MATRICES

- ***Matrices :*** A rectangular array (arrangement) of numbers real or complex is called a Matrix. The horizontal lines are called rows and the vertical lines are called columns. A set of mn numbers arranged in m rows and n columns is called m x n matrix.
- ***Row & Column Matrices :*** A matrix having only one row is called a row matrix, and matrix having only one column is called column matrix.
- ***Zero Matrix :*** A matrix having all its elements as zeros is called a zero matrix or null matrix, it is denoted by 'O'.
- ***Square Matrix :*** If in a matrix, the number of rows is equal to the number of columns, then it is called a square matrix.
- ***Diagonal Matrix :*** In a square matrix, the elements a_{11}, a_{22}, ... a_{nn} are called the elements of the principal diagonal. If in a matrix all the elements above and below the principal diagonal are zero then it is called a diagonal matrix.
- ***Scalar Matrix :*** A diagonal matrix in which all the principal diagonal elements are equal is called as scalar matrix.

$[4], \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}, \begin{bmatrix} a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a \end{bmatrix}$ are scalar matrices of order 1,2 and 3 respectively.

- ***Unit Matrix (Identity Matrix) :*** A scalar matrix in which each diagonal element is unity is called the unit matrix (identity matrix)

$I_1 = [1],\ I_2 = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix},\ I_3 = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ are the unit matrices of order 1,2 and 3 respectively.

- ***Equality of Matrices :*** Two matrices A and B are equal if :
  i. they are of the same type (order) i.e., both are mxn matrices.
  ii. each element of A is equal to the corre sponding element of B.
- ***Addition of Matrices :*** If $A = (a_{ij})_{mxn}$ and $B = (b_{ij})_{mxn}$ then $A + B = (a_{ij} + b_{ij})_{mxn}$ Addition is defined between matrices of the same order.
- Addition of matrices is both commutative and associative, i.e., A + B = B + A (Commutative law) and (A+B) +C = A + (B+C) (associative law).
- If every element of the matrix A is multiplied by a scalar k then the matrix obtained is written as kA. If $A = (a_{ij})_{m \times n}$ then $kA = (ka_{ij})_{m \times n}$. If A and B are matrices of the same type then, k(A+B) = kA + kB.
- ***Additive Inverse :*** If A is a m x n matrix then the zero matrix of the type m x n is called the additive identity, then -A is called the additive inverse of A.
- ***Product of Matrices :*** If $A = [a_{ij}]_{m \times n}$ where $1 \le i \le m$, $1 \le j \le n$ and $B = (b_{jk})_{n \times p}$ where $1 \le j \le n$, $1 \le k \le p$ then the product A B is an m x p matrix and AB is given by $AB = C = (c_{ik})_{mxp}$ where

$$C_{ik} = \sum_{j=1}^{n} a_{ij} b_{jk}$$

$$c_{ik} = a_{i1}b_{1k} + a_{i2}b_{2k} + ...+ a_{in}b_{nk}$$

- Matrix multiplication does not follow commutative law.
- Matrix multiplication is associative i.e., (AB)C = A(BC).
- Matrix multiplication is distributive over matrix addition i.e., A(B+C) = AB + AC & (B + C)A = BA + CA.
- The cancellation law need not hold in matrix multiplication, i.e., if A, B, C are three matrices

then AB = AC need not imply that B = C. For example let

$A = \begin{bmatrix} 1 & 0 \\ 2 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$ and $C = \begin{bmatrix} 0 & 0 \\ 3 & 2 \end{bmatrix}$.

Then AB = AC = O. But $B \neq C$

- ***Commute :*** Two matrices A and B commute if AB = BA.
- ***Transpose of the Matrix :*** The matrix obtained by interchanging the rows and columns of a matrix A is called the transpose of the matrix A & if order of A is mxn then order of transpose of A is n x m, it is denoted by A^T.
- $(A^T)^T = A$
  $(A + B)^T = A^T + B^T$
  $(AB)^T = B^T A^T$
  $(KA)^T = KA^T$ (K is a scalar)
- ***Upper Triangular Matrix :*** A square matrix $A = [a_{ij}]$ is called upper triangular matrix if $a_{ij} = o$ whenever $i > j$

  Ex: $A = \begin{bmatrix} 1 & 2 & 3 \\ 0 & 5 & 7 \\ 0 & 0 & 4 \end{bmatrix}$
- ***Lower Triangular Matrix :*** A square matrix $A = (a_{ij})$ is lower triangular matrix if $a_{ij} = 0$ whenever $i < j$. Ex. $\begin{bmatrix} 1 & 0 & 0 \\ 1 & 2 & 0 \\ 1 & 3 & 5 \end{bmatrix}$
- ***Idempotent :*** A square matrix is called idempotent if $A^2 = A \Rightarrow |A| = 0$ or 1
- ***Involutary :*** A square matrix is called involutary if $A^2 = I \Rightarrow |A| = \pm 1$
- ***Nilpotent :*** A square matrix is called nilpotent matrix if there exists a positive integer 'n' such that
  $A^n = O$. If 'm' is the least positive integer such that $A^m = O$, them 'm' is called the index of the nilpotent matrix.
- Every nilpotent matrix is a singular matrix.
- ***Conjugate of Matrix :*** The conjugate of a matrix A is the matrix obtained by replacing the elements by their corresponding conjugate complex numbers. It is denoted by $\overline{A}$.

  Ex: If $A = \begin{bmatrix} 2+3i & i & 7i \\ 0 & -4i & 2-5i \\ 7 & -6-i & -i \end{bmatrix}$ then

  $$\overline{A} = \begin{bmatrix} 2-3i & -i & -7i \\ 0 & 4i & 2+5i \\ 7 & -6+i & i \end{bmatrix}$$
- If det $A = \alpha + \beta i$ then det $\overline{A} = \alpha - i\beta$
- ***Symmetric Matrix :*** A square matrix A is called a symmetric matrix if $A^T = A$.
  i) $A+A^T, AA^T, A^TA$ are Symmetric matrices
  ii) If A is symmetric then A^n is also symmetric for all $n \in N$

30. **Skew - Symmetric Matrix :** A square matrix A is called skew - symmetric if $A^T = -A$.
    i) $A-A^T$ and A^T-A are skew - symmetric matrices
    ii) If A is skew - symmetric then
    A^n is symmetric whenever n is an even +ve integer
    A^n is skew symmetric whenver n is an odd +ve integer .
    iii) If A is a skew - symmetric matrix of odd order then det A = 0 and that of even order is a perfect square.

31. If A is a square matrix then

    $A = \frac{A^T + A}{2} + \frac{A - A^T}{2}$ where $\frac{A^T + A}{2}$ is symmetric

    matrix and $\frac{A - A^T}{2}$ is a skew - symmetric matrix.

32. ***Hermitian :*** A square matrix A is called Hermitian. If the transpose conjugate of A is itself, i.e., $\left(\overline{A}\right)^T = A$

33. ***Skew - Hermintian :*** A square matrix is called skew - Hermintian if $\left(\overline{A}\right)^T = -A$.

34. ***Trace :*** The sum of the principal (main diagonal elements $a_{11} + a_{22} + ... + a_{nn}$ of a square

matrix A is called the trace of A :

Trace A = Tr (A) = $a_{11} + a_{22} + \dots\dots + a_{nn}$.

i) If A and B are two matrices of order n then

Tr (A +B) = Trace A + Trace B.

Tr (A -B) = Trace A - Trace B.

Tr (kA)=k(TrA)

Tr (A^T) = Tr(A)

ii)If A, B,C are square matrices of order n, then

Tr ABC = Tr BCA = Tr CAB = Tr ACB = Tr BCA = Tr CBA.

iii) Tr of skew -symmetric matrix is Zero.

35. ***Determinant of a Matrix :*** a) The determinant of a square matrix A = $\begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$ is denoted by det A or $|A|$ and is defined as the expression $\begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix} = a_{11}a_{22} - a_{12}a_{21}$

b) detA is a real number or complex number,

$$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = a_1\begin{vmatrix} b_2 & c_2 \\ b_3 & c_3 \end{vmatrix} - b_1\begin{vmatrix} a_2 & c_2 \\ a_3 & c_3 \end{vmatrix} + c_1\begin{vmatrix} a_2 & b_2 \\ a_3 & b_3 \end{vmatrix}$$

$$= \sum a_1(b_2c_3 - b_3c_2)$$

36. Let $A = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$

Then the Minor of a_{11} = $M_{11} = \begin{vmatrix} a_{22} & a_{23} \\ a_{32} & a_{33} \end{vmatrix}$

Minor of a_{12} = $M_{12} = \begin{vmatrix} a_{21} & a_{23} \\ a_{31} & a_{33} \end{vmatrix}$

Minor of a_{13} = $M_{13} = \begin{vmatrix} a_{21} & a_{22} \\ a_{31} & a_{32} \end{vmatrix}$

Minor of a_{21} = $M_{21} = \begin{vmatrix} a_{12} & a_{13} \\ a_{32} & a_{33} \end{vmatrix}$

The cofactor of $a_{11} = A_{11} = (-1)^{1+1} M_{11}$

the cofactor of $a_{12} = A_{12} = (-1)^{1+2} M_{12}$

the cofactor of $a_{13} = A_{13} = (-1)^{1+3} M_{13}$

the cofactor of $a_{21} = A_{21} = (-1)^{2+1} M_{21}$

and so on.

37. ***Singular :*** A matrix is said to be singular if det A = |A| = 0, it is non - singular if $|A| \neq 0$. Unit matrix is non- singular.

38. If A and B are non- singular matrices of the same type of then the product matrix AB is non-singular of the same type. If k is non-zero scalar then kA is non-singular $\Leftrightarrow$ A is non-singular.

39. Let A be an n x n matrix. If the rows and the columns in a square matrix are interchanged, then the value of its determinant remains unaltered.

(1) det (A) = det (A^T)

(2) det (kA) = k^n |A|.

40. The determinant of a square matrix changes it sign when any two rows or columns are interchanged.

41. If two rows or columns of a square matrix are identical or in the same ratio then the value of the determinant is zero.

42. If all the elements of a row (or column) of a square matrix are multiplied by a number 'k' then the determinant of the resulting matrix is equal to 'k' times the determinant of the original matrix.

43. If to the elements of row (or column) of a square matrix are added 'k' times the corresponding elements of any other row (or column) then the value of the determinant of the resulting matrix is not altered.

44. (a) The sum of the products of the elements of any row (or columns) of a square matrix with the cofactors of the corresponding elements of same row (or columns) is det of the matrix.

(b) The sum of the products of the elements of any row (or columns) of a square matrix with the cofactors of the corresponding elements of any other row (or columns) is zero.

45. If the elements of a square matrix are polynomials in x and if two rows or columns become identical when x = a, then (x - a) is a factor of its determinant, if three rows are identical then $(x- a)^2$ is a factor of determinant.

46. ***Adjoint of A :*** Let A be a square matrix. The transpose of the matrix got from A by replacing the elements of A by the

corresponding cofactors is called the adjoint of A. It is denoted by Adj. A.

47. ***Multiplicative Inverse :*** If for a square matrix A, there exits another matrix B such that AB = BA = I, then 'B' is called the multiplicative inverse of A, It is denoted by A^{-1}

48. $(A^{-1})^{-1} = A$, $(AB)^{-1} = B^{-1}A^{-1}$, $(A^T)^{-1} = (A^{-1})^T$ $(ABC)^{-1} = C^{-1}B^{-1}A^{-1}$ etc.

