EXERCISE LEVEL –I

EL– I

Q.1 If A is a 3 × 4 matrix, then each row of A possesses
(A) 3 elements (B) 4 elements
(C) 12 elements (D) 7 elements

Q.2 What defines the order of a matrix?
(A) The product of the number of rows and the number of columns
(B) The product of the number of columns and the number of rows
(C) The product of the number of rows and the number of rows
(D) The product of the number of columns and the number of columns

Q.3 A matrix consists of 16 elements. Which of the following could be the matrix's order?
(A) 1 × 16 (B) 2 × 8
(C)4 × 4 (D)All of these

Q.4 If a matrix comprises 13 elements, then the possible orders of the matrix are
(A) 1 × 13 or 13 × 1 (B) 1 × 26 or 26 × 1
(C) 2 × 13 or 13 × 2 (D)None of these

Q.5 If A is matrix or order m × n and B is a matrix such that AB′ and B′A are both defined, then what is the order of matrix B ?
(A) m × m (B) n × n
(C)n × m (D) m × n

Q.6 Identify the upper triangular matrix in the following.
(A) $\begin{bmatrix}1 & 0 & 0\\0 & 2 & 0\\3 & 0 & 3\end{bmatrix}$ (B) $\begin{bmatrix}5 & 4 & 2\\0 & 0 & 3\\0 & 0 & 1\end{bmatrix}$ (C) $\begin{bmatrix}0 & 2 & 3\\0 & 0 & 4\end{bmatrix}$ (D) $\begin{bmatrix}2 & 1\\0 & 3\\0 & 0\end{bmatrix}$

Q.7 In the following options, identify the singular matrix:
(A) $\begin{bmatrix}2 & 3\\1 & 3\end{bmatrix}$ (B) $\begin{bmatrix}3 & 2\\2 & 3\end{bmatrix}$ (C) $\begin{bmatrix}1 & 2\\1 & 0\end{bmatrix}$ (D) $\begin{bmatrix}2 & 3\\4 & 6\end{bmatrix}$

Q.8 Recognize the scalar matrix
(A) $\begin{bmatrix}-1 & 3\\2 & 4\end{bmatrix}$ (B) $\begin{bmatrix}0 & 3\\2 & 0\end{bmatrix}$
(C) $\begin{bmatrix}4 & 0\\0 & 4\end{bmatrix}$ (D) None of these

Q.9 For any square matrix $A = [a_{ij}]$, where $a_{ij} = 0$, when $i \neq j$, then A is-
(A) unit matrix (B) scalar matrix
(C) diagonal matrix (D) none of these

Q.10 A row matrix has only-
(A) one element
(B) one row with one or more columns
(C) one column with one or more rows
(D) one row and one column

Q.11 A matrix $A = (a_{ij})_{m \times n}$ considered a square matrix if-
(A) $m = n$ (B) $m \leq n$ (C) $m \geq n$ (D) $m < n$

Q.12 In the following options, identify the diagonal matrix
(A) $\begin{bmatrix} 0 & 3 \\ 4 & 0 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \end{bmatrix}$ (C) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ (D) $\begin{bmatrix} 3 & 0 \\ 0 & 4 \end{bmatrix}$

Q.13 If matrix A has p elements in each row and q elements in each column, then the order of A is:
(A) $p \times p$ (B) $q \times q$ (C) $p \times q$ (D) $q \times p$

Q.14 Find the matrix 2A where $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 0 & 5 & 6 \end{bmatrix}$ is given,
(A) $\begin{bmatrix} 2 & 4 & 6 \\ 2 & 3 & 4 \\ 0 & 5 & 6 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 6 & 8 \\ 0 & 5 & 6 \end{bmatrix}$
(C) $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 0 & 10 & 12 \end{bmatrix}$ (D) $\begin{bmatrix} 2 & 4 & 6 \\ 4 & 6 & 8 \\ 0 & 10 & 12 \end{bmatrix}$

