 \\ 2^2 & 3^3 & 4^2 & 5^2 \\ 3^2 & 4^2 & 5^2 & 6^2 \\ 4^2 & 5^2 & 6^2 & 7^2 \end{vmatrix} \text{ is}$$

(a) 1 (b) 0

(c) 2 (d) none

44. The det. $\begin{vmatrix} xp+y & x & y \\ yp+z & y & z \\ 0 & xp+y & yp+z \end{vmatrix} = 0$ if

(a) x, y z are in A.P

(b) x, y, z are in G.P.

(c) x, y, z are in H.P.

(d) xy, yz, zx are in A.P.

45. If $\begin{vmatrix} x & 3 & 7 \\ 2 & x & 2 \\ 7 & 6 & x \end{vmatrix} = 0$ then x is equal to

(a) -9 (b) 2

(c) 7 (d) all of these

46. If

$$\Delta(x) = \begin{vmatrix} 1 & x & (x+1) \\ 2x & x(x-1) & x(x+1) \\ 3x(x-1) & x(x-1)(x-2) & x(x^2-1) \end{vmatrix}$$

then $\Delta(100)$ equals

(a) 0 (b) -100

(c) 100! (d) -100!

47. If

$$\begin{vmatrix} \lambda^2+3\lambda & \lambda-1 & \lambda+3 \\ \lambda+1 & 1-2\lambda & \lambda-4 \\ \lambda-2 & \lambda+4 & 3\lambda \end{vmatrix} = p\lambda^4+q\lambda^3+r\lambda^2+s\lambda+t$$

then t is

(a) 5 (b) 10

(c) -10 (d) 15.

48. If $\Delta(x)=\begin{vmatrix} 1 & 1 & 1 \\ (e^x+e^{-x})^2 & (\pi^x+\pi^{-x})^2 & 2 \\ \left(e^x-e^{-x}\right)^2 & \left(\pi^x-\pi^{-x}\right)^2 & -2 \end{vmatrix}$

then $\Delta(x)$ equals to

(a) $e^{x^2}-\pi^{x^2}$ (b) e^{x^2}

(c) 0 (d) $x^2-\pi$

49. If $\Delta_1=\begin{vmatrix} x & b & b \\ a & x & b \\ a & a & x \end{vmatrix} ...and...\Delta_2=\begin{vmatrix} x & b \\ a & x \end{vmatrix}$ are the given determinants, then

(a) $\Delta_1=3(\Delta_2)^2$ (b) $\frac{d}{dx}(\Delta_1)=3\Delta_2$

(c) $\frac{d}{dx}\Delta_1=3{\Delta_2}^2$ (d) $\Delta_1=3(\Delta_2)^{3/2}$

50. The value of n for which the determinant $\begin{vmatrix} 8_{c_3} & 9_{c_5} & 10_{c_7} \\ 8_{c_4} & 9_{c_6} & 10_{c_8} \\ 9_{c_n} & 10_{c_{n+2}} & 11_{c_{n+4}} \end{vmatrix}$ becomes zero if

(a) n = 2 (b) n = 3

(c) n = 4 (d) None of the

ANSWERS

1. (c)	**2.** (b)	**3.** (c)	**4.** (b)	**5.** (b)	**6.** (c)	**7.** (c)	**8.** (b)	**9.** (c)	**10.** (a)
11. (d)	**12.** (b)	**13.** (c)	**14.** (d)	**15.** (c)	**16.** (c)	**17.** (a)	**18.** (c)	**19.** (c)	**20.** (d)
21. (d)	**22.** (a)	**23.** (a)	**24.** (c)	**25.** (c)	**26.** (c)	**27.** (b)	**28.** (b)	**29.** (c)	**30.** (b)
31. (a)	**32.** (d)	**33.** (b)	**34.** (a)	**35.** (d)	**36.** (a)	**37.** (a)	**38.** (b)	**39.** (d)	**40.** (c)
41. (d)	**42.** (a)	**43.** (b)	**44.** (b)	**45.** (d)	**46.** (a)	**47.** (b)	**48.** (c)	**49.** (b)	**50.** (c)