Matrices

Question 1.
If A and B are symmetric matrices of the same order, then
(a) AB is a symmetric matrix
(b) A – Bis askew-symmetric matrix
(c) AB + BA is a symmetric matrix
(d) AB – BA is a symmetric matrix
Answer:
(c) AB + BA is a symmetric matrix

Question 2.
If $A = \begin{bmatrix} 3 & x-1 \\ 2x+3 & x+2 \end{bmatrix}$ is a symmetric matrix, then x =
(a) 4
(b) 3
(c) -4
(d) -3
Answer:
(c) -4

Question 3.
If A is a square matrix, then A – A' is a
(a) diagonal matrix
(b) skew-symmetric matrix
(c) symmetric matrix
(d) none of these
Answer:
(b) skew-symmetric matrix

Question 4.
If A is any square matrix, then which of the following is skew-symmetric?
(a) $A + A^T$
(b) $A - A^T$
(c) AA^T
(d) A^TA

Answer:
(b) $A - A^T$

Question 5.

If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ and $A^2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$, then

(a) $\alpha = a^2 + b^2, \beta = ab$
(b) $\alpha = a^2 + b^2, \beta = 2ab$
(c) $\alpha = a^2 + b^2, \beta = a^2 - b^2$
(d) $\alpha = 2ab, \beta = a^2 + b^2$
Answer:
(b) $\alpha = a^2 + b^2, \beta = 2ab$

Question 6.
If $A = \begin{bmatrix} 1 & 2 & x \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 & y \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and $AB = I_3$, then x + y equals
(a) 0
(b) -1
(c) 2
(d) None of these
Answer:
(a) 0

Question 7.
If $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ and f(x) = (1 + x) (1 – x), then f(a) is

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

(c) $4\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ (d) None of these

Answer:
(a) $-4\begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$

Question 8.

If $A = \begin{bmatrix} 1 & 3 \\ 3 & 4 \end{bmatrix}$ and $A^2 - KA - 5I = 0$, then K =

(a) 5
(b) 3
(c) 7
(d) None of these

Answer:

(a) 5

Question 9.

If $A = \begin{bmatrix} 1 & -2 & 1 \\ 2 & 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 3 & 2 \\ 1 & 1 \end{bmatrix}$, then $(AB)^T$ is equal to

(a) $\begin{bmatrix} -3 & -2 \\ 10 & 7 \end{bmatrix}$

(b) $\begin{bmatrix} -3 & 10 \\ -2 & 7 \end{bmatrix}$

(c) $\begin{bmatrix} -3 & 7 \\ 10 & 2 \end{bmatrix}$

(d) None of these

Answer:

(b) $\begin{bmatrix} -3 & 10 \\ -2 & 7 \end{bmatrix}$

Question 10.

If matrix $A = \begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix}$ where a, b, c are real positivenumbers, abc = 1 and $A^TA = I$, then the value of $a^3 + b^3 + c^3$ is

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

Answer:

(d) 4

Question 11.

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

(a) $\frac{1}{11}\begin{bmatrix} 1 & -3 & 5 \\ -2 & 5 & -1 \\ 7 & -1 & -2 \end{bmatrix}$ (b) $\frac{1}{11}\begin{bmatrix} 1 & -2 & 5 \\ -2 & 5 & -1 \\ 7 & -1 & -2 \end{bmatrix}$

(c) $\frac{1}{11}\begin{bmatrix} -1 & -3 & 5 \\ -2 & 5 & -1 \\ 7 & -1 & -2 \end{bmatrix}$ (d) $\frac{1}{11}\begin{bmatrix} 1 & -3 & 5 \\ -1 & 5 & -1 \\ 7 & -1 & -2 \end{bmatrix}$

Answer:

(c) $\frac{1}{11}\begin{bmatrix} -1 & -3 & 5 \\ -2 & 5 & -1 \\ 7 & -1 & -2 \end{bmatrix}$

Question 12.

Let $A = \begin{bmatrix} 1 & 2 \\ -5 & 1 \end{bmatrix}$ and $A^{-1} = xA + yI$, then the values of x and y respectively are

(a) $\frac{-1}{11}, \frac{2}{11}$ (b) $\frac{-1}{11}, \frac{-2}{11}$

(c) $\frac{1}{11}, \frac{2}{11}$ (d) $\frac{1}{11}, \frac{-2}{11}$

Answer:

(a) $\frac{-1}{11}, \frac{2}{11}$

Question 13.