Q.15 Find the value of a, if $X = = \begin{bmatrix} 1 & a \\ 0 & 1 \end{bmatrix}$ and $3X - \begin{bmatrix} 2 & 3 \\ 0 & 2 \end{bmatrix} = \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}$, is given.
(A) –2 (B) 0 (C) 2 (D) 1

Q.16 If $A = \begin{bmatrix} 1 & 2 \\ -1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 4 \\ 2 & -2 \end{bmatrix}$, find the transpose of the product $(AB)^T$
(A) $\begin{bmatrix} 11 & -2 \\ 5 & -6 \end{bmatrix}$ (B) $\begin{bmatrix} 11 & 5 \\ -2 & -6 \end{bmatrix}$
(C) $\begin{bmatrix} 7 & 1 \\ 0 & -8 \end{bmatrix}$ (D) $\begin{bmatrix} 7 & 0 \\ 1 & -8 \end{bmatrix}$

Q.17 If A and B are matrices of order $m \times n$ and $n \times m$ respectively, what is the order of the matrix B^T $(A^T)^T$.
(A) $m \times n$ (B) $m \times m$ (C) $n \times n$ (D) Not defined

Q.18 If A, B, C, are three matrices, what does $A^T + B^T + C^T$ equal to?
(A) zero matrix (B) $A + B + C$ (C) $-(A + B + C)$ (D) $(A + B + C)^T$

Q.19 If $A = = \begin{bmatrix} 3 & 2 \\ 1 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 \\ -1 & 1 \end{bmatrix}$, which statement is correct?
(A) $AB = BA$ (B) $AA^T = A^2$
(C) $AB = B^2$ (D) None of these

Q.20 If $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$, what is the value of AA^T.
(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) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (D) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$

Q.21 If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$, what is the determinant of $|A + A^T|$.

(A) $4(a^2 - b^2)$ (B) $2(a^2 - b^2)$

(C) $a^2 - b^2$ (D) 4 ab

Q.22 Identify the false statement for suitable matrices A, B.

(A) $(AB)^T = A^T B^T$ (B) $(A^T)^T = A$

(C) $(A - B)^T = A^T - B^T$ (D) $(A^T)^{-1} = (A^{-1})^T$

Q.23 If $A = \begin{bmatrix} 2 & 3 & 4 \\ 3 & 4 & 5 \end{bmatrix}$, $B = \begin{bmatrix} 3 & 4 \\ 2 & 1 \\ 1 & 3 \end{bmatrix}$, what is the transpose of the product (AB)'

(A) $\begin{bmatrix} 16 & 22 \\ 23 & 31 \end{bmatrix}$ (B) $\begin{bmatrix} 16 & 23 \\ 22 & 31 \end{bmatrix}$

(C) $\begin{bmatrix} 22 & 31 \\ 16 & 30 \end{bmatrix}$ (D) $\begin{bmatrix} 23 & 16 \\ 31 & 20 \end{bmatrix}$

Q.24 If $A = \begin{bmatrix} 3 & x \\ y & 0 \end{bmatrix}$ and $A = A^T$, then -

(A) $x = 0, y = 3$ (B) $x + y = 3$

(C) $x = y$ (D) $x = -y$

Q.25 If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, what is the result of AA'

(A) I (B) A (C) A' (D) 0

Q.26 If A is a matrix of order 3×4, then both AB^T and $B^T A$ are defined if order of B is -

(A) 3×3 (B) 4×4 (C) 4×3 (D) 3×4

Q.27 Matrix $\begin{bmatrix} 0 & 5 & -7 \\ -5 & 0 & 11 \\ 7 & -11 & 0 \end{bmatrix}$ is a-

(A) diagonal matrix (B) upper triangular matrix

(C) skew-symmetric matrix (D) symmetric matrix

Q.28 If A and B are square matrices of same order, which of the following is skew-symmetric-

(A) $\frac{A+A^T}{2}$ (B) $\frac{A^T+B^T}{2}$ (C) $\frac{A^T-B^T}{2}$ (D) $\frac{B-B^T}{2}$

