EXERCISE LEVEL –I

EL– I

Q.1 The determinant $\begin{vmatrix} a+b+2c & a & b \\ c & b+c+2a & b \\ c & a & c+a+2b \end{vmatrix}$ of is equal to.

(A) $2(a + b + c)$ (B) $2(a + b + c)^2$
(C) $2(a + b + c)^3$ (D) $(2a + 2b + 2c)^3$

Q.2 $\begin{vmatrix} a & b & a\alpha+b \\ b & c & b\alpha+c \\ a\alpha+b & b\alpha+c & 0 \end{vmatrix} = 0$, then a, b, c are in -

(A) A.P. (B) G.P. (C) H.P. (D) None of these

Q.3 $\begin{vmatrix} b^2+c^2 & a^2 & a^2 \\ b^2 & c^2+a^2 & b^2 \\ c^2 & c^2 & a^2+b^2 \end{vmatrix}$ is equal to -

(A) $a^2b^2c^2$ (B) $2a^2b^2c^2$
(C) $4a^2b^2c^2$ (D) None of these

Q.4 If $\begin{vmatrix} a & 5x & p \\ b & 10y & 5 \\ c & 15z & 15 \end{vmatrix} = 125$, then the value of $\begin{vmatrix} 3a & 3b & c \\ x & 2y & z \\ p & 5 & 5 \end{vmatrix}$ is

(A) 25 (B) 50 (C) 75 (D) 100

Q.5 $\Delta = \begin{vmatrix} \lambda & c & -b \\ -c & \lambda & a \\ b & -a & \lambda \end{vmatrix}$, then the value of $\Delta' = \begin{vmatrix} a^2+\lambda^2 & ab+c\lambda & ca-b\lambda \\ ab-c\lambda & b^2+\lambda^2 & bc+a\lambda \\ ac+b\lambda & bc-a\lambda & c^2+\lambda^2 \end{vmatrix}$ is -

(A) 3Δ (B) Δ^2 (C) Δ^3 (D) None of these

Q.6 The value of the determinant $\begin{vmatrix} 0 & (a-b)^2 & (a-c)^2 \\ (b-a)^2 & 0 & (b-c)^2 \\ (c-a)^2 & (c-b)^2 & 0 \end{vmatrix}$ is identical to -

(A) $(a – b)^2 (b – c)^2 (c – a)^2$ (B) 0
(C) $2(a – b)^2 (b – c)^2 (c – a)^2$ (D) None of these

Q.7 If $0 < \theta < \frac{\pi}{2}$ and $\begin{vmatrix} 1+\sin^2\theta & \cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & 1+\cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & \cos^2\theta & 1+4\sin 4\theta \end{vmatrix} = 0$ then find the value of θ.

(A) $\frac{\pi}{24}, \frac{5\pi}{24}$ (B) $\frac{5\pi}{24}, \frac{7\pi}{24}$ (C) $\frac{7\pi}{24}, \frac{11\pi}{24}$ (D) None of these

Q.8 $\begin{vmatrix} {}^xC_1 & {}^xC_2 & {}^xC_3 \\ {}^yC_1 & {}^yC_2 & {}^yC_3 \\ {}^zC_1 & {}^zC_2 & {}^zC_3 \end{vmatrix}$ is equal to -

(A) xyz (x – y)(y – z)(z – x) (B) $\frac{xyz}{6}$ (x – y)(y– z) (z – x)

(C) $\frac{xyz}{12}$ (x – y)(y – z)(z – x) (D) None of these

Q.9 If $\Delta_1 = \begin{vmatrix} x & b & b \\ a & x & b \\ a & a & x \end{vmatrix}$ and $\Delta_2 = \begin{vmatrix} x & b \\ a & x \end{vmatrix}$ then which one is right.

(A) $\Delta_1 = 3\Delta_2^2$ (B) $\frac{d}{dx}(\Delta_1) = 3\Delta_2^2$

(C) $\frac{d}{dx}(\Delta_1) = 3\Delta_2$ (D) None of these

Q.10 The determinant $\begin{vmatrix} a_1 & ma_1 & b_1 \\ a_2 & ma_2 & b_2 \\ a_3 & ma_3 & b_3 \end{vmatrix}$ value is -

(A) 0 (B) $ma_1a_2a_3$ (C) $ma_1b_2a_2$ (D) $mb_1b_2b_3$

Q.11 If the determinant is denoted by $\Delta = \begin{vmatrix} a & 0 & 0 \\ b & c & a \\ c & a & b \end{vmatrix}$, then $\begin{vmatrix} p^2a & 0 & 0 \\ pb & c & a \\ pc & a & b \end{vmatrix}$ is equal to-