Using elementary transformation, find the inverse of matrix $\begin{bmatrix} -1 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$

(a) $\begin{bmatrix} 1 & -1 & 1 \\ -8 & 7 & -5 \\ 5 & -4 & 3 \end{bmatrix}$ (b) $\begin{bmatrix} 2 & -1 & 1 \\ -6 & 7 & -5 \\ 5 & -4 & 3 \end{bmatrix}$

(c) $\begin{bmatrix} 2 & -1 & 1 \\ -6 & 4 & -5 \\ 5 & -4 & 3 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & -1 & 1 \\ -6 & 4 & -5 \\ 5 & -4 & 3 \end{bmatrix}$

Answer:

(a) $\begin{bmatrix} 1 & -1 & 1 \\ -8 & 7 & -5 \\ 5 & -4 & 3 \end{bmatrix}$

Question 14.

Find the inverse of the matrix $A = \begin{bmatrix} 1 & 3 \\ 2 & 7 \end{bmatrix}$, using elementary row transformation.

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

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

Answer:

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

Question 15.

If $A = \begin{bmatrix} 2x & 0 \\ x & x \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} 1 & 0 \\ -1 & 2 \end{bmatrix}$, then x equals

(a) 2 (b) $-\frac{1}{2}$

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

Answer:

(d) $\frac{1}{2}$

Question 16.

Find the values of x, y, z respectively if the matrix $A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ satisfy the equation $A^TA = I_3$.

(a) $\frac{1}{\sqrt{2}} \cdot \frac{1}{\sqrt{6}}, \frac{1}{\sqrt{3}}$

(b) $\frac{-1}{\sqrt{2}}, \frac{-1}{\sqrt{6}}, \frac{-1}{\sqrt{3}}$

(c) Both (a) and (b)

(d) None of these

Answer:

(c) Both (a) and (b)

Question 17.

If $A = \begin{bmatrix} \cos x & -\sin x \\ \sin x & \cos x \end{bmatrix}$, find AAT.

(a) Zero Matrix

(b) I_2

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

(d) None of these

Answer:

(b) I_2

Question 18.

If $A = \begin{bmatrix} 0 & -1 & 2 \\ 1 & 0 & 3 \\ -2 & -3 & 0 \end{bmatrix}$, then $A + 2A^T$ equals

(a) A

(b) $-A^T$

(c) A^T

(d) $2A^2$

Answer:

(c) A^T

Question 19.

For any square matrix A, AA^T is a

(a) unit matrix

(b) symmetric matrix

(c) skew-symmetric matrix

(d) diagonal matrix
Answer:
(b) symmetric matrix

Question 20.
If $A = \begin{bmatrix} 6 & 8 & 5 \\ 4 & 2 & 3 \\ 9 & 7 & 1 \end{bmatrix}$ is the sum of a symmetric matrix B and skew-symmetric matrix C, then B is

(a) $A = \begin{bmatrix} 6 & 6 & 7 \\ 6 & 2 & 5 \\ 7 & 5 & 1 \end{bmatrix}$ (b) $A = \begin{bmatrix} 0 & 2 & -2 \\ -2 & 5 & -2 \\ 2 & 2 & 0 \end{bmatrix}$

(c) $A = \begin{bmatrix} 6 & 6 & 7 \\ -6 & 2 & -5 \\ -7 & 5 & 1 \end{bmatrix}$ (d) $A = \begin{bmatrix} 0 & 6 & -2 \\ 2 & 2 & -2 \\ -2 & -2 & 0 \end{bmatrix}$

Answer:
(a) $A = \begin{bmatrix} 6 & 6 & 7 \\ 6 & 2 & 5 \\ 7 & 5 & 1 \end{bmatrix}$

Question 21.
If the matrix $A = \begin{bmatrix} 5 & 2 & x \\ y & 2 & -3 \\ 4 & t & -7 \end{bmatrix}$ is a symmetric matrix, then find the value of x, y and t respectively.
(a) 4, 2, 3
(b) 4, 2, -3
(c) 4, 2, -7
(d) 2, 4, -7
Answer:
(b) 4, 2, -3

Question 22.
If a matrix A is both symmetric and skew-symmetric, then
(a) A is a diagonal matrix
(b) A is a zero matrix
(c) A is a scalar matrix
(d) A is a square matrix
Answer:
(b) A is a zero matrix

Question 23.