Q.29 If A is both a symmetric and skew symmetric matrix, then -

(A) A is a diagonal matrix (B) A is a null matrix

(C) A is a unit matrix (D) A is a triangular matrix

Q.30 If $A - A' = 0$, then A' is -

(A) orthogonal matrix (B) symmetric matrix

(C) skew- symmetric matrix (D) triangular matrix

Q.31 If matrix $\begin{bmatrix} x & y \\ u & v \end{bmatrix}$ is symmetric, then -

(A) $x + v = 0$ (B) $x - v = 0$ (C) $y + u = 0$ (D) $y - u = 0$

Q.32 If A is symmetric matrix and B is a skew- symmetric matrix, determine the incorrect statement for $n \in N$.

(A) A^n is symmetric

(B) A^n is symmetric only when n is even

(C) B^n is skew symmetric when n is odd

(D) B^n is symmetric when n is even

Q.33 If A is a square matrix, then A– A′ is -

(A) unit matrix (B) null matrix

(C) A (D) a skew symmetric matrix

Q.34 Consider a square matrix denoted by A. Identify which of the options is not a symmetric matrix.

(A) A + A′ (B) AA′ (C) A′A (D) A – A′

Q.35 What is the total number of elementary operations that can be performed on matrices?

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

Q.36 After applying the operation $R_1 \to R_1+R_2$ to the matrix $A = \begin{bmatrix} 2 & 3 \\ 6 & 4 \end{bmatrix}$, which of the following matrices will be the resulting new matrix?

(a) $\begin{bmatrix} 8 & 7 \\ 6 & -4 \end{bmatrix}$ (b) $\begin{bmatrix} 8 & 7 \\ 6 & 4 \end{bmatrix}$

(c) $\begin{bmatrix} 8 & 7 \\ 6 & 5 \end{bmatrix}$ (d) $\begin{bmatrix} 8 & 7 \\ 6 & 2 \end{bmatrix}$

Q.37 If the elementary operation $R_1 \to 2R_1+3R_2$ is applied to the matrix, which of the following matrices will remain unchanged?

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

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

Q.38 Which one of the following does not qualify as a valid elementary operation?

(a) $R_i \leftrightarrow R_j$ (b) $R_i \to R_j+kR_i$

(c) $R_i \to kR_i$ (d) $R_i \to 1+kR_i$

Q.39 Which elementary operation has been performed on the matrix $A = \begin{bmatrix} 8 & 5 \\ 2 & 8 \end{bmatrix}$ to transform it into $\begin{bmatrix} 12 & 21 \\ 2 & 8 \end{bmatrix}$

(a) $R_1 \to R_1-2R_2$ (b) $R_1 \to 2R_1+R_2$

(c) $R_1 \to R_2+R_1$ (d) $R_1 \to R_1+2R_2$

Q.40 After implementing the following elementary operations on the matrix

$$A = \begin{bmatrix} 4 & 5 & 2 \\ 6 & 7 & 1 \\ 3 & 9 & 5 \end{bmatrix}, R_1 \to 2R_1+3R_2, R_2 \to 3R_2-2R_3$$

Which of the following matrices will be the resulting new matrix?

(a) $\begin{bmatrix} 24 & 31 & 7 \\ 12 & 3 & 7 \\ 3 & 9 & 5 \end{bmatrix}$ (b) $\begin{bmatrix} 24 & 31 & 7 \\ 12 & 3 & -7 \\ 3 & 9 & 5 \end{bmatrix}$

(c) $\begin{bmatrix} 24 & 31 & 7 \\ 6 & 7 & 1 \\ 3 & 9 & 5 \end{bmatrix}$ (d) $\begin{bmatrix} 4 & 5 & 2 \\ 6 & 7 & 1 \\ 3 & 9 & 5 \end{bmatrix}$