(A) $p\Delta$ (B) $p^2\Delta$ (C) $p^3\Delta$ (D) $2p\Delta$

Q.12 the determinant $\begin{vmatrix} \frac{1}{a} & 1 & bc \\ \frac{1}{b} & 1 & ca \\ \frac{1}{c} & 1 & ab \end{vmatrix}$ value is equal to

(A) abc (B) $\frac{1}{abc}$ (C) 0 (D) None of these

Q.13 If every row in a third-order determinant with a value of Δ is multiplied by 3, the new determinant's value is -

(A) Δ (B) 27 Δ (C) 21 Δ (D) 54 Δ

Q.14 Find the sum of infinite series $\begin{vmatrix} 1 & 2 \\ 6 & 4 \end{vmatrix} + \begin{vmatrix} \frac{1}{2} & 2 \\ 2 & 4 \end{vmatrix} + \begin{vmatrix} \frac{1}{4} & 2 \\ \frac{2}{3} & 4 \end{vmatrix} + ...$

(A) –10 (B) 0 (C) 10 (D) ∞

Q.15 Evaluate $\begin{vmatrix} a & ma+nx & x \\ b & mb+ny & y \\ c & mc+nz & z \end{vmatrix}$

(A) a + b + c
(B) x + y + z
(C) m(a + b + c) + n(x + y + z)
(D) 0

Q.16 What is the value of $\begin{vmatrix} a & a+b & a+b+c \\ 2a & 3a+2b & 4a+3b+2c \\ 3a & 6a+3b & 10a+6b+3c \end{vmatrix}$

(A) a^3 (B) b^3 (C) c^3 (D) $a^3 + b^3 + c^3$

Q.17 Find the determinant $\begin{vmatrix} ka & k^2+a^2 & 1 \\ kb & k^2+b^2 & 1 \\ kc & k^2+c^2 & 1 \end{vmatrix}$ value.

(A) k (a + b) (b + c) (c + a)
(B) k abc $(a^2 + b^2 + c^2)$
(C) k (a – b) (b – c) (c – a)
(D) k (a + b – c) (b + c – a) (c + a – b)

Q.18 Find the value of $\sum_{r=1}^{n} \Delta_r$ If $\Delta_r = \begin{vmatrix} r & x & \frac{n(n+1)}{2} \\ 2r-1 & y & n^2 \\ 3r-2 & z & \frac{n(3n-1)}{2} \end{vmatrix}$, is given.

(A) $\frac{1}{6}n(n+1)(2n+1)$
(B) $\frac{1}{4}n^2(n+1)^2$
(C) 0
(D) None of these

Q.19 Given $\begin{vmatrix} a+x & a-x & a-x \\ a-x & a+x & a-x \\ a-x & a-x & a+x \end{vmatrix} = 0$, find the value of x.

(A) 0, a (B) 0, – a (C) a, – a (D) 0, 3a

Q.20 In the case of any ΔABC, the determinant $\begin{vmatrix} \sin^2 A & \cot A & 1 \\ \sin^2 B & \cot B & 1 \\ \sin^2 C & \cot C & 1 \end{vmatrix}$ value is-

(A) 0
(B) 1
(C) sin A sin B sin C
(D) sin A + sin B + sin C

Q.21 What is the formula for determining the area of a triangle with vertices (x_1,y_1), (x_2,y_2), (x_3,y_3) among the options below?

(a) $\Delta = \begin{Vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{Vmatrix}$ (b) $\Delta = \frac{1}{2}\begin{Vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 0 \\ x_3 & y_3 & 1 \end{Vmatrix}$

(c) $\Delta = \frac{1}{2}\begin{Vmatrix} x_1 & y_1 & 1 \\ x_2 & 1 & 1 \\ x_3 & y_3 & 1 \end{Vmatrix}$ (d) $\Delta = \frac{1}{2}\begin{Vmatrix} x_1 & y_1 & 1 \\ x_2 & y_2 & 1 \\ x_3 & y_3 & 1 \end{Vmatrix}$

Q.22 What is the area of the triangle defined by the vertices (0,1), (0,2), (1,5)?
(a) 1 square unit (b) 2 square unit
(c) $\frac{1}{3}$ square unit (d) $\frac{1}{2}$ square unit

Q.23 The triangle formed by three collinear points has an area of zero.
(a) True (b) False

