1 Mark Questions

1. If $3A - B = \begin{bmatrix} 5 & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$, then find the value of matrix A.

2. Find the value of $x - y$, if

$$2\begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$$

3. If A is a square matrix such that $A^2 = I$, then find the simplified value of $(A - I)^3 + (A + I)^3 - 7A$.

4. Write the number of all possible matrices of order 2×2 with each entry 1, 2 or 3.

5. If $[2\ 1\ 3]\begin{bmatrix} -1 & 0 & -1 \\ -1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix}\begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix} = A$, then write the order of matrix A.

6. Write the element a_{23} of a 3×3 matrix $A = [a_{ij}]$, whose elements a_{ij} are given by $a_{ij} = \frac{|i - j|}{2}$.

7. If $[2x \quad 3]\begin{bmatrix} 1 & 2 \\ -3 & 0 \end{bmatrix}\begin{bmatrix} x \\ 3 \end{bmatrix} = O$, find x.

8. If $2\begin{bmatrix} 3 & 4 \\ 5 & x \end{bmatrix} + \begin{bmatrix} 1 & y \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 7 & 0 \\ 10 & 5 \end{bmatrix}$, then find $(x - y)$.

9. Solve the following matrix equation for x.

$$[x \quad 1]\begin{bmatrix} 1 & 0 \\ -2 & 0 \end{bmatrix} = O$$

10. If A is a square matrix such that $A^2 = A$, then write the value of $7A - (I + A)^3$, where I is an identity matrix.

11. If $\begin{bmatrix} x-y & z \\ 2x-y & w \end{bmatrix} = \begin{bmatrix} -1 & 4 \\ 0 & 5 \end{bmatrix}$, then find the value of $x + y$.

12. If $\begin{bmatrix} a+4 & 3b \\ 8 & -6 \end{bmatrix} = \begin{bmatrix} 2a+2 & b+2 \\ 8 & a-8b \end{bmatrix}$, then write the value of $a - 2b$.

13. If $\begin{bmatrix} x \cdot y & 4 \\ z+6 & x+y \end{bmatrix} = \begin{bmatrix} 8 & w \\ 0 & 6 \end{bmatrix}$, then write the value of $(x + y + z)$.

14. The elements a_{ij} of a 3×3 matrix are given by $a_{ij} = \frac{1}{2}|-3i + j|$. Write the value of element a_{32}

15. If $\begin{bmatrix} 2x & 4 \end{bmatrix} \begin{bmatrix} x \\ -8 \end{bmatrix} = O$, then find the positive value of x.

16. If $2\begin{bmatrix} 1 & 3 \\ 0 & x \end{bmatrix} + \begin{bmatrix} y & 0 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 5 & 6 \\ 1 & 8 \end{bmatrix}$, then find the value of $(x + y)$

17. Find the value of a, if $\begin{bmatrix} a-b & 2a+c \\ 2a-b & 3c+d \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}$.

18. If $\begin{bmatrix} 9 & -1 & 4 \\ -2 & 1 & 3 \end{bmatrix} = A + \begin{bmatrix} 1 & 2 & -1 \\ 0 & 4 & 9 \end{bmatrix}$, then find the matrix A.

19. If matrix $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$ and $A^2 = kA$, then write the value of k.

20. If matrix $A = \begin{bmatrix} 2 & -2 \\ -2 & 2 \end{bmatrix}$ and $A^2 = pA$, then write the value of p.

21. If matrix $A = \begin{bmatrix} 3 & -3 \\ -3 & 3 \end{bmatrix}$ and $A^2 = \lambda A$, then write the value of λ

22. Simplify

$$\cos\theta \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} + \sin\theta \begin{bmatrix} \sin\theta & -\cos\theta \\ \cos\theta & \sin\theta \end{bmatrix}.$$

23. If $\begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix} \begin{bmatrix} 1 & -3 \\ -2 & 4 \end{bmatrix} = \begin{bmatrix} -4 & 6 \\ -9 & x \end{bmatrix}$, write the value of x.