49. If A is a $n \times n$ non- singular matrix, then

(i) $A(AdjA)=|A|I$

(ii) $A^{-1} = \dfrac{Adj\ A}{|A|}$

(iii) $Adj\ A = |A|\ A^{-1}$

(iv) $(Adj\ A)^{-1} = \dfrac{A}{|A|} = Adj\ (A^{-1})$

(v) $Adj\ A^T = (Adj\ A)^T$

(vi) $Det\ (A^{-1}) = (Det\ A)^{-1}$

(vii) $|Adj\ A| = |A|^{n-1}$

(viii) $Adj\ (Adj\ A) = |A|^{n-2} A$

(ix) For any scalar 'k' $Adj\ (kA) = k^{n-1} Adj\ A$

(x) $|Adj\ Adj\ A| = |A|^{(n-1)^2}$

(xi) $|Adj\ Adj\ Adj\ A| = |A|^{(n-1)^3}$

50. If A and B are two non-singular matrices of the same type then
(i) Adj (AB) = (Adj B) (Adj A) .
(ii) |Adj (AB) | = |Adj A| |Adj B | = |Adj B| |Adj A|

51. Let A and B be two matrices of order n. Then AB - BA is called the commutator of A and B . If A and B commute then the commutator of A and B is zero.

52. The necessary and sufficient condition for the square matrix A to be invertible(to have inverse) is that $|A| \neq 0$

LEVEL - 1

Addition of Matrices :

1. If $A = \begin{bmatrix} 1 & 4 \\ -1 & 1 \end{bmatrix}$ $B = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ then $\begin{bmatrix} 4 & 7 \\ -3 & 4 \end{bmatrix}$ is

1) 2A + B 2) A - B 3) AB 4) A - 2B

2. If $\begin{bmatrix} x+3 & 2y+x \\ z-1 & 4a-z \end{bmatrix} = \begin{bmatrix} 0 & -7 \\ 3 & 2a \end{bmatrix}$, (x+y+z+a) =

1) -1 2) 0 3) 1 4) 8

3. $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} + 2x = \begin{bmatrix} 3 & 5 \\ 5 & 9 \end{bmatrix}$, $\Rightarrow$ X =

1) $\begin{bmatrix} 2 & 3 \\ 2 & 5 \end{bmatrix}$ 2) $\begin{bmatrix} 1 & 3/2 \\ 1 & 5/2 \end{bmatrix}$

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

4 If $\begin{bmatrix} r+2 & 5 \\ -2 & r+1 \end{bmatrix} = \begin{bmatrix} 4 & y+3 \\ z & 3 \end{bmatrix}$, then

1) r = y = z 2) r = -y = z
3) -r = y = z 4) r = y = -z

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

1) $\begin{bmatrix} 1-t & 2 \\ 3 & 1-t \end{bmatrix}$ 2) $\begin{bmatrix} 1+t & 2 \\ 3 & 1-t \end{bmatrix}$

3) $\begin{bmatrix} 1-t & 2 \\ -3 & 1-t \end{bmatrix}$ 4) $\begin{bmatrix} 1+t & -2 \\ -3 & 1+t \end{bmatrix}$

6. If $A = \begin{bmatrix} 9 & 1 \\ 4 & 3 \end{bmatrix}, B = \begin{bmatrix} 1 & 5 \\ 6 & 11 \end{bmatrix}$ &
3A + 5B + 2X = 0 then X =

1) $\begin{bmatrix} 16 & -14 \\ 21 & -32 \end{bmatrix}$ 2) $\begin{bmatrix} 16 & 14 \\ -21 & -32 \end{bmatrix}$

3) $\begin{bmatrix} -16 & -14 \\ -21 & -32 \end{bmatrix}$ 4) $\begin{bmatrix} 16 & 14 \\ 21 & 32 \end{bmatrix}$

7. $If\ A=\begin{bmatrix}2&3&4\\4&5&6\\7&8&9\end{bmatrix}$ then 3A =

1) $\begin{bmatrix}6&9&12\\12&15&18\\21&24&27\end{bmatrix}$ 2) $\begin{bmatrix}6&9&12\\4&5&6\\7&8&9\end{bmatrix}$

3) $\begin{bmatrix}2&3&4\\12&15&18\\7&8&-9\end{bmatrix}$ 4) $\begin{bmatrix}2&3&4\\4&5&6\\12&24&27\end{bmatrix}$

8 Square root of $\begin{bmatrix}1&0\\0&1\end{bmatrix}$ =

1) $\pm\begin{bmatrix}-1&0\\0&1\end{bmatrix}$ 2) $\pm\begin{bmatrix}1&0\\0&-1\end{bmatrix}$

3) $\pm\begin{bmatrix}1&0\\0&1\end{bmatrix}$ 4) $\pm\begin{bmatrix}1&1\\1&1\end{bmatrix}$

9. The additive inverse of $\begin{pmatrix}1&4&-7\\-3&2&5\\2&3&-1\end{pmatrix}$ is

1) $\begin{pmatrix}-1&-4&7\\3&+2&-5\\+2&+3&-1\end{pmatrix}$ 2) $\begin{pmatrix}-1&-4&7\\3&-2&-5\\-2&-3&-1\end{pmatrix}$

3) not possible 4) $\begin{pmatrix}-1&-4&7\\3&-2&-5\\-2&-3&1\end{pmatrix}$

10. If A-2B = $\begin{pmatrix}1&-2\\3&0\end{pmatrix}$ and 2A-3B = $\begin{pmatrix}-3&3\\1&-1\end{pmatrix}$ then B =

1) $\begin{pmatrix}-5&7\\5&1\end{pmatrix}$ 2) $\begin{pmatrix}-5&7\\-5&-1\end{pmatrix}$ 3) $\begin{pmatrix}-5&7\\5&-1\end{pmatrix}$ 4) $\begin{pmatrix}-5&-7\\-5&-1\end{pmatrix}$

Product of Matrices **:**

11. If $A=\begin{bmatrix}i&0\\0&-i\end{bmatrix}$ then A^2 =

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

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

12. If $A=\begin{bmatrix}0&-1\\1&0\end{bmatrix}$ and $B=\begin{bmatrix}0&i\\i&0\end{bmatrix}$ then

1) $A^2 = B^2 = I$ 2) $A^2 = B^2 = -I$
3) $A^2 = I, B^2 = -I$ 4) $A^2 = -I, B^2 = I$

13. If $A=\begin{bmatrix}1&-2&3\\-4&2&5\end{bmatrix}$ and $B=\begin{bmatrix}2&3\\4&5\\2&1\end{bmatrix}$ then

1) AB, BA exist and equal
2) AB, BA exist and are not equal
3) AB exists and BA does not exist
4) AB does not exist and BA exists

14. If A = $\begin{bmatrix}1&0\\0&1\end{bmatrix}$ then $5A^3 - 7A^2 + 2A$ = ...

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

15. If A = $\begin{bmatrix}i&0\\0&-i\end{bmatrix}$ B = $\begin{bmatrix}0&-1\\1&0\end{bmatrix}$ and C = $\begin{bmatrix}0&i\\i&0\end{bmatrix}$ then AB $\neq$

1) - BA 2) - C 3) BA 4) AB

16. If A = $\begin{bmatrix}1&2&3\\4&5&6\end{bmatrix}$, B = $\begin{bmatrix}1\\0\\5\end{bmatrix}$, then AB =

1) $\begin{bmatrix}1&0&15\end{bmatrix}$ 2) $\begin{bmatrix}4&0&30\end{bmatrix}$

3) $\begin{bmatrix}16\\34\end{bmatrix}$ 4) $\begin{bmatrix}16&34\end{bmatrix}$

17. If P = $\begin{bmatrix}1\\3\\4\end{bmatrix}$, Q = $\begin{bmatrix}2&-1&5\end{bmatrix}$, then PQ =

1) $\begin{bmatrix}2&-1&5\\6&-3&15\\8&-4&20\end{bmatrix}$ 2) $\begin{bmatrix}2&-3&20\end{bmatrix}$

3) $\begin{bmatrix}2\\-3\\20\end{bmatrix}$ 4) $\begin{bmatrix}19\end{bmatrix}$

18. If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then AB+BA=
1) A 2) 2A 3) 3A 4) 4A

19. If $A = \begin{bmatrix} a & 0 \\ a & 0 \end{bmatrix}$, $B = \begin{bmatrix} 0 & 0 \\ b & b \end{bmatrix}$, then AB =
1) 0 2) bA 3) aB 4) ab AB

20. If $A = \begin{bmatrix} i & 0 \\ 0 & -i \end{bmatrix}$, $B = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$, $C = \begin{bmatrix} o & i \\ i & o \end{bmatrix}$
then $A^2 + B^2 + C^2 =$
1) $2I$ 2) $-2I$ 3) $-3I$ 4) $3I$

21. If $A = \begin{bmatrix} 2 & 3 \\ 0 & 4 \end{bmatrix}$, then $A^2 - 5I =$
1) $\begin{bmatrix} 4 & 18 \\ 0 & 16 \end{bmatrix}$ 2) $\begin{bmatrix} -1 & 18 \\ 0 & 11 \end{bmatrix}$
3) $\begin{bmatrix} 1 & -13 \\ 5 & -11 \end{bmatrix}$ 4) $\begin{bmatrix} 1 & -13 \\ 5 & 11 \end{bmatrix}$

22. If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, then $A^4 =$
1) I 2) 0 3) A 4) 4I

23. If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ then $A^5 =$
1) I 2) O 3) A 4) A^2

24. If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then
A^2 - (a + d) A - (bc - ad) I =
1) 0 2) I 3) 2I 4) (a - d)

25. $\begin{bmatrix} x & 0 \\ 0 & y \end{bmatrix}\begin{bmatrix} a & b \\ c & d \end{bmatrix} =$
1) $\begin{bmatrix} ax & bx \\ yc & dy \end{bmatrix}$ 2) $\begin{bmatrix} ax & 0 \\ 0 & dy \end{bmatrix}$
3) $\begin{bmatrix} ay & cy \\ bx & dy \end{bmatrix}$ 4) $\begin{bmatrix} 0 & ax \\ dy & 0 \end{bmatrix}$

26. If $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$, then $A^4 =$ ....
1) 16A 2) 32I 3) 4A 4) 8A

27. $\begin{bmatrix} x & 0 & 0 \\ y & z & 0 \\ l & m & n \end{bmatrix}\begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix} =$
1) $\begin{bmatrix} ax & 0 & 0 \\ ay & bz & 0 \\ al & mb & nc \end{bmatrix}$ 2) $\begin{bmatrix} ax & 0 & 0 \\ 0 & ab & az \\ 0 & al & mb \end{bmatrix}$
3) $\begin{bmatrix} ax & ab & al \\ 0 & bz & mb \\ 0 & 0 & nc \end{bmatrix}$ 4) $\begin{bmatrix} 0 & 0 & nc \\ 0 & bz & mb \\ ax & ab & al \end{bmatrix}$

28. If $A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 0 & 0 \\ 1 & 0 & 1 \end{bmatrix}$ then A^2 = ...
1) A 2) - A 3) 2A 4) -2A

29. If $A = \begin{bmatrix} o & c & -b \\ -c & o & a \\ b & -a & o \end{bmatrix}$ and $B = \begin{bmatrix} a^2 & ab & ac \\ ab & b^2 & bc \\ ac & bc & c^2 \end{bmatrix}$
then AB =
1) A 2) B 3) I 4) O

30. If A and B are two n x n matrices then $(A + B)^2 =$
1) $A^2 + 2AB + B^2$ 2) $A^2 + AB + BA + B^2$
3) $A^2 + B^2$ 4) A + B

31. If $A = \begin{bmatrix} a^2 & ab & ac \\ ab & b^2 & bc \\ ac & bc & c^2 \end{bmatrix}$ and $a^2 + b^2 + c^2 = 1$,
then $A^2 =$
1) A 2) 2A 3) 3A 4) 4A