Q.24 Determine the value of k for which (1,2), (3,0), (2,k) are collinear.
(a) 0 (b) -1 (c) 2 (d) 1

Q.25 Calculate the area of the triangle if the vertices are (0,2), (0, 0), (3, 0)?
(a) 1 sq. unit (b) 5 sq. units (c) 2 sq. units (d) 3 sq. units

Q.26 Determine the equation of the line formed by joining points A(2,1) and B(6,3) using determinants.
(a) 2y-x=0 (b) 2y + x=0 (c) y-x=0 (d) y-2x=0

Q.27 Calculate the area of the triangle define by the vertices (2,3), (4,1), (5,0).
(a) 3 sq. units (b) 2 sq. units (c) 0 (d) 1 sq. unit

Q.28 Determine the equation of the line formed by joining A(5,1), B(4,0) using determinants.
(a) 4x-y=4 (b) x-4y=4 (c) x-y=4 (d) x-y=0

Q.29 Determine the value of k for which the points (3, 2), (1,2), (5,k) are collinear.
(a) 2 (b) 5 (c) 4 (d) 9

Q.30 The cofactors corresponding to the elements 1, –2, –3 and 4 in matrix $\begin{vmatrix} 1 & -2 \\ -3 & 4 \end{vmatrix}$ are
(A) 4, 3, 2, 1 (B) –4, 3, 2, –1 (C) 4, –3, –2, 1 (D) –4, –3, –2, –1

Q.31 The minors associated with the elements of the first row in the determinant $\begin{vmatrix} 2 & -1 & 4 \\ 4 & 2 & -3 \\ 1 & 1 & 2 \end{vmatrix}$ are:
(A) 2, 7, 11 (B) 7, 11, 2 (C) 11, 2, 7 (D) 7, 2, 11

Q.32 If $\Delta = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$ and A_2, B_2, C_2 represent the cofactors of a_2, b_2, c_2 then expression $a_1A_2 + b_1B_2 + c_1C_2$ is equal to
(A) $-\Delta$ (B) 0 (C) Δ (D) None of these

Q.33 For a 4 × 4 matrix $A = (a_{ij})$ with c_{ij} as the cofactor of the element a_{ij} in Det (A), the expression $a_{11}c_{11} + a_{12}c_{12} + a_{13}c_{13} + a_{14}c_{14}$ is equal to

(A) 0 (B) – 1 (C) 1 (D) Det. (A)

Q.34 If the cofactor of 2x in the determinant $\begin{vmatrix} x & 1 & -2 \\ 1 & 2x & x-1 \\ x-1 & x & 0 \end{vmatrix}$ is zero, then the value of x is:

(A) 0 (B) 2 (C) 1 (D) –1

Q.35 Which of the following represents the adjoint of the matrix $A = \begin{bmatrix} 1 & 5 \\ 3 & 4 \end{bmatrix}$?

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

Q.36 If $A = \begin{bmatrix} 5 & -8 \\ 2 & 6 \end{bmatrix}$ determine A (adj A).

(a) $\begin{bmatrix} 41 & 0 \\ 0 & 46 \end{bmatrix}$ (b) $\begin{bmatrix} 46 & 0 \\ 1 & 46 \end{bmatrix}$ (d) $\begin{bmatrix} 46 & 0 \\ 0 & 46 \end{bmatrix}$

Q.37 If $A = \begin{bmatrix} 1 & 0 \\ 9 & 4 \end{bmatrix}$ then (adj A) A is

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

Q.38 What is the formula used to compute the inverse of the matrix among the following options?

(a) $\frac{2}{|A|}\text{adj}A$ (b) $\frac{1}{|A|}\text{adj}A$ (c) $\frac{-1}{|A|}\text{adj}A$ (d) $\frac{1}{|2A|}\text{adj}A$

Q.39 Determine the inverse of the matrix $A = \begin{bmatrix} 8 & 5 \\ 4 & 1 \end{bmatrix}$

(a) $\begin{bmatrix} -\frac{1}{12} & \frac{5}{12} \\ \frac{1}{3} & -\frac{2}{3} \end{bmatrix}$ (b) $\begin{bmatrix} \frac{1}{12} & \frac{5}{12} \\ \frac{1}{3} & -\frac{2}{3} \end{bmatrix}$

(c) $\begin{bmatrix} -\frac{1}{12} & \frac{5}{12} \\ \frac{1}{3} & \frac{2}{3} \end{bmatrix}$ (d) $\begin{bmatrix} -\frac{1}{12} & \frac{5}{12} \\ -\frac{1}{3} & -\frac{2}{3} \end{bmatrix}$

Q.40 Which of the following conditions is not accurate for the inverse of matrix A?