24. Find the value of $y - x$ from following equation.

$$2\begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$$

25. If $x\begin{bmatrix} 2 \\ 3 \end{bmatrix} + y\begin{bmatrix} -1 \\ 1 \end{bmatrix} = \begin{bmatrix} 10 \\ 5 \end{bmatrix}$, then write the value of x.

26. If $3A - B = \begin{bmatrix} 5 & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$, then find the matrix A.

27. Write the value of $x - y + z$ from following equation.

$$\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$$

28. Write the order of product matrix $\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix} \begin{bmatrix} 2 & 3 & 4 \end{bmatrix}$.

29. If a matrix has 5 elements, then write all possible orders it can have.

30. For a 2×2 matrix, $A = [a_{ij}]$ whose elements are given by $a_{ij} = i/j$, write the value of a_{12}.

31. If $\begin{bmatrix} x & x-y \\ 2x+y & 7 \end{bmatrix} = \begin{bmatrix} 3 & 1 \\ 8 & 7 \end{bmatrix}$, then find the value of y.

32. From the following matrix equation, find the value of x.

$$\begin{bmatrix} x+y & 4 \\ -5 & 3y \end{bmatrix} = \begin{bmatrix} 3 & 4 \\ -5 & 6 \end{bmatrix}$$

33. Find x from the matrix equation

$$\begin{bmatrix} 1 & 3 \\ 4 & 5 \end{bmatrix} \begin{bmatrix} x \\ 2 \end{bmatrix} = \begin{bmatrix} 5 \\ 6 \end{bmatrix}.$$

34. If $\begin{bmatrix} 3 & 4 \\ 2 & x \end{bmatrix}\begin{bmatrix} x \\ 1 \end{bmatrix} = \begin{bmatrix} 19 \\ 15 \end{bmatrix}$, then find the value of x.

35. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$, then for what value of α, A is an identity matrix?

36. If $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}\begin{bmatrix} 3 & 1 \\ 2 & 5 \end{bmatrix} = \begin{bmatrix} 7 & 11 \\ k & 23 \end{bmatrix}$, then write the value of k.

37. If A is a matrix of order 3×4 and B is a matrix of order 4×3, then find order of matrix (AB).

38. If $\begin{bmatrix} x+y & 1 \\ 2y & 5 \end{bmatrix} = \begin{bmatrix} 7 & 1 \\ 4 & 5 \end{bmatrix}$, then find the value of x.

39. If $\begin{bmatrix} 2x+y & 3y \\ 0 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ 0 & 4 \end{bmatrix}$, then find the value of x.

40. If $\begin{bmatrix} 3y-x & -2x \\ 3 & 7 \end{bmatrix} = \begin{bmatrix} 5 & -2 \\ 3 & 7 \end{bmatrix}$, then find the value of y

2 Marks Questions

41. If $A = \begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$, show that

$(A - 2I)(A - 3I) = O$.

42. Find a matrix A such that

$2A - 3B + 5C = O$, where $B = \begin{bmatrix} -2 & 2 & 0 \\ 3 & 1 & 4 \end{bmatrix}$

and $C = \begin{bmatrix} 2 & 0 & -2 \\ 7 & 1 & 6 \end{bmatrix}$.

43. If $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$, then find the values of $(A^2 - 5A)$.

4 Marks Questions

44. Find matrix A such that

$\begin{bmatrix} 2 & -1 \\ 1 & 0 \\ -3 & 4 \end{bmatrix} A = \begin{bmatrix} -1 & -8 \\ 1 & -2 \\ 9 & 22 \end{bmatrix}$

45. Let $A = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} 5 & 2 \\ 7 & 4 \end{bmatrix}, C = \begin{bmatrix} 2 & 5 \\ 3 & 8 \end{bmatrix}$, find a matrix D such that $CD - AB = O$.