32. If AB = A and BA = B then
1) A = 2B 2) $A^2 = A$ and $B^2 = B$
3) 2A = B
4) cannot be determined

33. If $A = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -1 \end{bmatrix}$ then BA =
1) $\begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$ 2) $\begin{bmatrix} 3 & 0 \end{bmatrix}$ 3) $\begin{bmatrix} 3 & 3 \end{bmatrix}$ 4) $\begin{bmatrix} 0 & -3 \end{bmatrix}$

34. If A and B are two matrices such that A has identical rows and AB is defined. Then AB has
1) no identical rows 2) identical rows
3) all of its zeros 4)cannotbe determinent

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

1) A 2) - A
3) Null matrix 4) 2A

36. If $A=[x, y], B=\begin{bmatrix}a & h\\ h & b\end{bmatrix}, C=\begin{bmatrix}x\\ y\end{bmatrix}$, then ABC=

1) $(ax+hy+bxy)$ 2) $(ax^2+2hxy+by^2)$
3) $(ax^2-2hxy+by^2)$ 4) $(bx^2-2hxy+ay^2)$

37. If $[3x^2+10xy+5y^2]=[x\ y]A\begin{bmatrix}x\\ y\end{bmatrix}$, and A is a symmetric matrix then A=

1) $\begin{bmatrix}3 & 10\\ 10 & 5\end{bmatrix}$ 2) $\begin{bmatrix}10 & 3\\ 5 & 10\end{bmatrix}$

3) $\begin{bmatrix}+3 & -5\\ -5 & +5\end{bmatrix}$ 4) $\begin{bmatrix}3 & 5\\ 5 & 5\end{bmatrix}$

38. If $\begin{bmatrix}x & 1\\ 1 & y\end{bmatrix}\begin{bmatrix}1 & 4\\ 2 & 6\end{bmatrix}=\begin{bmatrix}4 & 14\\ 7 & 22\end{bmatrix}$, then (x,y) =

1) (1,-2) 2) (2,1) 3) (3,2) 4) (2,3)

39. If AB = O, then
1) A = O 2) B = O
3) A and B need not be zero matrices
4) A and B are zero matrices

40. If $A^2 = A$, $B^2 = B$, AB = BA = O then $(A+B)^2$ =
1) A - B 2) A + B 3) $A^2 - B^2$ 4) 0

41. If $I=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}, E=\begin{bmatrix}0 & 1\\ 0 & 0\end{bmatrix}$, then $(aI+bE)^3$ =

1) $aI+bE$ 2) a^3I+b^3E
3) a^3I+3ab^2E 4) a^3I+3a^2bE

42. If $I=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ and $E=\begin{bmatrix}0 & 1\\ 0 & 0\end{bmatrix}$ then $(2I+3E)^3$ =

1) $8I+18E$ 2) $4I+36E$
3) $8I+36E$ 4) $2I+3E$

43. A_{nxn} and B_{nxn} are diagonal matrices then AB =................. matrix
1) square 2) diagonal
3) scalar 4) rectangular

44. If $A_\theta=\begin{pmatrix}Cos\theta & Sin\theta\\ -Sin\theta & Cos\theta\end{pmatrix}$ then $A_\alpha.A_\beta$ =

1) $A_{\alpha+\beta}$ 2) $A_{\alpha\beta}$ 3) $A_\alpha+A_\beta$ 4) I

45. If $\begin{pmatrix}10 & 20 & 30\\ 20 & 45 & 80\\ 30 & 80 & 171\end{pmatrix}=$

$\begin{pmatrix}1 & 0 & 0\\ 2 & 1 & 0\\ 3 & 4 & 1\end{pmatrix}\begin{pmatrix}x & 0 & 0\\ 0 & 5 & 0\\ 0 & 0 & 1\end{pmatrix}\begin{pmatrix}1 & 2 & 3\\ 0 & 1 & 0\\ 0 & 0 & 1\end{pmatrix}$

then x =

1) 5 2) 10 3) $\frac{5}{2}$ 4) $\frac{10}{3}$

46. If $A+B=\begin{pmatrix}3 & -4\\ 2 & 5\end{pmatrix}$, $A-B\begin{pmatrix}1 & 2\\ -2 & -3\end{pmatrix}$ then AB=

1) $\begin{pmatrix}0 & -40\\ 8 & 16\end{pmatrix}$ 2) $\begin{pmatrix}0 & -40\\ 4 & 8\end{pmatrix}$

3) $\begin{pmatrix}0 & -10\\ 2 & 4\end{pmatrix}$ 4) $\begin{pmatrix}0 & 40\\ 2 & 11\end{pmatrix}$

47. If $A=\begin{bmatrix}2 & -1\\ 3 & -2\end{bmatrix}$ then A^5=

1) I 2) A 3) -A 4) +2

48. If A=diagonal (3, 3, 3) then A^4=
1) 12A 2) 81A 3) 684A 4) 27A

Problems based on Induction :

49. If $A=\begin{bmatrix}x & x\\ x & x\end{bmatrix}$, then A^n = ..., $n \in N$

1) $\begin{bmatrix}2^nx^n & 2^nx^n\\ 2^nx^n & 2^nx^n\end{bmatrix}$ 2) $\begin{bmatrix}2^{n-1}x^n & 2^{n-1}x^n\\ 2^{n-1}x^n & 2^{n-1}x^n\end{bmatrix}$

3) $\begin{bmatrix}2^{n-2}x^n & 2^{n-2}x^n\\ 2^{n-2}x^n & 2^{n-2}x^n\end{bmatrix}$ 4) $\begin{bmatrix}2^{n-1}x^{n-1} & 2^{n-1}x^{n-1}\\ 2^{n-1}x^{n-1} & 2^{n-1}x^{n-1}\end{bmatrix}$

50. If 'n' is a +ve integer and if $A=\begin{bmatrix}\cos h\theta & \sin h\theta \\ \sin h\theta & \cosh\theta\end{bmatrix}$ then A^n =

1) $\begin{bmatrix}\cos h\theta & -\sin h\theta \\ \sin h\theta & \cos h\theta\end{bmatrix}$ 2) $\begin{bmatrix}\cos h\theta & -\sin h\theta \\ -\sin h\theta & \cos h\theta\end{bmatrix}$

3) $\begin{bmatrix}\cos hn\theta & \sin hn\theta \\ \sin hn\theta & \cos hn\theta\end{bmatrix}$ 4) $\begin{bmatrix}\cos hn\theta & \cos hn\theta \\ \sinh n\theta & \sinh n\theta\end{bmatrix}$

51. If 'n' is a +ve integer and if $A=\begin{bmatrix}\cos\theta & \sin\theta \\ -\sin\theta & \cos\theta\end{bmatrix}$ then A^n =

1) $\begin{bmatrix}\cos\theta & -\sin\theta \\ \sin\theta & \cos\theta\end{bmatrix}$ 2) $\begin{bmatrix}\cos\theta & -\sin\theta \\ -\sin\theta & \cos\theta\end{bmatrix}$

3) $\begin{bmatrix}\cos n\theta & \sin n\theta \\ -\sin n\theta & \cos n\theta\end{bmatrix}$ 4) $\begin{bmatrix}\cos n\theta & \cos n\theta \\ \sin n\theta & \sin n\theta\end{bmatrix}$

52. Matrix A is such that $A^2 = 2A - I$ where I is the unit matrix . Then for $n \geq 2, A^n =$

1) $nA-(n-1)I$ 2) $nA-I$

3) $2^{n+1}A(n-1)I$ 4) $2^{n+1}A-1$

53. $\begin{bmatrix}i & o & o \\ o & i & o \\ o & o & i\end{bmatrix}$ then $A^{4n+1} = ..., n \in N$

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

3) $\begin{bmatrix}i & 0 & 0 \\ 0 & i & 0 \\ 0 & 0 & i\end{bmatrix}$ 4) $\begin{bmatrix}-i & 0 & 0 \\ 0 & -i & 0 \\ 0 & 0 & -i\end{bmatrix}$

54. $A = \begin{bmatrix}\frac{1}{2} & \frac{1}{2} \\ \frac{1}{2} & \frac{1}{2}\end{bmatrix}$ then $A^n = ..., n \in N$

1) I 2) A 3) 1/2A 4) 2A

55 If $A=\begin{bmatrix}3 & -4 \\ 1 & -1\end{bmatrix}$ then A^P where $P \in N$ is

1) $\begin{bmatrix}2P & -4P \\ P & 1-2P\end{bmatrix}$ 2) $\begin{bmatrix}1+2P & -4P \\ P & 1-2P\end{bmatrix}$

3) $\begin{bmatrix}1+2P & -4P \\ P & -P\end{bmatrix}$ 4) $\begin{bmatrix}1+2p & -4 \\ -p & 1-2p\end{bmatrix}$

56. If A $=\begin{bmatrix}a & 0 & 0 \\ 0 & a & 0 \\ 0 & 0 & a\end{bmatrix}$ then A^n =

1) a^n. A 2) a^{n-1}.A 3) a^{n+1}.A 4) a^{3n}I

57. If $A=\begin{bmatrix}x & o \\ o & x\end{bmatrix}$, $A^n = ...where\, n \in N$

1) $\begin{bmatrix}x^n & o \\ o & x^n\end{bmatrix}$ 2) $\begin{bmatrix}x^{n-1} & o \\ o & x^{n-1}\end{bmatrix}$

3) $\begin{bmatrix}x & o \\ o & x\end{bmatrix}$ 4) $\begin{bmatrix}x & o^n \\ x^n & o\end{bmatrix}$

58. If the matrix $A=\begin{pmatrix}1 & -1 \\ -1 & 1\end{pmatrix}$ then A^{n+1} =

1) $2\begin{pmatrix}1 & -1 \\ -1 & 1\end{pmatrix}$ 2) $2n\begin{pmatrix}1 & -1 \\ -1 & 1\end{pmatrix}$

3) $2^n\begin{pmatrix}1 & -1 \\ -1 & 1\end{pmatrix}$ 4) $2^{n+1}\begin{pmatrix}1 & -1 \\ -1 & 1\end{pmatrix}$

59. If $A=\begin{pmatrix}1 & 1 \\ 1 & 1\end{pmatrix}$ then n ε N then A^n =

1) 2^{n-1}A 2) 2^nA 3) nA 4)2n

60. $\begin{pmatrix}2 & -1 \\ 3 & -2\end{pmatrix}^n = \begin{pmatrix}1 & 0 \\ 0 & 1\end{pmatrix}$ if n is

1) odd 2) any natural number
3) even 4) not possible

61. If $\begin{pmatrix}1 & -\tan\theta \\ \tan\theta & 1\end{pmatrix}\begin{pmatrix}1 & \tan\theta \\ -\tan\theta & 1\end{pmatrix}$

$= \begin{pmatrix}a & -b \\ -b & a\end{pmatrix}$

1) a =1, b = -1 2) a = $\sec^2\theta$, b=0
3) a=0, b = $\sin^2\theta$ 4)a = $\sin 2\theta$, b=$\cos 2\theta$

62. If n is a natural number and

$A=\begin{bmatrix}5 & -8\\2 & -3\end{bmatrix}$ then $A^n=$

1) $\begin{pmatrix}6-n & -2n-6\\2n & 1-4n\end{pmatrix}$ 2) $\begin{pmatrix}4+n & -8n\\2n & 2-5n\end{pmatrix}$

3) $\begin{pmatrix}1+4n & -8n\\2n & 1-4n\end{pmatrix}$ 4) $\begin{pmatrix}6-n & -8n\\2n & 1-4n\end{pmatrix}$