(a) The matrix A must be a square matrix
(b) A must be singular matrix
(c) A must be a non-singular matrix
(d) adj A≠0

Q.41 Among the provided matrices, which one possesses an inverse $\frac{1}{-6}\begin{bmatrix} 2 & 1 \\ 0 & -3 \end{bmatrix}$?

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

Q.42 If the matrices $A = \begin{bmatrix} -8 & 2 \\ 6 & -3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 1 & 7 \end{bmatrix}$ given then find the $(AB)^{-1}$

(a) $-\frac{1}{432}\begin{bmatrix} -27 & 6 \\ 9 & 14 \end{bmatrix}$ (b) $\frac{1}{432}\begin{bmatrix} 27 & 6 \\ 9 & 14 \end{bmatrix}$

(c) $\frac{1}{432}\begin{bmatrix} -27 & 6 \\ 9 & 14 \end{bmatrix}$ (d) $\frac{-1}{432}\begin{bmatrix} 27 & 6 \\ 9 & 14 \end{bmatrix}$

Q.43 Which of the following formula is not accurate?

(a) $A(\text{adj } A)=|A|I$

(b) $|\text{adj }(A)|=|A|^{n-1}$, for an n^{th} order matrix

(c) $A^{-1}=\frac{1}{|A|}\text{adj } A$

(d) $A(\text{adj } A)=|A|^{n-1}$

Q.44 A square matrix A is considered non-singular if the determinant $|A| \neq 0$

(a) True (b) False

Q.45 The system of equations $x + 2y + 3z = 1$, $2x + y + 3z = 2$ and $5x + 5y + 9z = 4$ has.

(A) Unique solution (B) many solutions

(C) Inconsistent (D) None of these

Q.46 The presence of unique solution in the system $x + y + z = b$, $2x + 3y - z = 6$, $5x - y + az = 10$ relies on.

(A) b only (B) a only (C) a and b (D) neither a nor b

Q.47 for what value of p does this system have no solution $px + y + z = 1$, $x + py + z = p$, $x + y + pz = p^2$, have no solution.

(A) –2 (B) –1 (C) 1 (D) 0

Q.48 The value of k for which the system of equations $3x + ky - 2z = 0$, $x + ky + 3z = 0$ and $2x + 3y - 4z = 0$ has a non – trivial solution is-

(A) 15 (B) 16 (C) $\frac{31}{2}$ (D) $\frac{33}{2}$

Q.49 The determinant $\begin{vmatrix} \cos(\theta+\phi) & -\sin(\theta+\phi) & \cos 2\phi \\ \sin\theta & \cos\theta & \sin\phi \\ -\cos\theta & \sin\theta & \cos\phi \end{vmatrix}$ is-

(A) 0 (B) independent of θ

(C) Independent of ϕ (D) independent of both θ and ϕ

Q.50 The system of linear equations $x + y + z = 2$, $2x + y - z = 3$, $3x + 2y + kz = 4$ has a unique solution if-

(A) $k \neq 0$ (B) $-1 < k > 1$ (C) $-2 < k < 2$ (D) $k = 0$

Q.51 If the system of equations, $x + 2y - 3z = 1$, $(k + 3)z = 3$, $(2k + 1)x + z = 0$ is inconsistent, then what is the value of k.

(A) –3 (B) $\frac{1}{2}$ (C) 0 (D) 2

Q.52 The system of equation $x + 2y + 3z = 1, 2x + y + 3z = 2, 5x + 5y + 9z = 4$ possesses.

(A) unique solution (B) infinitely many solutions

(C) inconsistent (D) None of these

Q.53 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) $\begin{bmatrix}3 & -4 & -5\\ 9 & 1 & -4\\ 5 & -3 & -1\end{bmatrix}$

Q.54 Inverse of the matrix $\begin{bmatrix}\cos 2\theta & -\sin 2\theta\\ \sin 2\theta & \cos 2\theta\end{bmatrix}$ is

(A) $\begin{bmatrix}\cos 2\theta & -\sin 2\theta\\ \sin 2\theta & \cos 2\theta\end{bmatrix}$ (B) $\begin{bmatrix}\cos 2\theta & \sin 2\theta\\ \sin 2\theta & -\cos 2\theta\end{bmatrix}$