Q.41 The matrix resulting from the elementary operation $R_2 \to 2R_2+3R_1$ applied to the original matrix $A = \begin{bmatrix} 2 & 5 & 4 \\ 5 & 2 & 6 \\ 7 & 2 & 1 \end{bmatrix}$ is

(a) $\begin{bmatrix} 2 & 5 & 4 \\ 16 & 19 & 24 \\ 7 & 2 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & 5 & 4 \\ 19 & 19 & 24 \\ 7 & 2 & 1 \end{bmatrix}$

(c) $\begin{bmatrix} 2 & -5 & 4 \\ 16 & 19 & 24 \\ 7 & 2 & 1 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 5 & 4 \\ 16 & 19 & 24 \\ 7 & 2 & 1 \end{bmatrix}$

Q.42 What is the new matrix after applying the elementary operation $C_1 \to 4C_1$ to the matrix

$$A = \begin{bmatrix} 5 & 8 \\ -1 & 2 \\ 3 & -4 \end{bmatrix}$$

(a) $\begin{bmatrix} 5 & 8 \\ -1 & 2 \\ 3 & -4 \end{bmatrix}$ (b) $\begin{bmatrix} 20 & 8 \\ -4 & 2 \\ 12 & -4 \end{bmatrix}$

(c) $\begin{bmatrix} 20 & 8 \\ 4 & 2 \\ 12 & -4 \end{bmatrix}$ (d) $\begin{bmatrix} 20 & 8 \\ -4 & 2 \\ 12 & 4 \end{bmatrix}$

Q.43 After applying the following column matrix operations:

$$A = \begin{bmatrix} -7 & 2 & 6 \\ -2 & 3 & -5 \\ 2 & 1 & 3 \end{bmatrix}, C_2 \to 2C_1+C_2, C_3 \to 3C_1+2C_3$$

Which of the following matrices will be the resulting new matrix?

(a) $\begin{bmatrix} -7 & -12 & 6 \\ 2 & -1 & -5 \\ 2 & -5 & 3 \end{bmatrix}$ (b) $\begin{bmatrix} -7 & -12 & 6 \\ -2 & -1 & -5 \\ 2 & 5 & 3 \end{bmatrix}$

(c) $\begin{bmatrix} -7 & 2 & 6 \\ -2 & 3 & -5 \\ 2 & 1 & 3 \end{bmatrix}$ (d) $\begin{bmatrix} -7 & -12 & -9 \\ -2 & -1 & -16 \\ 2 & 5 & 12 \end{bmatrix}$

Q.44 Which one of the following column operations is not accurate for the given matrix $A = \begin{bmatrix} 1 & 2 & 5 \\ 6 & 3 & 8 \end{bmatrix}$

(a) $C_1 \to 3C_1$ (b) $C_2 \to C_1+C_2$ (c) $C_2 \to 2+2C_2$ (d) $C_2 \to 2C_1+2C_2-C_3$

Q.45 For any 2×2 matrix A, A(adj A) $= \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$, then |A| equals to

(A) 0 (B) 3 (C) 6 (D) 9

Q.46 If $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 0 & 0 & 2 \end{bmatrix}$, then the value of adj (adj A) is-

(A) $|A|^2$ (B) – 2A (C) 2A (D) A^2

Q.47 If $A = \begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$ and A. adj A $= k\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then the value of k is

(A) sin x cos x (B) 1 (C) 2 (D) 3

Q.48 If $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 3 & 1 \\ 2 & 1 & 2 \end{bmatrix}$, then A (adj A) equals-

(A) $\begin{bmatrix} 9 & 0 & 0 \\ 0 & 9 & 0 \\ 0 & 0 & 9 \end{bmatrix}$ (B) $-\begin{bmatrix} 9 & 0 & 0 \\ 0 & 9 & 0 \\ 0 & 0 & 9 \end{bmatrix}$

(C) $\begin{bmatrix} 0 & 0 & 9 \\ 0 & 9 & 0 \\ 9 & 0 & 0 \end{bmatrix}$ (D) None of these

Q.49 If A and B are square matrices of same orders, then adj (AB) is equal to.