***<u>Transpose of Matrix</u>* :**

63. $If\ A=\begin{bmatrix}1 & -1\\1 & 0\end{bmatrix}$ then A^T

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

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

64. If $A=\begin{bmatrix}0 & 1 & 4\\-1 & 0 & 7\\-4 & -7 & 0\end{bmatrix}$ then $A^T=$

1) A 2) - A 3) I 4) A^2

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

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

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

66. $\begin{bmatrix}r+4 & 6\\3 & r+3\end{bmatrix}=\begin{bmatrix}5 & r+2\\r+5 & 4\end{bmatrix}^T$ then r =

1) 1 2) 2 3) 3 4) -1

67. $A=\begin{bmatrix}2 & 6 & 7\\2 & 1 & 3\end{bmatrix}, B=\begin{bmatrix}1 & 2\\4 & 1\\5 & 2\end{bmatrix}$ then $A+3B^T=$

1) $\begin{bmatrix}5 & 18 & 22\\8 & 4 & 9\end{bmatrix}$ 2) $\begin{bmatrix}5 & 8\\18 & 4\\22 & 9\end{bmatrix}$

3) $\begin{bmatrix}7 & 22 & 26\\8 & 4 & 11\end{bmatrix}$ 4) $\begin{bmatrix}7 & 8 & 11\\22 & 4 & 26\end{bmatrix}$

68. Let $A=\begin{bmatrix}5 & x\\y & 0\end{bmatrix}$ and $A=A^T$ then

1) x = 0, y = 5 2) x+y=5
3) x = y 4) x = -y

69. If $A=\begin{bmatrix}\cos\alpha & \sin\alpha\\-\sin\alpha & \cos\alpha\end{bmatrix}$ then $A.A^T$

1) Null matrix 2) A 3) I_2 4) A^T

70. $(A+AB)^T=XA^T, then\ x=$

1) B^T 2) I + B 3) $I+B^T$ 4) B^TA^T

71. $(A^TB^T)^T=$
1) AB 2) BA 3) A^TB^T 4) AB^T

72. If $3A+4B^T=\begin{pmatrix}7 & -10 & 17\\0 & 6 & 31\end{pmatrix}$ and $2B-3A^T=\begin{pmatrix}-1 & 18\\4 & -6\\-5 & -7\end{pmatrix}$ then B =

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

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

73 If $5A=\begin{pmatrix}3 & -4\\ 4 & x\end{pmatrix}$ and $AA^T=A^TA=I$ then x=

1)3 2)-3 3)2 4)-2

74. If $2A+B^T=\begin{pmatrix}2 & 3\\ 4 & 7\end{pmatrix}$, $A^T-B=\begin{pmatrix}4 & -5\\ 0 & 1\end{pmatrix}$

then A = ----

1) $\frac{1}{3}\begin{pmatrix}2 & 3\\ -1 & 8\end{pmatrix}$ 2) $\begin{pmatrix}2 & 3\\ -1 & 8\end{pmatrix}$

3) $\frac{1}{2}\begin{pmatrix}2 & 3\\ -1 & 8\end{pmatrix}$ 4) 0

Symmetric / Skew Symmetric Matrices **:**

75. If $A=\begin{bmatrix}a & h & g\\ h & b & f\\ g & f & c\end{bmatrix}$, then A is

1) a nilpotent 2) an involutory
3) a symmetric 4) an idempotent

76. If A is a symmetric or skew-symmetric matrix then A^2 is
1) symmetric 2) skew-symmetric
3) Diagonal 4) scalar

77. Let A be a square matrix. consider
1) $A+A^T$ 2) AA^T 3) A^TA 4) A^T+A
5) $A-A^T$ 6) A^T-A, Then
1) all are symmetric matrices
2) (2),(4),(6) are symmetric matrices
3) (1),(2),(3),(4) are symmetric matrices & (5),(6) are skew symmetric matrices
4) 5,6 are symmetric

78. $A=\begin{bmatrix}9 & 1\\ 4 & 3\end{bmatrix}$, $B=\begin{bmatrix}1 & 5\\ 6 & 11\end{bmatrix}$ then

$(2A+5B)^T$=

1) $\begin{bmatrix}23 & 27\\ 38 & 61\end{bmatrix}$ 2) $\begin{bmatrix}23 & 38\\ 27 & 61\end{bmatrix}$

3) $\begin{bmatrix}23 & -27\\ -38 & 61\end{bmatrix}$ 4) $\begin{bmatrix}47 & 15\\ 26 & 36\end{bmatrix}$

79. $\begin{bmatrix}1 & 6\\ 7 & 2\end{bmatrix}=P+Q$, where P is a symmetric & Q is a skew-symmetric then P =

1) $\begin{bmatrix}1 & \frac{13}{2}\\ \frac{13}{2} & 2\end{bmatrix}$ 2) $\begin{bmatrix}1 & -\frac{13}{2}\\ -\frac{13}{2} & 2\end{bmatrix}$

3) $\begin{bmatrix}1 & -\frac{1}{2}\\ \frac{1}{2} & 2\end{bmatrix}$ 4) $\begin{bmatrix}0 & 13/2\\ 13/2 & 0\end{bmatrix}$

80. If $S=\begin{bmatrix}6 & -8\\ 2 & 10\end{bmatrix}=P+Q$, where P is a symmetric & Q is a skew -symmetric matrix then Q=

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

3) $\begin{bmatrix}0 & 8\\ -8 & 0\end{bmatrix}$ 4) $\begin{bmatrix}0 & 6\\ -6 & 0\end{bmatrix}$

81. $L=\begin{bmatrix}2 & 3 & 5\\ 4 & 1 & 2\\ 1 & 2 & 1\end{bmatrix}=P+Q$, *P is a symmetric* matrix, Q is a skew-symmetric matrix then P =

1) $\begin{bmatrix}2 & 7 & 6\\ 7 & 1 & 4\\ 6 & 4 & 1\end{bmatrix}$ 2) $\begin{bmatrix}2 & -7 & 6\\ -7 & 1 & 4\\ 6 & 4 & 1\end{bmatrix}$

3) $\begin{bmatrix}2 & 7/2 & 3\\ 7/2 & 1 & 2\\ 3 & 2 & 1\end{bmatrix}$ 4) $\begin{bmatrix}4 & 7 & 6\\ 7 & 2 & 4\\ 6 & 4 & 2\end{bmatrix}$

82. $A=\begin{bmatrix}x & -7\\ 7 & y\end{bmatrix}$ is a skew-symmetric matrix, then (x,y) =
1) (1,-1) 2) (7,-7) 3) (0,0) 4) (14,-14)

83. If $A=\begin{pmatrix}1 & 2 & 3\\2 & 4 & 5\\x & 5 & 6\end{pmatrix}$ and $A^T = A$ then x =

1) 3   2) 3   3)2   4)-2

84. If A, B are symmetric matrices of the same order then AB-BA is

1) symmetric matrix   2) skew symmetric matrix
3)Diagonal matrix   4) identity matrix

85. If $A=\begin{bmatrix}2 & x-3 & x-2\\3 & -2 & -1\\4 & -1 & -5\end{bmatrix}$ is a symmetric matrix then x=

1) 0   2)3   3)6   4)8

86) If $A=\begin{pmatrix}x & 1 & 4\\-1 & 0 & 7\\-4 & -7 & 0\end{pmatrix}$ such that A^T = -A then x =

1)-1   2)0   3)1   4)4

87. If a matrix A is both symetric and skew-symetric then A is

1) I   2)O
3)A   4)Diagonal matrix

88) If $A^T B^T = C^T$ then C =

1) AB   2)BA   3)BC   4)ABC

Trace of a Matrix :

89. If Tr (A) = 6 $\Rightarrow$ Tr (4A) =

1) 3/2   2) 2   3) 12   4) 24

90. If Tr (A) = 2 + i $\Rightarrow$ Tr[(2-i) A] =

1) 2 + i   2) 2 - i   3) 3   4) 5

91. If

$$A=\begin{bmatrix}1 & 2 & 3\\4 & 5 & 6\\7 & 1 & 0\end{bmatrix}, B=\begin{bmatrix}1 & 0 & 0\\0 & 3 & 0\\0 & 4 & 5\end{bmatrix}, Tr(BA)=...$$

1) 40   2) 45   3) 39   4) 5

92. If Tr (A) = 8 , Tr(B) = 6, $\Rightarrow$ Tr (A - 2B) =

1) -4   2) 4   3) 2   4) 11

93. $If\ A=\begin{bmatrix}6 & 10 & 100\\7 & 1 & 0\\0 & 9 & 10\end{bmatrix} then Tr(A^T)=$

1) -17   2) 17   3) -1/17   4) 1/17

94. If $A = [a_{ij}]$ is a scalar matrix of order n × n, such that a_{ij} = k for all i=j, then trace of A =

1) nk   2) n+k   3) $\frac{n}{k}$ 4) 1

Special Type of Matrices :

95. If $A=\begin{bmatrix}\lambda\mu & \mu^2\\-\lambda^2 & -\lambda\mu\end{bmatrix}$ then A is

1) an idempotent matrix 2) nilpotent matrix
3) an orthogonal matrix 4) symmetric

96. If $A=\begin{bmatrix}a^2 & ab & ac\\ab & b^2 & bc\\ac & bc & c^2\end{bmatrix}$ and $a^2 + b^2 + c^2 = k$, then A^2 =

1) kA   2) k^2A 3) k^3A 4) k^4A

97. If $A=\begin{bmatrix}1 & 2-3i & 3+4i\\2+3i & O & 4-5i\\3-4i & 4+5i & 2\end{bmatrix}$ then A is

1) Hermitian   2) Skew-Hermitian
3) Symmetric   4) Skew-Symmetric

98. If $A=(a_{ij})_{nxn}$ is an upper triangular matrix then $a_{ij}(i > j)$ =

1) 1   2) complex number
3) -1   4) 0

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

1) an idempotent marix
2) nilpotent matrix   3) involuntary
4) orghogonal matrix

100. Then matrix $A=\begin{bmatrix}\frac{1}{\sqrt{2}} & \frac{1}{\sqrt{2}}\\\frac{-1}{\sqrt{2}} & \frac{-1}{\sqrt{2}}\end{bmatrix}$ is

1) unitary   2) orthogonal
3) nilpotent   4) involuntary

101. If A is skew-symmetric matrix and n is odd positive integer, then A^n is
1) a symmetric matrix
2) skew-symmetric matrix
3) diagonal matrix 4) triangular matrix

102. If A is skew-symmetric matrix and n is even positived integer, then A^n is
1) a symmetric matrix
2) skew-symmetric matrix
3) diagonal matrix 4) triangular matrix

103. If A, B are two idempotent matrices and AB = B A = 0 then A+B is
1) Scalar matrix 2) Idempotent matrix
3) Diagonal matrix 4) Nilptent matrix

Problems on Order of Matrices **:**

104. If the order of A is 4×3, the order of B is 4×5 and the order of C is 7×3, then the order of (A'B)'C' is
1) 4×5 2) 3×7 3) 4×3 4) 5×7

105. If A is 3×4 matrix 'B' is a matrix such that A'B and BA^1 are both defined then B is of the type
1) 3×4 2) 3×3 3) 4×4 4) 4×3

106. If A and B are two matrices such that A + B and AB are both defined then
1) A and B are two matrices not necessarily of same order
2) A and B are square matrices of same order
3) A and B are matrices of same type
4) A and B are rectangular matrices of same order

107. If a matrix has 13 elements, then the possible dimensions (orders) of the matrix are
1) 1×13 or 13×1 2) 1×26 or 26×1
3) 2×13 or 13×2 4) 13×13