(C) $\begin{bmatrix}\cos 2\theta & \sin 2\theta\\ \sin 2\theta & \cos 2\theta\end{bmatrix}$ (D) $\begin{bmatrix}\cos 2\theta & \sin 2\theta\\ -\sin 2\theta & \cos 2\theta\end{bmatrix}$

Q.55 If l_2 is the identity matrix of order 3, then l_3^{-1} is

(A) 0 (B) $3I_3$

(C) l_3 (D) Does not exist

Q.56 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) $\begin{bmatrix}1 & -2 & 1\\ 0 & 0 & 1\\ 0 & 0 & 2\end{bmatrix}$

Q.57 $A = \begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 1\\ 0 & -2 & 4\end{bmatrix}; I = \begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}, A^{-1} = \frac{1}{6}[A^2 + cA + dI]$, where $c, d \in R$, then pair of values (c, d)

(A) (6, 11) (B) (6, –11)

(C) (–6, 11) (D) (–6, –11)

Q.58 If A and B are non-singular square matrices of same order, then adj(AB) is equal to

(A) (adj A)(adj B) (B) (adj B)(adj A)

(C)) (adj B^{-1})(adj A^{-1}) (D) (adj A^{-1})(adj B^{-1})

Q.59 If A is a singular matrix, then adj A is

(A) Singular (B) Non-singular

(C) Symmetric (D) Not defined

Q.60 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 symmetric matrix is symmetric

(D) Adjoint of diagonal matrix is diagonal

Q.61 If k is a scalar and I is a unit matrix of order 3, then adj(kI) =

(A) k^3I (B) k^2I

(C) $-k^3I$ (D) $-k^2I$

Q.62 Which of the following is/are true?

(i) Adjoint of a symmetric matrix is symmetric

(ii) Adjoint of a 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) Only (i) (B) Only (i) and (ii)

(C) Only (i), (ii) and (iii) (D) All (i), (ii), (iii) and (iv)

Q.63 x + ky – z = 0, 3x – ky – z = 0 and x – 3y + z = 0 has non-zero solution for k =

(A) –1 (B) 0

(C) 1 (D) 2

Q.64 If $a_1x + b_1y + c_1z = 0, a_2x + b_2y + c_2z = 0, a_3x + b_3y + c_3z = 0$ and $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 0$, then the given system has

(A) One trivial and one non-trivial solution

(B) No solution

(C) One solution

(D) Infinite solution

Q.65 The existence of the unique solution of the system x + y + z = λ, 5x – y + μz = 10, 2x + 3y – z = 6 depends on

(A) μ only (B) λ only

(C) λ and μ both (D) Neither λ nor μ

Q.66 The value of λ for which the system of equations 2x – y – z = 12, x – 2y + z = –4, x + y + λz = 4 has no solution is

(A) 3 (B) –3

(C) 2 (D) –2

Q.67 The number of solution of the following equations $x_2 - x_3 = 1, -x_1 + 2x_3 = -2, x_1 - 2x_2 = 3$ is

(A) Zero (B) One

(C) Two (D) Infinite

Q.68 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, 3) (D) (–1, 0, 2)

Q.69 If $x + ay + a^2z = 0$
$x + by + b2z = 0$
$x + cy + c2z = 0$
$a \neq b \neq c$ then given system of equations
(A) Has no solution
(B) Has infinite solution
(C) Has unique solution
(D) Has unique or infinite solution depending on values of a, b, c

Q.70 $A = \begin{bmatrix} 1 & 0 & k \\ 2 & 1 & 3 \\ k & 0 & 1 \end{bmatrix}$ is invertible for
(A) k = 1 (B) k = –1
(C) k ≠ ± 1 (D) k = 0

Q.71 The roots of the equation $\begin{vmatrix} 1 & 4 & 20 \\ 1 & -2 & 5 \\ 1 & 2x & 5x^2 \end{vmatrix} = 0$ are
(A) –1, –2 (B) –1, 2
(C) 1, –2 (D) 1, 2

Q.72 If $a \neq b \neq c$, the value of x which satisfies the equation $\begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix} = 0$, is
(A) x = 0 (B) x = a
(C) x = b (D) x = c

Q.73 $\begin{vmatrix} a+b & a+2b & a+3b \\ a+2b & a+3b & a+4b \\ a+4b & a+5b & a+6b \end{vmatrix} =$
(A) $a^2 + b^2 + c^2 - 3abc$ (B) 3ab
(C) 3a + 5b (D) 0