46. If $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$, then find $A^2 - 5A + 4I$ and hence find a matrix X such that $A^2 - 5A + 4I + X = O$.

47. If $A = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}$, $B = \begin{bmatrix} a & 1 \\ b & -1 \end{bmatrix}$ and $(A + B)^2 = A^2 + B^2$, then find the values of a and b.

48. If $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$, then find value of $A^2 - 3A + 2I$.

6 Marks Questions

49. If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ and $A^3 - 6A^2 + 7A + kI_3 = O$, find the value of k

1 Mark Questions

1. If $A=\begin{bmatrix}1 & 2 & 2\\ 2 & 1 & x\\ -2 & 2 & -1\end{bmatrix}$ is a matric satisfying $AA' = 9I$, find x.

2. If the matrix $A=\begin{bmatrix}0 & a & -3\\ 2 & 0 & -1\\ b & 1 & 0\end{bmatrix}$ is skew-symmetric, find the values of 'a' and 'b'.

3. Matrix $A=\begin{bmatrix}0 & 2b & -2\\ 3 & 1 & 3\\ 3a & 3 & -1\end{bmatrix}$ is given to be symmetric, find the values of a and b.

4. If $A=\begin{bmatrix}\cos\alpha & \sin\alpha\\ -\sin\alpha & \cos\alpha\end{bmatrix}$, then find α satisfying $0<\alpha<\frac{\pi}{2}$ when $A + A^T = \sqrt{2}\, I_2$; where A^T is transpose of A.

5. If $A=\begin{pmatrix}3 & 5\\ 7 & 9\end{pmatrix}$ is written as $A = P + Q$, where P is a symmetric matrix and Q is skew-symmetric matrix, then write the matrix P.

6. Write 2×2 matrix which is both symmetric and skew-symmetric.

7. For what value of x, is the matrix $A=\begin{bmatrix}0 & 1 & -2\\ -1 & 0 & 3\\ x & -3 & 0\end{bmatrix}$ a skew-symmetric matrix?

8. If $A^T=\begin{bmatrix}3 & 4\\ -1 & 2\\ 0 & 1\end{bmatrix}$ and $B=\begin{bmatrix}-1 & 2 & 1\\ 1 & 2 & 3\end{bmatrix}$, then find $A^T - B^T$.

9. If $A=\begin{bmatrix}1 & 2\\ 3 & 4\end{bmatrix}$, then find $A + A'$.

10. If $\begin{pmatrix}2x+y & 3y\\ 0 & 4\end{pmatrix}=\begin{pmatrix}6 & 0\\ 6 & 4\end{pmatrix}'$, then find the value of x.

2 Marks Question

11. Show that all the diagonal elements of a skew-symmetric matrix are zero.

4 Marks Questions

12. Express the matrix $A=\begin{bmatrix}2 & 4 & -6\\ 7 & 3 & 5\\ 1 & -2 & 4\end{bmatrix}$ as the sum of a symmetric and skew-symmetric matrix.

13. For the following matrices A and B, verify that $[AB]' = B'A'$;

$$A=\begin{bmatrix}1\\ -4\\ 3\end{bmatrix}, B=[-1 \quad 2 \quad 1].$$

14. Express the following matrix as a sum of a symmetric and a skew-symmetric matrices and verify your result:

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

1 Mark Question

1. Use elementary column operation $C_2 \to C_2 - 2C_1$ in the matrix equation

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

4 Marks Questions

2. Using elementary row transformations (ERT), find inverse of matrix $A = \begin{bmatrix} 6 & 5 \\ 5 & 4 \end{bmatrix}$.

3. Find A^{-1}, by using elementary row transformations for matrix $A = \begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix}$.

4. Using elementary row transformations, find inverse of matrix $A = \begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$.