108. If A=(1 2 3 4) and AB = (3 4 -1)then the order of matrix B is
1) 2×3 2) 3×3 3) 4×3 4) 1×3

Minors & Cofactors **:**

109. $If\ A=\begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix}$ then cofactor of a_{21} is
1) b^2 - ac 2) ac - b^2 3) a^2-bc 4) bc-a^2

110. $If\ A=\begin{bmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{bmatrix}$, then the minor of a_{22} is
1) -56 2) 51 3) -43 4) 41

111. $If\ A=\begin{bmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{bmatrix}$ then minor of a_{31} is
1) -1 2) 0 3) 1 4) -1

112. If $A=\begin{bmatrix} a & c & b \\ b & a & c \\ c & b & a \end{bmatrix}$ then the cofactor of a_{32} in $A + A^T$ is
1) $2a(b+c)-(b+c)^2$ 2) $ac-b^2$
3) a^2-bc 4) $2a(a+c)-(a+c)^2$

113. If A= $\begin{bmatrix} a & b & o \\ c & d & o \\ o & o & 1 \end{bmatrix}$ where ad - bc $\neq$ 0 then A^{-1}
1) $\begin{bmatrix} \frac{1}{a} & \frac{1}{b} & 0 \\ \frac{1}{c} & \frac{1}{d} & 0 \\ 0 & 0 & 1 \end{bmatrix}$ 2) $\frac{1}{ad-bc}\begin{bmatrix} d & -b & 0 \\ -c & a & 0 \\ 0 & 0 & ad-bc \end{bmatrix}$
3) I 4) A

114. If A= $\begin{bmatrix} 1 & 5 & -6 \\ -8 & 0 & 4 \\ 3 & -7 & 2 \end{bmatrix}$, then the cofactor of -7 = ...
1) 44 2) 43 3) 40 4) 39

115. $If\ A=\begin{bmatrix} 3 & 4 \\ 6 & 7 \end{bmatrix}$, then cofactor of a_{11} is
1) -7 2) 7 3) -4 4) -6

116. If $A=\begin{bmatrix} 8 & 9 \\ 10 & 11 \end{bmatrix}$, then cofactor of a_{12} is

1) 11 2) 10 3) -11 4) -10

117. If $A=\begin{bmatrix} 1 & 4 \\ 2 & 8 \end{bmatrix}$ and $B=\begin{bmatrix} x & y \\ y & x \end{bmatrix}$ then the cofactor of a_{21} in AB is

1) $-y-4x$ 2) $y+4x$

3) $2x+8y$ 4) $-2x-8y$

Determinants :

118. If the product of two non zero square matrices A and B of the same order is a zero matrix then

1) A,B are non-singular
2) atleast one of A&B is singular
3) A is non-singular, but B is singular
4) A is singlar but B is non-singular

119. If $AB = AC \Rightarrow B = C$, then A is

1) non-singular 2) singular
3) symmetric 4) Skew symmetric

120. If AB = O, then A and B are ....., when A $\neq$ O, B $\neq$ O

1) Non-singular 2) singular
3) one of the two is singular
4) symmetric matrices

121. The value of $\begin{vmatrix} 2+i & 2-i \\ 1+i & 1-i \end{vmatrix}$ is

1) A complex quantity 2) real quantity
3) 0 4)cannot be determined

122. $Det\begin{bmatrix} 1 & 3 & 4 \\ 2 & -1 & 3 \\ 2 & 1 & 2 \end{bmatrix} = ...$

1) -17 2) 17 3) 15 4) -15

123. $\det\begin{bmatrix} 2 & 45 & 55 \\ 1 & 29 & 32 \\ 3 & 68 & 87 \end{bmatrix} = ...$

1) 45 2) 64 3) 54 4) 32

124. $\det\begin{bmatrix} 43 & 1 & 6 \\ 35 & 7 & 4 \\ 17 & 3 & 2 \end{bmatrix} = ...$

1) 2 2) -2 3) 0 4) 5

125. $\det\begin{bmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{bmatrix} = ...$

1) -8 2) -7 3) -6 4) -21/4

126. $\det\begin{bmatrix} 18 & 40 & 89 \\ 40 & 89 & 198 \\ 89 & 198 & 440 \end{bmatrix} = ...$

1) -8 2) -6 3) -1 4) 0

127. $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix} = ...$

1) 0 2) 1 3) 2 4) -1

128. $\begin{vmatrix} 1 & 4 & 2 \\ 2 & -1 & 4 \\ -3 & 7 & -6 \end{vmatrix} =$

1) 4 2) 2 3) 0 4) 8

129. If AB = AC then

1) B = C 2) B $\neq$ C
3) B need not be equal to C 4) B = -C

130. $\begin{vmatrix} a^2+ab+b^2 & a^2-ab+b^2 \\ a+b & a-b \end{vmatrix} = ...$

1) $2a^3$ 2) $2b^3$ 3) $-2a^3$ 4) $-2b^3$

131. $\begin{vmatrix} 1 & \log_b a \\ \log_a b & 1 \end{vmatrix} = ...$

1) ab 2) b/a 3) a/b 4) 0

132. $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} =$

1) $a^3 + b^3 + c^3$ 2) $a^3 + b^3 + c^3 - 3abc$
3) $3abc - a^3 - b^3 - c^3$ 4) 0

133. If a, b, c are all positive and not all euqal then the value of the determinant $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ is

1) 0 2) < 0 3) > 0
4) cannot be determined

134. $\det\begin{bmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{bmatrix} =$

1) (a+b) (b+c) (c+a) 2) (a-b) (b-c) (c-a)
3) 0 4) abc

135. $\begin{vmatrix} 1 & 1 & 1 \\ 4 & 3 & 2 \\ 4^2 & 3^2 & 2^2 \end{vmatrix} =$

1) 2 2) -2 3) 1 4) 0

136. $\begin{vmatrix} 1 & 1 & 1 \\ x & y & z \\ x^3 & y^3 & z^3 \end{vmatrix} =$

1) (x+y+z) (x+y) (y+z)(z+x)
2) (x+y+z)(x-y)(y-z) (z-x)
3) (x-y) (y - z) (z -x) 4) (x+y) (y+z) (z+x)

137. $\begin{vmatrix} 1 & 1 & 1 \\ x^2 & y^2 & z^2 \\ x^3 & y^3 & z^3 \end{vmatrix} =$

1) 0 2) (x-y)(y-z)(z-x)(xy+yz+zx)
3) (x+yx+zx) (x+y)(y+z) (z+x) 4) (x+y+z)

138. $\begin{vmatrix} b^2+c^2 & a^2 & a^2 \\ b^2 & c^2+a^2 & b^2 \\ c^2 & c^2 & a^2+b^2 \end{vmatrix} =$

1) $a^2b^2c^2$ 2) 4abc 3) $4a^2b^2c^2$ 4) $2a^2b^2c^2$

139. $\begin{vmatrix} a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \\ 2c & 2c & c-a-b \end{vmatrix} =$

1) $2(a+b+c)^3$ 2) $(a-b-c)^3$
3) $2(a-b-c)^3$ 4) $(a+b+c)^3$

140. $\det\begin{bmatrix} bc & b+c & 1 \\ ca & c+a & 1 \\ ab & a+b & 1 \end{bmatrix} =$

1) 0 2) (a-b) (b-c) (c-a)
2) 4abc 4) $a^2+b^2+c^2$

141. $\begin{vmatrix} 2c & 2c & c-a-b \\ a-b-c & 2a & 2a \\ 2b & b-c-a & 2b \end{vmatrix} =$

1) $(a+b+c)^2$ 2) $(a+b+c)^3$
3) (a+b+c) 4) $(a+b+c)^4$

142. $\begin{vmatrix} x+y+2z & x & y \\ z & y+z+2x & y \\ z & x & z+x+2y \end{vmatrix} =$

1) $(x+y+z)^3$ 2) $2(x+y+z)^3$
3) x+y+z 4) $(x+y+z)^2$

143. $\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} =$

1) 0 2) 1
3) abc

4) $abc\left(1+\frac{1}{a}+\frac{1}{b}+\frac{1}{c}\right)$

144. $\begin{vmatrix} 1+a & b & c \\ a & 1+b & c \\ a & b & 1+c \end{vmatrix} =$

1) 0 2) 1
3) a+b+c 4) 1+a+b+c

145. $\begin{vmatrix} a^2+1 & ab & ac \\ ab & b^2+1 & bc \\ ac & bc & c^2+1 \end{vmatrix} =$

1) abc 2) a+b+c
3) $1+a^2+b^2+c^2$ 4) abc(1+a+b+c)

146. $\begin{vmatrix} z+y & x & x \\ y & z+x & y \\ z & z & x+y \end{vmatrix} =$

1) xyz 2) 4 xyz 3) 2 xyz 4) 3 xyz

147. $\begin{vmatrix} y+z & x & y \\ z+x & z & x \\ x+y & y & z \end{vmatrix} =$

1) $(x+y+z)(x-z)^2$ 2) xyz
3) $2(x+y+z)$ 4) $xyz(x-z)^2$

148. $\begin{vmatrix} 1 & bc & a(b+c) \\ 1 & ca & b(c+a) \\ 1 & ab & c(a+b) \end{vmatrix} =$

1) 0 2) 1 3) abc 4 $a^2+b^2+c^2$

149. $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix} =$

1) 4abc 2) $4a^2b^2c^2$
3) $a^2b^2c^2$ 4) $a^2+b^2+c^2-ab-bc-ca$

150. If A,B,C are the angles of triangle ABC, then

$\begin{vmatrix} \sin 2A & \sin C & \sin B \\ \sin C & \sin 2B & \sin A \\ \sin B & \sin A & \sin 2C \end{vmatrix} =$

1) 1 2) 0 3) -1 4) $\frac{3\sqrt{3}}{8}$

151. Det $\begin{bmatrix} o & p-q & p-r \\ q-p & o & q-r \\ r-p & r-q & o \end{bmatrix} =$

1) (p-q) (q-r) (r-p) 2) 0
3) pqr 4) 4 pqr

152. $\begin{vmatrix} 0 & 2005 & 2006 \\ -2005 & 0 & -2007 \\ -2006 & 2007 & 0 \end{vmatrix}$

1) 2005 2) 2006 3) 2007 4) 0

153. $\begin{vmatrix} -bc & b^2+bc & c^2+bc \\ a^2+ac & -ac & c^2+ac \\ a^2+ab & b^2+ab & -ab \end{vmatrix} =$

1) $(ab+bc+ca)^2$ 2) $(ab+bc+ca)^3$
3) (ab+bc+ca) 4) $(a+b+c)^3$

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

1) 8 2) 16 3) -8 4) -16

155. $\begin{vmatrix} a^2+2a & 2a+1 & 1 \\ 2a+1 & a+2 & 1 \\ 3 & 3 & 1 \end{vmatrix} =$

1) $(1-a)^3$ 2) $(a-1)^2$ 3) $(a-1)^3$ 4) $(a+1)^2$

156. $\begin{vmatrix} a^2 & bc & ac+c^2 \\ a^2+ab & b^2 & ac \\ ab & b^2+bc & c^2 \end{vmatrix} =$

1) 2abc 2) 8 abc 3) $4a^2b^2c^2$ 4) $2a^2b^2c^2$

157. The value of $\begin{vmatrix} x+1 & x+2 & x+4 \\ x+3 & x+5 & x+8 \\ x+7 & x+10 & x+14 \end{vmatrix}$ is

1) -2 2) 2 3) 0 4) 1

158. If D1 $= \begin{vmatrix} 1 & a & bc \\ 1 & b & ca \\ 1 & c & ab \end{vmatrix}$ & $D_2 = \begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$ then