Q.74 $\begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix} =$
(A) abc (B) 2abc
(C) 3abc (D) 4abc

Q.75 Let $\begin{vmatrix} 6i & -3i & 1 \\ 4 & 3i & -1 \\ 20 & 3 & i \end{vmatrix} = x + iy$, then
(A) x = 3, y = 1 (B) x = 0, y = 0
(C) x = 0, y = 3 (D) x = 1, y = 3

Q.76 A root of the equation $\begin{vmatrix} 3-x & -6 & 3 \\ -6 & 3-x & 3 \\ 3 & 3 & -6-x \end{vmatrix} = 0$ is
(A) 6 (B) 3
(C) 0 (D) 6

Q.77 Let $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then $|2A|$ is equal to

(A) $4\cos 2\theta$ (B) 1

(C) 2 (D) 4

Q.78 If ω is non-real complex cube root of unity, then $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & \omega & 1 \end{vmatrix}$ is equal to

(A) 0 (B) 1

(C) 3 (D) 2

Q.79 If the system of the equations $x - ky - z = 0$, $kx - y - z = 0$, $x + y - z = 0$ has a nonzero solution, then the possible value of k are

(A) –1, 2 (B) 1, 2

(C) 0, 1 (D) –1, 1

Q.80 The value of $\begin{vmatrix} x & x^2 - yz & 1 \\ y & y^2 - zx & 1 \\ z & z^2 - xy & 1 \end{vmatrix}$ is

(A) 1 (B) –1

(C) 0 (D) –xyz

Q.81 $\begin{vmatrix} 11 + a & c & 1 + bc \\ 11 + a & d & 1 + bd \\ 11 + a & e & 1 + be \end{vmatrix}$ is equal to

(A) 1 (B) 0

(C) 3 (D) $a + b + c$

Q.82 If $A^2 = 8A + kI$ where $A = \begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$, then k is

(A) 7 (B) –7

(C) 1 (D) –1

Q.83 If a, b, c are positive and not equal then value of $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ may be

(A) 1 (B) –3

(C) 2 (D) 4

Q.84 If $A = \begin{bmatrix} 11 & 7 \\ -13 & 17 \end{bmatrix}$, then adj(adj A) is

(A) $\begin{bmatrix} 17 & -7 \\ 13 & 11 \end{bmatrix}$ (B) $\begin{bmatrix} 11 & 7 \\ -13 & 17 \end{bmatrix}$

(C) $\begin{bmatrix} -17 & 7 \\ 13 & -11 \end{bmatrix}$ (D) $\begin{bmatrix} -11 & 7 \\ -13 & 17 \end{bmatrix}$

Q.85 Let $x + y + z = 6$, $4x + \lambda y - \lambda z = 0$, $3x + 2y - 4z = -5$. The value of λ for which given system of equations does not have a unique solution is

(A) 0 (B) 1 (C) 2 (D) 3

Q.86 The system of equations $ax + 4y + z = 0$, $bx + 3y + z = 0$, $cx + 2y + z = 0$ has non-trivial solution if a, b, c are in

(A) AP (B) GP

(C) HP (D) None of these

Q.87 Consider the matrix $A = \begin{bmatrix} 0 & -h & -g \\ h & 0 & -f \\ g & f & 0 \end{bmatrix}$

STATEMENT-1 : det A = 0.

and STATEMENT-2 : The value of the determinant of a skew symmetric matrix of odd order is always zero.

(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

Q.88 Consider the system of equations

$x - 2y + 3z = -1$

$-x + y - 2z = k$

$x - 3y + 4z = 1$

STATEMENT-1 : The system of equations has no solution for $k \neq 3$.

and

STATEMENT-2 : The determinant $\begin{vmatrix} 1 & 3 & -1 \\ -1 & -2 & k \\ 1 & 4 & 1 \end{vmatrix} \neq 0$, for $k \neq 3$.

(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

Q.89 STATEMENT-1 : A system of homogenous equations is always consistent.

And

STATEMENT-2 : Trivial solution is always a solution of the homogeneous system of equations.