The matrix $\begin{bmatrix} 0 & 5 & -7 \\ -5 & 0 & 11 \\ 7 & -11 & 0 \end{bmatrix}$ is

(a) a skew-symmetric matrix
(b) a symmetric matrix
(c) a diagonal matrix
(d) an upper triangular matrix

Answer:

(a) a skew-symmetric matrix

Question 24.

$\begin{bmatrix} \mathbf{2} & \mathbf{0} & \mathbf{3} \\ \mathbf{5} & \mathbf{1} & \mathbf{0} \\ \mathbf{0} & \mathbf{1} & \mathbf{-1} \end{bmatrix}$

(a) $\frac{1}{13}\begin{bmatrix} -1 & 3 & -3 \\ 5 & -2 & 15 \\ 5 & -2 & 2 \end{bmatrix}$ (b) $\frac{1}{13}\begin{bmatrix} -1 & 3 & 2 \\ -5 & 2 & 15 \\ 5 & -2 & 2 \end{bmatrix}$

(c) $\frac{1}{23}\begin{bmatrix} 3 & -2 & 2 \\ 5 & 2 & -5 \\ 5 & -5 & 3 \end{bmatrix}$ (d) $\frac{1}{13}\begin{bmatrix} 3 & -1 & 2 \\ 5 & 5 & -5 \\ 15 & -5 & 3 \end{bmatrix}$

Answer:

(a) $\frac{1}{13}\begin{bmatrix} -1 & 3 & -3 \\ 5 & -2 & 15 \\ 5 & -2 & 2 \end{bmatrix}$

Question 25.

$$\begin{bmatrix} 0 & -1 & 1 \\ 2 & -3 & 4 \\ 3 & -3 & 4 \end{bmatrix}$$

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

(c) $\begin{bmatrix} 0 & -1 & 1 \\ -4 & 3 & -2 \\ -3 & 3 & -2 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & -1 & 2 \\ -2 & 3 & -4 \\ -3 & 3 & -2 \end{bmatrix}$

Answer:

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

Question 26.

If $A = [a_{ij}]_{4\times 3}$ where $a_{ij} = \frac{i-j}{i+j}$, then find A

(a) $\begin{bmatrix} 0 & -1/3 & -1/2 \\ 1/2 & 0 & 1/5 \\ 1/3 & 1/5 & 0 \\ 3/5 & 1/3 & 1/7 \end{bmatrix}$ (b) $\begin{bmatrix} 0 & -1/3 & -1/2 \\ 1/3 & 0 & -1/5 \\ 1/2 & 1/5 & 0 \\ 3/5 & 1/3 & 1/7 \end{bmatrix}$

(c) $\begin{bmatrix} 0 & -3 & -1/2 \\ 2 & 0 & 5 \\ 3 & 5 & 0 \\ 3/5 & 3 & 7 \end{bmatrix}$ (d) $\begin{bmatrix} 0 & 1/3 & 1/2 \\ -1/3 & 0 & 1/5 \\ -1/2 & -1/5 & 0 \\ -3/5 & -1/3 & -1/7 \end{bmatrix}$

Answer:

(b) $\begin{bmatrix} 0 & -1/3 & -1/2 \\ 1/3 & 0 & -1/5 \\ 1/2 & 1/5 & 0 \\ 3/5 & 1/3 & 1/7 \end{bmatrix}$

Question 27.
The matrix A = $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ is a
(a) unit matrix
(c) symmetric matrix
(b) diagonal matrix
(d) skew-symmetric matrix
Answer:
(d) skew-symmetric matrix

Question 28.
If $\begin{bmatrix} x+y & 2x+z \\ x-y & 2z+w \end{bmatrix} = \begin{bmatrix} 4 & 7 \\ 0 & 10 \end{bmatrix}$, then the values of x, y, z and w respectively are
(a) 2, 2, 3, 4
(b) 2, 3, 1, 2
(c) 3, 3, 0, 1
(d) None of these
Answer:
(a) 2, 2, 3, 4