1) $D_1 = D_2^2$ 2) $D_1^2 = D_2$ 3) $D_1 = D_2$
4) $D_1 = 2D_2$

159. If a,b,c are in G.P. then the value of

$\begin{vmatrix} a & b & ax+by \\ b & c & bx+cy \\ ax+by & bx+cy & 0 \end{vmatrix}$ is

1) 0 2) 1 3) -1 4) ab

160. If a,b,c are in A.P., then

$\begin{vmatrix} x+1 & x+2 & x+a \\ x+2 & x+3 & x+b \\ x+3 & x+4 & x+c \end{vmatrix} =$

1) $\frac{a+b}{2}$ 2) ab 3) 0 4) abc

161. $\begin{vmatrix} \frac{1}{a} & a^2 & bc \\ \frac{1}{b} & b^2 & ca \\ \frac{1}{c} & c^2 & ab \end{vmatrix} =$

1) abc 2) a+b+c 3) 0 4) 4abc

162. If $\begin{vmatrix} 0 & \cos x & -\sin x \\ \sin x & 0 & \cos x \\ \cos x & \sin x & 0 \end{vmatrix}^2 = \begin{vmatrix} 1 & -a & a \\ -a & 1 & a \\ a & a & 1 \end{vmatrix}$

then a =

1) sinx 2) cosx 3) sinx.cosx

4) sinx-cosx

163. $\begin{vmatrix} b+c & a-c & a-b \\ b-c & c+a & b-a \\ c-b & c-a & a+b \end{vmatrix} =$

1) 4 abc 2) 6 abc 3) 8 abc 4) 2 abc

164. $\begin{vmatrix} \frac{1}{a} & a^2 & -bc \\ \frac{1}{b} & b^2 & -ac \\ \frac{1}{c} & c^2 & -ab \end{vmatrix} =$

1) 3abc 2) 0

3) $a^3+b^3+c^3-3abc$ 4) $a^2+b^2+c^2$

165. If A = $\begin{bmatrix} 0 & c & -b \\ -c & 0 & a \\ b & -a & 0 \end{bmatrix}$ then $(a^2+b^2+c^2)|A| =$

1) abc 2) a + b + c

3) $(a^3 + b^3+c^3)$ 4) 0

166. det $\begin{bmatrix} x+y & 0 & 0 \\ 0 & x-y & 0 \\ 0 & 0 & x^2+y^2 \end{bmatrix} =$

1) $x^8 - y^8$ 2) $x^6 - y^6$

3) $x^4 - y^4$ 4) $x^3 - y^3$

167. $\begin{vmatrix} (b+c)^2 & a^2 & b^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix} = \lambda abc\,(a+b+c)^3$ then $\lambda = ...$

1) 0 2) 1 3) 2 4) 3

168. $\begin{vmatrix} 1 & 1 & 1 \\ 1 & 1+x & 1 \\ 1 & 1 & 1+y \end{vmatrix} = ...$

1) xy 2) $x+y$ 3) $x-y$ 4) x^2y^2

169. $\begin{vmatrix} 0 & \cos\alpha & \cos\beta \\ \cos\alpha & 0 & \cos\gamma \\ \cos\beta & \cos\gamma & 0 \end{vmatrix} =$

1) $\cos\alpha + \cos\beta + \cos\gamma$

2) $\cos\alpha \cos\beta \cos\gamma$

3) $2\cos\alpha \cos\beta \cos\gamma$

4) $2\sum \cos\alpha \cos\beta$

170. If $A = \begin{bmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{bmatrix}$ and A_i, B_i, C_i, are cofactors of a_i, b_i, c_i then $a_1 B_1 + a_2B_2 + a_3 B_3 =$

1) 0 2) $|A|$ 3) $|A|^2$ 4) $2|A|$

171. $A^2 = I \Rightarrow$

1) $|A| = 0$ 2) $|A| = 1$ 3) $|A| = -1$

4) $|A| = \pm 1$

172. If A+ B + C = π, then

$\begin{vmatrix} \tan(A+B+C) & \tan B & \tan C \\ \tan(A+C) & 0 & \tan A \\ \tan(A+B) & -\tan A & 0 \end{vmatrix}$

1) 0 2) 1

3) tanA tanB tanC 4) -2

173. If x,y z are all different and if $\begin{vmatrix} x & x^2 & 1+x^3 \\ y & y^2 & 1+y^3 \\ z & z^2 & 1+z^3 \end{vmatrix}$

= 0 then xyz =

1) -1 2) 0 3) 1 4) ± 1

174. If x,y z are all different and if $\begin{vmatrix} x & x^3 & x^4-1 \\ y & y^3 & y^4-1 \\ z & z^3 & z^4-1 \end{vmatrix}=0$

then xyz (xy+yz+zx) = ...

1) 0 2) 1
3) x+y+z 4) $x^2+y^2+z^2$

175. $D_r = \begin{vmatrix} 2^{r-1} & 2(3^{r-1}) & 4(5^{r-1}) \\ x & y & z \\ 2^n-1 & 3^n-1 & 5^n-1 \end{vmatrix} \Rightarrow \sum_{r=1}^{n} D_r =$

1) $2^n . 3^n . 5^n$ 2) $(2^n-1)(3^n-1)(5^n-1)$
3) x y z 4) 0

176. 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 Δ_1

$\begin{vmatrix} a_1+pb_1 & b_1+qc_1 & c_1+ra_1 \\ a_2+pb_2 & b_2+qc_2 & c_2+ra_2 \\ a_3+pb_3 & b_3+qc_3 & c_3+ra_3 \end{vmatrix}$ then $\Delta_1 =$

1) Δ(1+pqr) 2) Δ(1+p+q+r)
3) Δ(1-pqr) 3) 0

<u>Solved for X</u> :

177. det $\begin{bmatrix} 2 & 0 & 0 \\ 4 & 3 & 0 \\ 4 & 6 & x \end{bmatrix} = 42 \ then \ x = ...$

1) 8 2) 7 3) 6 4) 21/4

178. $\begin{vmatrix} 1 & 4 & 20 \\ 1 & -2 & 5 \\ 1 & 2x & 5x^2 \end{vmatrix} = 0 \ if \ x = ...$

1) -1, 2 2) 0,1 3) 1, 3 4) 2, 0

179. If x<1 and

$\begin{vmatrix} 3x-8 & 3 & 3 \\ 3 & 3x-8 & 3 \\ 3 & 3 & 3x-8 \end{vmatrix} = 0 \ then \ x = ...$

1) 2/3 2) -2/3 3) 0 4) 1/3

180. If $\begin{vmatrix} 1 & 0 & 0 \\ 2 & 3 & 4 \\ 5 & -6 & x \end{vmatrix} = 45$ then x =

1) 4 2) 7 3) -5 4) -7

181. If $\begin{vmatrix} a+x & a-x & a-x \\ a-x & a+x & a-x \\ a-x & a-x & a+x \end{vmatrix} = 0$ then the non-zero value of x = ...

1) a 2) 3a 3) 2a 4) 4a

182. If abc $\neq 0$ and if $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix} = 0$ then

$\dfrac{a^3+b^3+c^3}{abc} =$

1) 3 2) -3 3) 2 4) -2

183. If each element of a row of square matrix is doubled, the determinant of the matrix is

1) non changed 2) doubled
3) multiplied by4 4) multiply by 1/2

<u>Adjoint of a Matrix</u> :

184. If A is a 3 x 3 singular matrix then A(Adj A) =

1) Det A 2) I 3) O 4) ± 1

185. (Adj A^T) =

1) $(\text{Adj A})^T$ 2) Adj A
3) A^T 4) $\text{Adj}[A]^{-1}$

186. If A and B are two non-singular matrices then $|\text{Adj(AB)}| =$

1) $|\text{Adj(B)}||\text{Adj A}|$ 2) $|\text{Adj A}||\text{Adj} B|$
3) Both (1) and (2) 4) None

187. If A is an n x n non-singular matrix, then $|\text{Adj A}|$ is =

1) $|A|^n$ 2) $|A|^{n+1}$ 3) $|A|^{n-1}$ 4) $|A|^{n-2}$

188. If $A = \begin{bmatrix} 1^2 & 2^2 & 3^2 \\ 2^2 & 3^2 & 4^2 \\ 3^2 & 4^2 & 5^2 \end{bmatrix}$ then $|Adj \ A| =$

1) 8 2) 16 3) 64 4) 128

189. If $A=\begin{bmatrix}2&1&1\\1&2&1\\1&1&2\end{bmatrix}$ then $\det(Adj\ A)=$

1) 4 2) 16 3) 8 4) 2

190. If $A=\begin{bmatrix}-1&-2&-2\\2&1&-2\\2&-2&1\end{bmatrix}$ then $Adj\ A=$

1) A^T 2) $2A^T$ 3) $3A^T$ 4) $4A^T$

191. If $P=\begin{bmatrix}1&4\\2&6\end{bmatrix}$, then adj (P)

1) $\begin{bmatrix}1&4\\2&6\end{bmatrix}$ 2) $\begin{bmatrix}6&-4\\-2&1\end{bmatrix}$

3) $\begin{bmatrix}6&-2\\-4&1\end{bmatrix}$ 4) $\begin{bmatrix}2&1\\6&4\end{bmatrix}$

192. If $A=\begin{bmatrix}0&1&2\\1&2&3\\3&1&1\end{bmatrix}$ then Adj (A) =

1) $A=\begin{bmatrix}-1&+8&-5\\1&-6&3\\-1&2&-1\end{bmatrix}$ 2) $\begin{bmatrix}-1&1&-1\\8&-6&2\\-5&3&-1\end{bmatrix}$

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

193. $A=\begin{bmatrix}3&0&0\\0&3&0\\0&0&3\end{bmatrix}$, then $Adj(A)$

1) 3A 2) 6A 3) $9A^T$ 4) $2A^T$

194. If A_{3x3} and det A = 5 then det (adj A) =
1) 5 2) 25 3) 125 4) 1/5

195. If A_{3x3} and det A = 6, then det (2 adj A)
1) 8 2) 48 3) 288 4) 1/12

196. $Adj\left(Adj\begin{bmatrix}2&-3\\4&6\end{bmatrix}\right)=$

1) $\begin{bmatrix}2&-3\\4&6\end{bmatrix}$ 2) $\begin{bmatrix}6&3\\-4&2\end{bmatrix}$

3) $\begin{bmatrix}-6&3\\-4&-2\end{bmatrix}$ 4) $\begin{bmatrix}-6&-3\\4&-2\end{bmatrix}$

197. If A_{3x3} and $|A|\neq 0 \Rightarrow Adj(AdjA)=$

1) $|A|^2 A$ 2) $|A|A$ 3) $\frac{A}{|A|}$ 4) $\frac{A}{|A|^2}$

198. A_{3x3} is a non - singular matrix $\Rightarrow A^2(\text{Adj}\,A)$ =

1) $|A|A$ 2) I 3) $|A|I$ 4) $|A|^2 I$

Inverse of a Matrix :

199. If A_{3x3} and det A = 2, then det A^{-1} =
1) 1/2 2) -2 3) 1/4 4) -4

200. $(\text{Adj}\,A)^{-1}$ =

1) $\text{Adj}\,(A^{-1})$ 2) $\text{Adj}[-A]$

3) $(\text{Adj}\,A)^T$ 4) $\text{Adj}(A^T)$

201. If $\begin{bmatrix}1&-\tan\theta\\\tan\theta&1\end{bmatrix}\begin{bmatrix}1&-\tan\theta\\\tan\theta&1\end{bmatrix}^{-1}=\begin{bmatrix}\cos\alpha&-\sin\alpha\\\sin\alpha&\cos\alpha\end{bmatrix}^{-1}$ then $\alpha=$

1) 0 2) $\frac{\pi}{2}$ 3) $\frac{\pi}{4}$ 4) $\frac{\pi}{6}$

202. If A = $\begin{bmatrix}2&1\\0&1\end{bmatrix}$, AB = I, then B =

1) $\begin{bmatrix}1&-1\\0&2\end{bmatrix}$ 2) $\frac{1}{2}\begin{bmatrix}1&-1\\0&2\end{bmatrix}$

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

203. Inverse of $\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}^n$ is

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

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

204. If $A^{-1} = P$ then P^{-1}

1) A 2) A^2 3) $\frac{A}{|A|}$ 4) $\frac{A^2}{|A|}$

205. Det (A^{-1}) =

1) $(\text{Det } A)^{-1}$ 2) Det A
3) Det 2A 4) Det 3A173.