(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1

(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

Let A and B are two matrices of same order 3 × 3 where

$$A = \begin{bmatrix} 1 & 3 & \lambda+2 \\ 2 & 4 & 8 \\ 3 & 5 & 10 \end{bmatrix} \text{ and } B = \begin{bmatrix} 3 & 2 & 4 \\ 3 & 2 & 5 \\ 2 & 1 & 4 \end{bmatrix}$$

On the basis of aobve information answer the following questions :

Q.90 tr(A + B) is equal to

(A) 6 (B) 12 (C) 24 (D) 17

Q.91 Matrix A is singular then λ is equal to
(A) 2 (B) 4
(C) 8 (D) 12

Q.92 det(adj B) is equal to
(A) Zero (B) 16
(C) 2 (D) 1

Q.93 If matrix A is singular then 2λ + det(A) is equal to
(A) 8 (B) 16 (C) 32 (D) 64

Q.94 tr(5A + 6B) is equal to
(A) 117 (B) 119 (C) 126 (D) 129

Q.95 $\begin{vmatrix} (a^x + a^{-x})^2 & (a^x - a^{-x})^2 & 1 \\ (b^x + b^{-x})^2 & (b^x - b^{-x})^2 & 1 \\ (c^x + c^{-x})^2 & (c^x - c^{-x})^2 & 1 \end{vmatrix}$ is equal to
(A) 0 (B) 2abc
(C) $a^2b^2c^2$ (D) abc

Q.96 Let a, b, c be such that (b + c) ≠ 0 if

$$\begin{vmatrix} a & a+1 & a-1 \\ -b & b+1 & b-1 \\ c & c-1 & c+1 \end{vmatrix} + \begin{vmatrix} a+1 & b+1 & c-1 \\ a-1 & b-1 & c+1 \\ (-1)^{n+2}a & (-1)^{n+1}b & (-1)^n c \end{vmatrix} = 0$$

then value of n is
(A) 0 (B) Any even integer
(C) Any odd integer (D) Any integer

Q.97 The value of the determinant

$$\begin{vmatrix} -(2^5+1)^2 & 2^{10}-1 & \dfrac{1}{2^5-1} \\ 2^{10}-1 & -(2^5-1)^2 & \dfrac{1}{2^5+1} \\ \dfrac{1}{2^5-1} & \dfrac{1}{2^5+1} & -\dfrac{1}{(2^{10}-1)^2} \end{vmatrix}$$

is
(A) 0 (B) 1 (C) 2 (D) 4

Q.98 If $s = (a + b + c)$, then value of $\begin{vmatrix} s+c & a & b \\ c & s+a & b \\ c & a & s+b \end{vmatrix}$
(A) $2s^2$ (B) $2s^3$ (C) s^3 (D) $3s^3$

Q.99 The determinant $D = \begin{vmatrix} \cos(\alpha+\beta) & -\sin(\alpha+\beta) & \cos 2\beta \\ \sin\alpha & \cos\alpha & \sin\beta \\ -\cos\alpha & \sin\alpha & \cos\beta \end{vmatrix}$ is independent of
(A) α (B) β (C) α and β (D) Neither α nor β

Q.100 The number of distinct real roots of $\begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix} = 0$ in the interval $-\frac{\pi}{4} \le x \le \frac{\pi}{4}$ is
(A) 0 (B) 2 (C) 1 (D) 3

EXERCISE LEVEL –II

EL– II

Q.1 Let $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 3 & 6 & 9 \end{bmatrix}$. Find determinant value of A.

Q.2 If A is 4×4 matrix and $|A| = 3$, then find determinant of $\mathrm{adj}(A)$.

Q.3 If A is 3×3 matrix and $|A| = 4$, then find $|\mathrm{adj}(\mathrm{adj}\, A)|$.

Q.4 Find the value of $\begin{vmatrix} 4 & 3 & 1 \\ 0 & -1 & 2 \\ 0 & 3 & 1 \end{vmatrix}$.

Q.5 Find the minor of element of 2nd row and 3rd column of determinant $\begin{vmatrix} 3 & 1 & 5 \\ 2 & -1 & 4 \\ 3 & 2 & 1 \end{vmatrix}$.

Q.6 If $\begin{vmatrix} x^2+3x & x-1 & x+3 \\ x+1 & 1-2x & x-4 \\ x-2 & x+4 & 3x \end{vmatrix} = Ax^4 + Bx^3 + Cx^2 + Dx + E$. Find E.

Q.7 Find the area of triangle whose vertices are $(3,8)$, $(-4,2)$ and $(5,1)$.

Q.8 Solve the system of equations
$2x + 5y = 1$
$3x + 2y = 7$

Q.9 Evaluate, $\Delta = \begin{vmatrix} b+c & a & a \\ b & c+a & b \\ c & c & a+b \end{vmatrix}$

Q.10 If $p + q + r = 0$, prove that $\begin{vmatrix} pa & qb & rc \\ qc & ra & pb \\ rb & pc & qa \end{vmatrix} = -pqr \begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$.