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

(C) adj A + adj B (D) adj A – adj B

Q.50 If $A = \begin{bmatrix} 1 & -2 & 3 \\ 4 & 0 & -1 \\ -3 & 1 & 5 \end{bmatrix}$, then the value of the element in the 2nd row and 3rd column of the adjoint of A, represented as $(\text{adj A})_{23}$ is equal to.

(A) 13 (B) – 13 (C) 5 (D) – 5

Q.51 The inverse matrix of $\begin{bmatrix} 4 & 7 \\ 1 & 2 \end{bmatrix}$ is -

(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) $\begin{bmatrix} -2 & 1 \\ 7 & -4 \end{bmatrix}$

Q.52 Matrix $\begin{bmatrix} \lambda & -1 & 4 \\ -3 & 0 & 1 \\ -1 & 1 & 2 \end{bmatrix}$ is non-invertible when

(A) $\lambda = -15$ (B) $\lambda = -17$

(C) $\lambda = -16$ (D) $\lambda = -18$

Q.53 If $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$, then the value of A^{-1} is-

(A) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ (B) $\begin{bmatrix} \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{2} & 0 \\ 0 & 0 & \frac{1}{2} \end{bmatrix}$

(C) $\begin{bmatrix} -2 & 0 & 0 \\ 0 & -2 & 0 \\ 0 & 0 & -2 \end{bmatrix}$ (D) None of these

Q.54 Which of the following statements is incorrect for any square matrix A.

(A) $(\text{adj A})^{-1} = \text{adj } (A^{-1})$ (B) $(A^T)^{-1} = (A^{-1})^T$

(C) $(A^3)^{-1} = (A^{-1})^3$ (D) None of these

Q.55 If A is an invertible matrix of order 2, then $\det(A^{-1})$ is equal to

(a) $|A|$ (b) $\frac{1}{|A|}$

(c) 1 (d) 0

Q.56 If B is the inverse of matrix A and $A = \begin{bmatrix} 1 & -1 & -1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$ and $10B = \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{bmatrix}$ given then fine the value of α .

(a) -2 (b) 1

(c) 2 (d) 5

Q.57 If A is a square matrix such that $A^2=I$, then find the value of A^{-1}

(a) 1 (b) 0

(c) A (d) I + A

Q.58 If $A=\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 1\\ 0 & -2 & 4\end{bmatrix}$, $6A^{-1}=A^2+cA+dI$, then (c, d) is equal to

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

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

Q.59 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

(a) $-6-12-18$ (b) $-6,4,9$

(c) $-6,-4,-9$ (d) $-6,12,18$

Q.60 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) $\begin{bmatrix}8 & 7\\ -20 & -9\end{bmatrix}$

Q.61 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 – AI (c) A – I (d) A + I

Q.62 If $[m \quad n]\begin{bmatrix}m\\ n\end{bmatrix}=[25]$ and $m<n$ and $m,n\in I^+$, then $(m,n)=$

(a) (2, 3) (b) (3, 4) (c) (4, 3) (d) (1, 5)

Q.63 If $A=\begin{bmatrix}i & 0\\ 0 & -i\end{bmatrix}$, $B=\begin{bmatrix}0 & i\\ i & 0\end{bmatrix}$, where $i=\sqrt{-1}$, then the correct relation is

(a) $A+B=O$ (b) $A^2=B^2$

(c) $A-B=O$ (d) $A^2+B^2=0$

Q.64 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 $AB=$

(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) $\begin{bmatrix}5 & 9 & 13\\ -1 & 4 & 2\\ -2 & 2 & 4\end{bmatrix}$

Q.65 Which is true about matrix multiplication?

(a) It is commutative (b) It is associative

(c) Both (1) & (2) (d) Neither commutative nor associative

Q.66 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

(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) $\begin{pmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{pmatrix}$

Q.67 Assuming that the sums and products given below are defined, which of the following is not true for matrices?