Question 29.
$$\begin{bmatrix} x+3 & z+4 & 2y-7 \\ 4x+6 & a-1 & 0 \\ b-3 & 3b & z+2c \end{bmatrix} = \begin{bmatrix} 0 & 6 & 3y-2 \\ 2x & -3 & 2c+2 \\ 2b+4 & -21 & 0 \end{bmatrix}$$
then find the values of a, b, c, x, y, and z respectively.
(a) -2, -7, -1, -3, -5, 2
(b) 2, 7, 1, 3, 5, -2
(c) 1, 3, 4, 2, 8, 9
(d) -1, 3, -2, -7, 4, 5
Answer:
(a) -2, -7, -1, -3, -5, 2

Question 30.
The order of the single matrix obtained from
$$\begin{bmatrix} 1 & -1 \\ 0 & 2 \\ 2 & 3 \end{bmatrix} \left\{ \begin{bmatrix} -1 & 0 & 2 \\ 2 & 0 & 1 \end{bmatrix} - \begin{bmatrix} 0 & 1 & 23 \\ 1 & 0 & 21 \end{bmatrix} \right\} \text{ is}$$
(a) 2 × 3
(b) 2 × 2

(c) 3 × 2
(d) 3 × 3
Answer:
(d) 3 × 3

Question 31.
$A = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}, B = \begin{bmatrix} x & 1 \\ y & -1 \end{bmatrix}$ and $(A + B)^2 = A^2 + B^2$, then x + y =
(a) 2
(b) 3
(c) 4
(d) 5
Answer:
(d) 5

Question 32.
If $A^2 - A + I = O$, then the inverse of A is
(a) I – A
(b) A – I
(c) A
(d) A + I
Answer:
(a) I – A

Question 33.
Total number of possible matrices of order 3 × 3 with each entry 2 or 0 is
(a) 9
(b) 27
(c) 81
(d) 512
Answer:
(d) 512

Question 34.
The matrix $\begin{bmatrix} 0 & -5 & 8 \\ 5 & 0 & 12 \\ -8 & -12 & 0 \end{bmatrix}$ is a
(a) diagonal matrix
(b) symmetric matrix
(c) skew symmetric matrix
(d) scalar matrix
Answer:
(c) skew symmetric matrix

Question 35.
If A is a matrix of order m × n and B is a matrix such that AB' and B'A are both defined, then the order of matrix B is
(a) m × m
(b) n × n
(c) n × m
(d) m × n
Answer:
(d) m × n

Question 36.
If A and B are matrices of the same order, then (AB' – BA') is a
(a) skew-symmetric matrix
(b) null matrix
(c) symmetric matrix
(d) unit matrix
Answer:
(a) skew-symmetric matrix

Question 37.
If A is a square matrix such that $A^2 = I$, then $(A - I)^3 + (A + I)^3 - 7A$ is equal to
(a) A
(b) I – A
(c) I + A
(d) 3A
Answer:
(a) A

Question 38.
If $A = \begin{bmatrix} 2 & 2 & 1 \\ 1 & 3 & 1 \\ 1 & 2 & 2 \end{bmatrix}$, then $A^4 - 2^4 (A - I) =$
(a) 5I + A
(b) 5I – A
(c) 5I
(d) 6I
Answer:
(b) 5I – A

Question 39.
If A is an m × n matrix such that AB and BA are both defined, then B is a
(a) m × n matrix
(b) n × m matrix

(c) n × n matrix
(d) m × n matrix
Answer:
(b) n × m matrix

Question 40.
If $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, then $A^2 - 5A$ is equal to
(a) 2I
(b) 3I
(c) -2I
(d) null matrix
Answer:
(a) 2I

Question 41.
If $A = \begin{bmatrix} 2 & 1 \\ -1 & 2 \end{bmatrix}, B = \begin{bmatrix} 1 & -2 \\ 2 & 1 \end{bmatrix}, C = \begin{bmatrix} 1 & -3 \\ 2 & 1 \end{bmatrix}$, then
(a) A + B = B + A and A + (B + C) = (A + B) + C
(b) A + B = B + A and AC = BC
(c) A + B = B + A and AB = BC
(d) AC = BC and A = BC
Answer:
(a) A + B = B + A and A + (B + C) = (A + B) + C