6 Marks Questions

Directions (Q. Nos. 5-9) *Using elementary row transformations, find inverse of following matrices.*

5. $A = \begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$

6. $A = \begin{bmatrix} -1 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$

7. $A = \begin{bmatrix} 1 & 2 & -2 \\ -1 & 3 & 0 \\ 0 & -2 & 1 \end{bmatrix}$

8. $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 7 \\ -2 & -4 & -5 \end{bmatrix}$.

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

Objective Questions

(For Complete Chapter)

1 Mark Questions

1. If A is 3×4 matrix and B is a matrix such that $A'B$ and BA' are both defined , then B is of the type

(a) 4×4 (b) 3×4

(c) 4×3 (d) 3×3

2. The symmetric part of the matrix $A = \begin{bmatrix} 1 & 2 & 4 \\ 6 & 8 & 2 \\ 2 & -2 & 7 \end{bmatrix}$ is equal to

(a) $\begin{bmatrix} 0 & -2 & -1 \\ -2 & 0 & -2 \\ -1 & -2 & 0 \end{bmatrix}$ (b) $\begin{bmatrix} 1 & 4 & 3 \\ 2 & 8 & 0 \\ 3 & 0 & 7 \end{bmatrix}$

(c) $\begin{bmatrix} 0 & -2 & 1 \\ 2 & 0 & 2 \\ -1 & 2 & 0 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 4 & 3 \\ 4 & 8 & 0 \\ 3 & 0 & 7 \end{bmatrix}$

3. If $AB = A$ and $BA = B$, then B^2 is equal to

(a) B (b) A

(c) $-B$ (d) B^3

4. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, then

(a) $A^2 + 7A - 5I = O$

(b) $A^2 - 7A + 5I = O$

(c) $A^2 + 5A - 7I = O$

(d) $A^2 - 5A + 7I = O$

5. Find the values of x, y and z from the following equations

$$\begin{bmatrix} 4 & x-z \\ 2+y & xz \end{bmatrix} = \begin{bmatrix} 4 & 3 \\ -1 & 10 \end{bmatrix}.$$

(a) $x=-5, y=3, z=2$
(b) $x=5, y=-3, z=2$
(c) $x=5, y=3, z=-2$
(d) $x=5, y=-3, z=-2$

6. Compute $\begin{bmatrix} -1 & 3 & 0 \\ 2 & 1 & 4 \end{bmatrix} \times \begin{bmatrix} 1 & 3 \\ 0 & 2 \\ -2 & -1 \end{bmatrix}$.

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

7. If $A = \begin{bmatrix} 3 & x-1 \\ 2x+3 & x+2 \end{bmatrix}$ is a symmetric matrix, then the value of x is

(a) 4 (b) 3 (c) -4 (d) -3

8. If $A = [a_{ij}]_{2\times 2}$, where $a_{ij} = i + j$, then A is equal to

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

9. If $A = \begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix}$ and A^2 is the identity matrix, then x is equal to

(a) -1 (b) 0
(c) 1 (d) 2

10. If A and B are two symmetric matrices of same order. Then, the matrix $AB - BA$ is equal to

(a) a symmetric matrix
(b) a skew-symmetrie matrix
(c) a null matrix
(d) the identity matrix

11. If $A = \begin{bmatrix} 1 & -2 \\ 4 & 5 \end{bmatrix}$ and $f(A) = A^2 - 3A + 7$, then $f(A) + \begin{bmatrix} 3 & 6 \\ -12 & -9 \end{bmatrix}$ is equal to

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

12. If A is square matrix, A' is its transpose, then $\frac{1}{2}(A - A')$ is

(a) a symmetric matrix
(b) a skew-symmetric matrix
(c) a unit matrix
(d) an elementary matrix

13. If $A(\alpha) = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then the matrix $A^2(\alpha)$ is equal to

(a) $A(2\alpha)$ (b) $A(\alpha)$ (c) $A(3\alpha)$ (d) $A(4\alpha)$