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

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

Q.68 The matrix $\begin{bmatrix} 0 & 5 & -7 \\ -5 & 0 & 11 \\ 7 & -11 & 0 \end{bmatrix}$ is known as

(a) Triangular matrix (b) Skew symmetric matrix
(c) A symmetric matrix (d) An idempotent matrix

Q.69 For a matrix A, $AI = A$ and $AA^T = I$ is true then A is necessarily

(a) A square matrix (b) Skew symmetric matrix
(c) A symmetric matrix (d) An idempotent matrix

Q.70 A square matrix $A = [a_{ij}]$ in which $a_{ij} = 0$ for $i \neq j$ and $a_{ij} = k$ (where $k \in R - \{0, 1\}$) for $i = j$ is called a

(a) Unit matrix (b) Scalar matrix
(c) Null matrix (d) Skew symmetric matrix

Q.71 If A is a square matrix, then which of the following matrices is not symmetric?

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

Q.72 For any square matrix A, AA^T is a

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

Q.73 If $A = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$, then which of the following statements is not correct?

(a) A is orthogonal matrix
(b) A′ is orthogonal matrix
(c) A is symmetric matrix if $\theta = n\pi$, $n \in I$
(d) A is skew symmetric matrix for $\theta \in R$

Q.74 If A is a skew-symmetric matrix of order n, and C is a column matrix of order $n \times 1$, then C^TAC is

(a) A identity matrix of order n (b) A unit matrix of order one
(c) A zero matrix of order one (d) A zero matrix of order n

Q.75 Let A be a 5×8 matrix, then each column of A contains

(a) 5 elements (b) 8 elements
(c) 40 elements (d) 13 elements

Q.76 If A is of order $m \times n$ and B is of order $p \times q$, then AB is defined only if

(a) $m = q$ (b) $m = p$
(c) $n = p$ (d) $n = q$

Q.77 If $A + B = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ and $A - 2B = \begin{bmatrix} -1 & 1 \\ 0 & -1 \end{bmatrix}$, then A is equal to

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

Q.78 If $X + \begin{bmatrix} 2 & 1 \\ 6 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$, then ' X is equal to

(a) $\begin{bmatrix} 0 & 1 \\ 0 & 6 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & -1 \\ 0 & -6 \end{bmatrix}$
(c) $\begin{bmatrix} -1 & 0 \\ -6 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 0 \\ 6 & 0 \end{bmatrix}$

Q.79 If $\begin{bmatrix} x & 1 \\ -1 & -y \end{bmatrix} + \begin{bmatrix} y & 1 \\ 3 & x \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$, then

(a) $x = -1, y = 0$ (b) $x = 1, y = 0$

(c) $x = 0, y = 1$ (d) $x = 1, y = 1$

Q.80 If $A = [ab], B = [-b - a]$ and $C = \begin{bmatrix} a \\ a \end{bmatrix}$, then correct statement is

(a) $A = -B$ (b) $A + B = A - B$

(c) $AC = BC$ (d) $CA = CB$

Q.81 If A is any square matrix, then

(a) $A + A^T$ is skew symmetric (b) $A - A^T$ is symmetric

(c) AA^T is symmetric (d) AA^T is skew symmetric

Q.82 Multiplicative inverse of the matrix $\begin{bmatrix} 2 & 1 \\ 7 & 4 \end{bmatrix}$ is

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

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

Q.83 $\begin{bmatrix} 7 & 1 & 2 \\ 9 & 2 & 1 \end{bmatrix} \begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix} + 2 \begin{bmatrix} 4 \\ 5 \end{bmatrix}$ is equal to

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

(c) $\begin{bmatrix} 44 \\ 43 \end{bmatrix}$ (d) $\begin{bmatrix} 43 \\ 50 \end{bmatrix}$

Q.84 If $A = \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 1 & 0 & 0 \end{bmatrix}$, then