Q.11 Prove that $\begin{vmatrix} 2bc-a^2 & c^2 & b^2 \\ c^2 & 2bc-b^2 & a^2 \\ b^2 & a^2 & 2ab-c^2 \end{vmatrix} = (a^3+b^3+c^3-3abc)^2$

Q.12 If $A = \begin{bmatrix} 2 & 4 & 4 \\ 2 & 5 & 4 \\ 2 & 5 & 3 \end{bmatrix}$, then verify that A-adj $A = |A| \cdot I$. Also find A^{-1}.

Q.13 Let $A = \begin{bmatrix} 1 & -2 & -3 \\ 0 & 1 & 0 \\ -4 & 1 & 0 \end{bmatrix}$. Find adjA.

Q.14 If $A = \begin{bmatrix} 4 & 5 \\ 8 & 9 \end{bmatrix}$, then find adjiA.

Q.15 Find minors and cofactors of all the elements of determinant $\begin{vmatrix} -1 & 2 & 3 \\ -4 & 5 & -2 \\ 6 & 4 & 8 \end{vmatrix}$.

Q.16 Prove that $\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ yz & zx & xy \end{vmatrix} = \begin{vmatrix} 1 & 1 & 1 \\ x^2 & y^2 & z^2 \\ x^3 & y^3 & z^3 \end{vmatrix} = (y-z)(z-x)(x-y)(yz+zx+xy)$

Q.17 Using properties evaluate $\begin{vmatrix} 1+a_1 & a_2 & a_3 \\ a_1 & 1+a_2 & a_3 \\ a_1 & a_2 & 1+a_3 \end{vmatrix}$.

Q.18 Prove that $\begin{vmatrix} x & x+y & x+y+z \\ 2x & 3x+2y & 4x+3y+2z \\ 3x & 6x+3y & 10x+6y+3z \end{vmatrix} = x^3$.

Q.19 Show that $\begin{vmatrix} x & y & z \\ 2x+2a & 2y+2b & 2z+2c \\ a & b & c \end{vmatrix} = 0$.

Q.20 Evaluate $\begin{vmatrix} 5 & 25 & 125 \\ 1 & 5 & 25 \\ 4 & 8 & 12 \end{vmatrix}$

Q.21 Evaluate the determinant $\Delta = \begin{vmatrix} 1 & 3 & -1 \\ 0 & 1 & 2 \\ 1 & 2 & 3 \end{vmatrix}$.

Q.22 If $\begin{vmatrix} x & x+1 \\ x-1 & x \end{vmatrix} = 1$, then find $x(x \in R)$.

Q.23 If $A = \begin{bmatrix} 2 & 4 & 4 \\ 2 & 5 & 4 \\ 2 & 5 & 3 \end{bmatrix}$, then verify that A-adji $A = |A| \cdot 1$. Also find A^{-1}.

Q.24 Show that $\Delta = \begin{vmatrix} (y+z)^2 & xy & zx \\ xy & (x+z)^2 & yz \\ xz & yz & (x+y)^2 \end{vmatrix} = 2xyz(x+y+z)^3$

ANSWER KEY – LEVEL – I

Q.	1	2	3	4	5	6	7	8	9	10
Ans.	C	B	C	A	B	C	C	C	C	A
Q.	11	12	13	14	15	16	17	18	19	20
Ans.	B	C	B	A	D	A	C	C	D	A
Q.	21	22	23	24	25	26	27	28	29	30
Ans.	D	D	A	D	D	A	C	C	A	A
Q.	31	32	33	34	35	36	37	38	39	40
Ans.	B	B	D	C	C	D	C	B	A	B
Q.	41	42	43	44	45	46	47	48	49	50
Ans.	B	C	D	A	A	B	A	D	B	A
Q.	51	52	53	54	55	56	57	58	59	60
Ans.	A	A	B	D	C	B	C	B	A	A
Q.	61	62	63	64	65	66	67	68	69	70
Ans.	B	D	C	D	A	D	A	D	C	C
Q.	71	72	73	74	75	76	77	78	79	80
Ans.	B	A	D	D	B	C	D	A	D	C
Q.	81	82	83	84	85	86	87	88	89	90
Ans.	B	B	B	B	D	A	A	A	A	C
Q.	91	92	93	94	95	96	97	98	99	100
Ans.	B	D	A	D	A	C	D	B	A	C