206. The matrix $\begin{bmatrix}1 & 1 & 1\\1 & 1 & 1\\1 & 1 & 1\end{bmatrix}$ has

1) one inverse 2) two inverse
3) no inverse 4) cannot be said

207. If $A = \begin{bmatrix}-1 & 1 & 1\\1 & -1 & 1\\1 & 1 & -1\end{bmatrix}$ then det (A^{-1}) =

1) 1 2) 1/2 3) 1/3 4) 1/4

208. If $A = \begin{bmatrix}a & o & o\\o & b & o\\o & o & c\end{bmatrix}$ then A^{-1} =

1) A 2) I

3) $\begin{bmatrix}\frac{1}{c} & o & o\\o & \frac{1}{b} & o\\o & o & \frac{1}{a}\end{bmatrix}$ 4) $\begin{bmatrix}\frac{1}{a} & o & o\\o & \frac{1}{b} & o\\o & o & \frac{1}{c}\end{bmatrix}$

209. If $A = \begin{bmatrix}o & o & a\\o & b & o\\c & o & o\end{bmatrix}$, then A^{-1}

1) A 2) I

3) $\begin{bmatrix}o & o & \frac{1}{c}\\o & \frac{1}{b} & o\\\frac{1}{a} & o & o\end{bmatrix}$ 4) $\begin{bmatrix}a & o & o\\o & b & o\\o & o & c\end{bmatrix}$

210. $If\ A = \begin{bmatrix}9 & 0 & 0\\0 & 10 & 0\\0 & 0 & 8\end{bmatrix}, then\ A^{-1}$

1) $\begin{bmatrix}\frac{1}{9} & 0 & 0\\0 & 10 & 0\\0 & 0 & \frac{1}{8}\end{bmatrix}$ 2) $\begin{bmatrix}9 & 0 & 0\\0 & \frac{1}{10} & 0\\0 & 0 & 8\end{bmatrix}$

3) $\begin{bmatrix}9 & 0 & 0\\0 & 10 & 0\\0 & 0 & \frac{1}{8}\end{bmatrix}$ 4) $\begin{bmatrix}\frac{1}{9} & 0 & 0\\0 & \frac{1}{10} & 0\\0 & 0 & \frac{1}{8}\end{bmatrix}$

211. $If\ P = \begin{bmatrix}a & 0 & 0\\0 & b & 0\\0 & 0 & c\end{bmatrix} then \det P^{-1}$

1) abc 2) $a^2b^2c^2$ 3) $\frac{1}{abc}$ 4) $\frac{1}{a^2b^2c^2}$

212. The inverse of $\begin{bmatrix}1 & a & b\\0 & x & 0\\0 & 0 & 1\end{bmatrix} is \begin{bmatrix}1 & -a & -b\\0 & 1 & 0\\0 & 0 & 1\end{bmatrix} then\ x =$

1) a 2) b 3) 0 4) 1

213. The inverse of $\begin{bmatrix}2 & 1 & 2\\1 & 0 & 1\\2 & 2 & 1\end{bmatrix}$ is

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

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

214. The inverse of $\begin{bmatrix} 3 & -2 & 1 \\ -4 & 1 & -1 \\ 2 & 0 & 1 \end{bmatrix}$

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

3) $\begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & -1 \\ 2 & 4 & 5 \end{bmatrix}$ 4) $\begin{bmatrix} 0 & 2 & 2 \\ 2 & 1 & -1 \\ -2 & -4 & 5 \end{bmatrix}$

215. The inverse of $\begin{bmatrix} 2 & 7 & 3 \\ 3 & 9 & 4 \\ 1 & 5 & 3 \end{bmatrix}$

1) $\begin{bmatrix} -7 & 6 & -1 \\ 5 & -3 & -1 \\ -6 & 3 & 3 \end{bmatrix}$ 2) $\frac{1}{3}\begin{bmatrix} -7 & 6 & -1 \\ 5 & -3 & -1 \\ -6 & 3 & 3 \end{bmatrix}$

3) $\frac{1}{6}\begin{bmatrix} -7 & 6 & -1 \\ 5 & -3 & -1 \\ -6 & 3 & 3 \end{bmatrix}$ 4) $\frac{-1}{6}\begin{bmatrix} -7 & 6 & -1 \\ 5 & -3 & -1 \\ -6 & 3 & 3 \end{bmatrix}$

216. If $\begin{bmatrix} x & y \\ 2 & 0 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 2 & 0 \end{bmatrix}$ then $\begin{bmatrix} x & y \\ 2 & 0 \end{bmatrix}^{-1} =$

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

3) $\begin{bmatrix} 0 & -8 \\ -2 & 1 \end{bmatrix}$ 4) $\begin{bmatrix} 0 & \frac{1}{2} \\ \frac{1}{2} & \frac{-1}{4} \end{bmatrix}$

217. If $A=\begin{bmatrix} 2 & 2 \\ -3 & 2 \end{bmatrix}$ $B=\begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ then $(B^{-1}A^{-1})^{-1} =$

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

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

218. A square matrix (Non singular) satisfies $A^2-A+2I=0$ then $A^{-1}=$

1) $\frac{I-A}{2}$ 2) I-A

3) $\frac{I+A}{2}$ 4) I+A

Rank of a Matrix :

219. The rank of the matrix $A=\begin{bmatrix} 1 & 4 & -1 \\ 2 & 3 & 0 \\ 0 & 1 & 2 \end{bmatrix}$ is

1) 3 2) 2 3) 1 4) 0

220. The rank of the matrix $A=\begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ *is*

1) 3 2) 2 3) 1 4) 0

221. The rank of the matrix $A=\begin{bmatrix} -1 & 2 & 3 \\ -2 & 4 & 6 \end{bmatrix}$ is

1) 3 2) 2 3) 1 4) 0

222. The rank of the matrix A= $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix}$ is

1) 3 2) 2 3) 1 4) 0

223. The Rank of $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ is

1) 1 2) 2 3) 0 4) 3

224. The Rank of $\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$ is

1) 1 2) 2 3) 0 4) 3

225. The Rank of $\begin{bmatrix} 1 & 0 & -4 \\ 2 & -1 & 3 \end{bmatrix}$ is

1) 1 2) 2 3) 0 4) 3

Homogeneous Linear Equations :

226. The set of equations $2x+3y+4z=0$, $3x+4y+6z=0$, $4x+5y+8z=0$

1) is consistent 2) is inconsistent
3) has unique solution 4) has two solutions

227. The set of equations $4x-3y+z=0$, $7x-8y+10z=0, 8x-6y+2z=0$
1) is consistent 2) inconsistent
3) has unique solution 4) has two solutions

228. If the euqations $x=cy+bz, y=az+cx, z=bx+ay$ are consistent then a relation among a,b,c is
1) $a^2+b^2+c^2=0$ 2) $a^2+b^2+c^2-2abc=0$
3) $a^2+b^2+c^2+2abc=1$ 4) $a^2+b^2+c^2+2abc=0$

229. The real value of 'a' for which the equations ax+y+z=0, -x+ay+z=0, -x-y+az = 0 have non-zero solution is
1) 1 2) 0 3) -1 4) all the above

230. The equations x + y - 2z = 0, 2x - 3y - z = 0 x - 5y + 4z = k are consistent if k =
1) 1 2) -1 3) 0 4) -2

231. If the equations x + y - z = 0, (1+a) x+(2+a) y-8z = 0, x - (1+a) y+(2+a) z = 0 are consistent then a =
1) $2+\sqrt{15}$ 2) $3-\sqrt{15}$
3) $\sqrt{15}$ 4) -4

232. $a \neq b \neq c \neq 1;\ ax+y+z=0,$ x + by + z = 0, x + y + cz = 0 have non trivial solutions then a + b + c - abc = ...
1) 0 2) 1 3) 2 4) 4

233. 2x - 3y + 4z = 0, 5x - 2y -z = 0 , 21x - 8y + az = 0 has infinity solutions then a =
1) -5 2) -4 3) 2 4) 4

234. The system of equations x + 2y - 3z = 0, 2x - y + 2z = 0, x + 7y - 11z = 0 has ..... solutions
1) unique 2) two 3)0 4) infinite

<u>Non Homogeneous Linear Equations</u> :

235. The system of equations which can be solved by cramers rule have
1) unique solution 2) no solution
3) infinitely many solutions
4) two solutions

236. If det A = 0. then the matrix equiation AX = B has
1) infinity solutions 2) unique solution
3) no solution
4) infinity solutions or no solution

237. The number of solutions of the equations 2x - 3y = 5, x + 2y=7 is ....
1) 1 2) 2 3) 4 4) 0

238. The number of solutions of the equations of 2x + 5y = 11, 6x + 15y = 1 are ...
1) 1 2) 2 3) 4 4) 0

239. The number of solutions of the equations 3x - 2y =5, 6x - 4y = 10 are ...
1) 0 2) 1 3) 10 4) infinity

240. If the lines $2x+3y-13=0$
$x-4y+10=0$
$ax+5y-21=0$
are concurrent then the value of a is
1) 1 2) 2 3) 3 4) -2

241. The equations $x+4y-2z=3$ have
$3x+y+5z=7$
$2x+3y+z=5$
1) a unique solution 2) no solution
3) two solutions 4) infinite solutions

242. The system of equations
$2x+6y+11=0$
$6y-18z+1=0$
$6x+20y-6z+3=0$
1) is consistent 2) has unique solution
3) is inconsistent 4) cannot be determined

243. The equations $x+4y-2z=3$
$3x+y+5z=7$
$2x+3y+z=5$ have
1) a unique solution
2) infinite number of solutions
3) no solution 4) two solutions

244. The number of solutions of the equation $3x+3y-z=5, x+y+z=3, 2x+2y-z=3$ is
1) 1 2) 0 3) infinite 4) two

245. The equations
$2x+4y+z=0, x+2y-2z=5, 3x+6y+7z=2$
have
1) unique solutions 2) no solution
3) infinite number of solutions
4) two solutions

246. The value of 'a' for which the equations $3x-y+az=1$, $2x+y+z=2$, $x + 2y-az = -1$ fail to have unique solution is

1) 7/2 2) -7/2 3) 2/7 4) -2/7

247. The equations $x + 2y + z = 0$, $2x + 4y + 2z=1$ have ..... solutions

1) 0 2) 1 3) 8 4) infinity

248. Number of solutions of the equations $x + 2y + z = 1$, $3x + 6y + 3z =3$ is ...

1) 0 2) 1 3) 4 4) infinity

249. The solutions of the equations $x+2y+3z=14$, $3x+y+2z = 11$, $2x + 3y + z = 11$ ...

1) $x = 0, y = 2, z = 4$ 2) $x = 1, y = 0, z = 4$
3) $x = 0, y = 1, z = 8$ 4) $x = 1, y = 2, z = 3$