(a) $A^2 = 0$ (b) $A^2 = A$

(c) $A^3 = A$ (d) $A^2 = 2A$

Q.85 If $A = \begin{bmatrix} 1 & 2 & 3 \\ -2 & 5 & 7 \end{bmatrix}$ and $2A - 3B = \begin{bmatrix} 4 & 5 & -9 \\ 1 & 2 & 3 \end{bmatrix}$, then B is equal to

(a) $\frac{1}{3}\begin{bmatrix} -2 & -1 & 15 \\ 5 & 8 & -11 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & 1 & -15 \\ 5 & -8 & -11 \end{bmatrix}$

(c) $\begin{bmatrix} 2 & -1 & 15 \\ 5 & 8 & 11 \end{bmatrix}$ (d) $-\frac{1}{3}\begin{bmatrix} 2 & 1 & -15 \\ 5 & -8 & -11 \end{bmatrix}$

Q.86 Let $A = \begin{bmatrix} 2 & 3 & 5 \\ 1 & 0 & 2 \\ 3 & 4 & 5 \end{bmatrix}$ and $A + B - 4I = 0$, then B is equal to

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

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

Q.87 If for a 2×2 matrix A, $A^2 + I_2 = 0$, where I_2 is the identity matrix, then A equals

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

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

Q.88 If $f(x) = x^2 + 4x - 5$ and $A = \begin{bmatrix} 1 & 2 \\ 4 & -3 \end{bmatrix}$, then f(A) is equal to

(a) $\begin{bmatrix} 0 & -4 \\ 8 & 8 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & 1 \\ 2 & 0 \end{bmatrix}$

(c) $\begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 8 & 4 \\ 8 & 0 \end{bmatrix}$

Q.89 $\cos\theta \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} + \sin\theta \begin{bmatrix} \sin\theta & -\cos\theta \\ \cos\theta & \sin\theta \end{bmatrix}$ is equal to

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

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

Q.90 If A is a square matrix, then A is symmetric, iff

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

(c) $A^T = A$ (d) $A^T = -A$

Q.91 If A is a square matrix, then A is skew symmetric iff

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

(c) $A^T = A$ (d) $A^T = -A$

Q.92 Consider the matrix $A = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$

STATEMENT-1 : A is idempotent.

And

STATEMENT-2 : If $A2 = A$, then A is called idempotent.

(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.93 STATEMENT-1 : The square matrix, whose elements are all zero, is a diagonal matrix. and

STATEMENT-2 : A square matrix $A = [a_{ij}]_{n \times n}$, whose elements above and below the principal diagonal are all zero, i.e. $a_{ij} = 0$ for all $i \neq j$, is called a diagonal matrix.

(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.94 STATEMENT-1 : Inverse of $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 3 \\ 1 & 4 & 7 \end{bmatrix}$ does not exist.

And

STATEMENT-2 : The matrix A is singular.

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

(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

$A = [2 \quad -3 \quad 4], B = [0 \quad 2 \quad 3], C = \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix}$ and $D = \begin{bmatrix} 2 \\ 2 \\ 4 \end{bmatrix}$ then answer the question number 95 to 99.

Q.95 $(A + B) \cdot (C + D)$ is equal to

(a) [40] (b) [41]

(c) $\begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix}$ (d) [36]

Q.96 The matrix CA is equal to

(a) $\begin{bmatrix} -9 & 12 & 6 \\ -6 & 8 & 4 \\ -3 & 4 & 2 \end{bmatrix}$ (b) $\begin{bmatrix} 6 & 12 & -9 \\ 4 & 8 & -6 \\ 2 & 4 & -3 \end{bmatrix}$

(c) $\begin{bmatrix} 6 & -9 & 12 \\ 4 & -6 & 8 \\ 2 & -3 & 4 \end{bmatrix}$ (d) $\begin{bmatrix} -9 & 6 & 12 \\ -6 & 4 & 8 \\ -3 & 2 & 4 \end{bmatrix}$

Q.97 The matrix $(A - B) \cdot (C + D)$ is equal to

(a) [5] (b) [15]

(c) –15] (d) [–5]

Q.98 The matrix trace of matrix D. B is equal to

(a) 12 (b) 16

(c) 20 (d) 28

Q.99 The order of matrix $(2A + 5B).(7C - 8D)$ is equal to

(a) 1×1 (b) 2×2

(c) 3×3 (d) 4×4

Q.100 The number of all possible matrices of order 2×3 with each entry 1 or -1 is

(a) 32 (b) 12

(c) 6 (d) 64

Q.1 If A is a 2 ×3, matrix and B is a 3×5 matrix, then what is the order of matrix (AB) or $(AB)^t$?

Q.2 What are the potential orders of a matrix that contains 6 elements?

Q.3 Demonstrate that the matrix $A = A = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ is idempotent.

Q.4 Demonstrate that the matrix $A = A = \begin{bmatrix} -5 & -8 & 0 \\ 3 & 5 & 0 \\ 1 & 2 & -1 \end{bmatrix}$ is involuntary.

Q.5 Find the values of a, b, c, x, y, z if $\begin{bmatrix} x+3 & z+4 & 2y-7 \\ -6 & a-1 & 0 \\ b-3 & -21 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 6 & 3y-2 \\ -6 & -3 & 2c+2 \\ 2b+4 & -21 & 0 \end{bmatrix}$

Q.6 Suppose $A = \begin{bmatrix} 1 & -3 & 2 \\ 2 & 1 & -3 \\ 4 & -3 & -1 \end{bmatrix}, B = \begin{bmatrix} 1 & 4 & 1 & 0 \\ 2 & 1 & 1 & 1 \\ 1 & -2 & 1 & 2 \end{bmatrix}$ &C $= \begin{bmatrix} 1 & 1 & -1 & -2 \\ 3 & -2 & -1 & -1 \\ 2 & -5 & -1 & 0 \end{bmatrix}$ are matrices then, Prove that the cancellation law does not hold in matrix multiplication.

Q.7 Given matrices A and B such that $A + B = \begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}, A - B = \begin{bmatrix} 3 & 2 \\ -2 & 0 \end{bmatrix}$ find the product AB.

Q.8 If $f(x) = x^2 - 3x + 3$ and $A = \begin{bmatrix} 2 & 1 \\ -1 & 1 \end{bmatrix}$ is a square matrix then demonstrate that $f(A) = O$. Consequently determine A^4.

Q.9 The expression $\begin{bmatrix} 1 & -\tan\frac{\theta}{2} \\ \tan\frac{\theta}{2} & 1 \end{bmatrix}\begin{bmatrix} 1 & \tan\frac{\theta}{2} \\ -\tan\frac{\theta}{2} & 1 \end{bmatrix}^{-1}$ is equal to What?

Q.10 If $A = \begin{bmatrix} 8 & 0 \\ 4 & -2 \\ 3 & 6 \end{bmatrix}$ is a matrix such that $2A + 3X = 5B$ where $B = \begin{bmatrix} 2 & -2 \\ 4 & 2 \\ -5 & 1 \end{bmatrix}$ is another matrix, find the matrix X.

Q.11 Given $A = \begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$, demonstrate that $A^3 - 23A - 40\ I = O$

Q.12 For matrices A and B, where A is of order m × n and B is of order n × n =, determine which of the following matrix products are defined:

Q.13 Given $A = \begin{bmatrix} 3 & 1 \\ 7 & 5 \end{bmatrix}$ and $A^2 + kI = 8A$, determine the value of k.

Q.14 If matrices A,B,C have dimensions 1 × 3, 3 × 3 and 3 × 1 respectively, what will be the dimensions of the matrix product ABC ?

Q.15 Demonstrate that if A is non-singular matrix and A is symmetric then A^{-1} is also symmetric.

ANSWER KEY – LEVEL – I

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