250. The number of solutions of the equation $x -y+3z = 5$, $4x + 2y - z = 0$, $x + 3y +z = 5$ is

1) one 2) two 3) 0 4) infinity

251. The number of solutions o the equations $3x + 4y + 5z = 18$, is $2x - y + 8z = 13$, $5x - 2y + 7z =20$

1) 0 2) 1 3) 2 4) infinity

KEY

1) 1	2) 3	3) 2	4) 4	5) 4
6) 3	7) 1	8) 3	9)4	10)2
11) 2	12)2	13)2	14) 1	15)3
16)3	17)1	18)2	19)1	20)3
21)2	22)1	23)3	24)1	25)1
26)4	27)1	28)3	29)4	30)2
31)1	32)2	33)3	34)2	35)3
36)2	37)4	38)4	39)3	40)2
41)4	42)3	43)2	44)1	45)2
46)3	47)2	48)4	49)2	50)3
51)3	52)1	53)3	54)2	55)2
56)2	57)1	58)3	59)1	60)3
61)2	62)3	63)1	64)2	65)1
66)1	67)1	68)3	69)3	70)3
71)2	72)3	73)1	74)1	75)3
76)1	77)3	78)2	79)1	80)2
81)3	82)3	83)2	84)2	85)3
86)2	87)2	88)2	89)4	90)4
91)1	92)1	93)2	94)1	95)2
96)1	97)1	98)4	99)1	100)3
101)2	102)1	103)2	104)4	105)1
106)2	107)1	108)3	109)2	110)1
111)2	112)1	113)2	114)1	115)2
116)4	117)1	118)2	119)1	120)3
121)1	122)2	123)3	124)3	125)1
126)3	127)1	128)3	129)3	130)4
131)4	132)3	133)2	134)2	135)2
136)2	137)2	138)3	139)4	140)2
141)2	142)2	143)4	144)4	145)3
146)2	147)1	148)1	149)2	150)2
151)2	152)4	153)2	154)3	155)3
156)3	157)1	158)3	159)1	160)3
161)3	162)3	163)3	164)2	165)4
166)3	167)3	168)1	169)3	170)1
171)4	172)1	173)1	174)3	175)4
176)1	177)2	178)1	179)1	180)2
181)2	182)1	183)2	184)3	185)1
186)3	187)3	188)3	189)2	190)3
191)2	192)2	193)3	194)2	195)3
196)1	197)2	198)1	199)1	200)1
201)1	202)2	203)4	204)1	205)1
206)3	207)4	208)4	209)3	210)4
211)3	212)4	213)3	214)2	215)2
216)4	217)2	218)1	219)1	220)3
221)3	222)2	223)3	224)1	225)2
226)1	227)1	228)3	229)4	230)3
231)1	232)3	233)1	234)4	235)1
236)4	237)1	238)4	239)4	240)3
241)2	242)3	243)3	244)3	245)2
246)2	247)1	248)4	249)4	250)1
251)2				

LEVEL - 2

Addition & Multiplication of Matrices :

1. $A = \begin{bmatrix} 2 & 1 \\ 3 & 0 \end{bmatrix}$ then $A^2 + 2A + I =$

1) $\begin{bmatrix} 12 & 4 \\ 12 & 4 \end{bmatrix}$ 2) $\begin{bmatrix} 12 & -4 \\ 4 & 12 \end{bmatrix}$

3) $= \begin{bmatrix} 4 & 12 \\ 12 & 4 \end{bmatrix}$ 4) $\begin{bmatrix} 4 & 12 \\ -12 & -4 \end{bmatrix}$

2. $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}$ *then* $A^{26} =$

1) I 2) $-I$ 3) A 4) -A

3. If $A = \begin{bmatrix} 1 & 2 & 1 \\ 3 & 4 & 2 \\ 1 & 3 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 10 & -4 & -1 \\ -11 & 5 & 0 \\ 9 & -5 & 1 \end{bmatrix}$ then

1) AB = BA 2) AB = -AB
3) AB = 2 BA 4) AB = 3 BA

4. $A=\begin{bmatrix}2&2&1\\1&2&1\\3&4&2\end{bmatrix}$ then (A-I) (A-2I) =

1) $\begin{bmatrix}5&6&-2\\1&0&7\\0&1&1\end{bmatrix}$ 2) $\begin{bmatrix}5&6&3\\4&6&2\\7&10&7\end{bmatrix}$

3) $\begin{bmatrix}1&0&7\\7&10&7\\4&6&2\end{bmatrix}$ 4) $\begin{bmatrix}-1&1&2\\3&4&1\\1&1&2\end{bmatrix}$

5 $A=\begin{bmatrix}1&-3&-4\\-1&3&4\\1&-3&-4\end{bmatrix}$ and $A^2=\lambda I$ $then \lambda =$

1) 0 2) 1 3) 1/2 4) -2

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

1) $\begin{bmatrix}3&0&0\\0&1&-1\\0&5&4\end{bmatrix}$ 2) $\begin{bmatrix}1&2&-1\\-3&1&1\\3&5&-4\end{bmatrix}$

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

7. Let A be a square matrix which of the following is not true ?

1) $|A|=|A^T|$ 2) $A=I \Rightarrow |A|=1$

3) $A=0 \Rightarrow |A|=0$

4) A is a skew symmetric matrix $\Rightarrow |A|=0$

8. $A=\begin{bmatrix}1&2&2\\2&1&2\\2&2&1\end{bmatrix}$ and $f(x)=x^2-4x-5$ then f(A) =

1) 2I 2) -4I 3) 0 4) 3I

9. $If\ A=\begin{bmatrix}2&2&2\\2&2&2\\2&2&2\end{bmatrix} then A^3-35A=$

1) A 2) 2A 3) 3A 4) 4A

10. A $=\begin{bmatrix}1&-1\\2&-1\end{bmatrix}$, B $=\begin{bmatrix}x&1\\y&-1\end{bmatrix}$,

$(A+B)^2=A^2+B^2$ then (x,y) =

1) (4,1) 2) (1,4) 3) (-4,-1) 4)(-1,-4)

11. $\begin{bmatrix}2&-2\\-2&5\end{bmatrix}=\begin{bmatrix}1&0\\-1&1\end{bmatrix}\begin{bmatrix}2&0\\0&x\end{bmatrix}\begin{bmatrix}0&-1\\0&1\end{bmatrix}$ then x =

1) -3 2) -2 3) 0 4) 3

12. $\begin{bmatrix}10&20&30\\20&45&80\\30&80&171\end{bmatrix}=\begin{bmatrix}1&0&0\\2&1&0\\3&4&1\end{bmatrix}\begin{bmatrix}x&0&0\\0&5&0\\0&0&1\end{bmatrix}\begin{bmatrix}1&2&3\\0&1&4\\0&0&1\end{bmatrix}$

then x =

1) 10 2) 20 3) 30 4) 40

13. If $I=\begin{bmatrix}1&0\\0&1\end{bmatrix}$ $J=\begin{bmatrix}0&1\\-1&0\end{bmatrix}$ and

B $=\begin{bmatrix}\cos\theta&\sin\theta\\-\sin\theta&\cos\theta\end{bmatrix} then\ B=$

1) $I\cos\theta+J\sin\theta$ 2) $I\sin\theta+J\cos\theta$

3) $I\cos\theta-J\sin\theta$ 4) $-I\cos\theta-J\sin\theta$

14. Which of the following is not true, if A and B are two matrices each of order n x n, then

1) $(A+B)'=B'+A'$ 2) $(A-B)'=A'-B'$

3) $(AB)'=A'B'$ 4) $(ABC)'=C'B'A'$

15. If A and B are two square matrices of order n and A and B commute then for any real number K. Then

1) A - KI, B - KI Commute
2) A - KI, B - KI are equal
3) A - KI, B - KI do not commute
4) A + KI, B - KI do not commute

16. If $\theta=\frac{\pi}{2}+\phi$, $\begin{bmatrix}\cos^2\theta&\cos\theta\sin\theta\\\cos\theta\sin\theta&\sin^2\theta\end{bmatrix}$ $\begin{bmatrix}\cos^2\phi&\cos\phi\sin\phi\\\cos\phi\sin\phi&\sin^2\phi\end{bmatrix}=$

1) 0 2) I 3) 2I 4) -2I

17. If $A=\begin{pmatrix}4 & 1 & 0\\ 1 & -2 & 2\end{pmatrix}$, $B=\begin{pmatrix}2 & 0 & -1\\ 3 & 1 & 4\end{pmatrix}$,

$C=\begin{pmatrix}1\\ 2\\ -1\end{pmatrix}$ and (3B-2A) C+2X=0 then X=

1) $\frac{1}{2}\begin{bmatrix}3\\ 13\end{bmatrix}$ 2) $\frac{1}{2}\begin{bmatrix}3\\ -13\end{bmatrix}$

3) $\frac{1}{2}\begin{bmatrix}-3\\ 13\end{bmatrix}$ 4) $\begin{bmatrix}3\\ -13\end{bmatrix}$

18. A, B, C are cofactors of elements, a, b, c in $\begin{bmatrix}a & b & c\\ 2 & 4 & 7\\ -1 & 0 & 3\end{bmatrix}$ then the value of (2A+4B+7C) is equal to

1) 0 2) 2 3) -1 4) 4

19. Let $F(\alpha)=\begin{bmatrix}\cos\alpha & -Sin\alpha & 0\\ Sin\alpha & Cos\alpha & 0\\ 0 & 0 & 1\end{bmatrix}$

where $\alpha\in R$ then, $[F(\alpha)]^{-1}$ is equal to

1) $F(-\alpha)$ 2) $F(\alpha^{-1})$

3) $F(2\alpha)$ 4) 0

Problems based on Induction :

20. $A=\begin{bmatrix}o & o & x\\ o & x & o\\ x & o & o\end{bmatrix}$, $A^{2n+1}=$..........$n\in N$

1) $\begin{bmatrix}x^{2n+1} & o & o\\ o & x^{2n-1} & o\\ o & o & x^{2n+1}\end{bmatrix}$ 2) $\begin{bmatrix}o & o & x^{2n+1}\\ o & x^{2n+1} & o\\ x^{2n+1} & o & o\end{bmatrix}$

3) $\begin{bmatrix}x^n & o & o\\ o & x^n & o\\ o & o & x^n\end{bmatrix}$ 4) $\begin{bmatrix}o & o & x^n\\ o & x^n & o\\ x^n & o & o\end{bmatrix}$

21. $A=\begin{bmatrix}0 & 0 & x\\ 0 & x & 0\\ x & 0 & 0\end{bmatrix}$, $A^{100}=$

1) $\begin{bmatrix}0 & 0 & x^{100}\\ 0 & x^{100} & 0\\ x^{100} & 0 & 0\end{bmatrix}$ 2) $\begin{bmatrix}x^{100} & 0 & 0\\ 0 & x^{100} & 0\\ 0 & 0 & x^{100}\end{bmatrix}$

3) $\begin{bmatrix}o & x^{100} & o\\ o & o & x^{100}\\ x^{100} & o & o\end{bmatrix}$ 4) $\begin{bmatrix}o & x^{100} & o\\ x^{100} & o & o\\ o & o & x^{100}\end{bmatrix}$

22. If $A=\begin{pmatrix}0 & 0\\ 1 & 1\end{pmatrix}$

then the value of $A+A^2+A^3+......A^n=$

1) A 2) nA

3) $(n+1)A$ 4) 0

Special Type of Matrices :

23. If $\begin{bmatrix}1 & 3 & 0\\ 1 & 0 & -2\\ -4 & -4 & 4\end{bmatrix}$ = A+B where A is symmetric matrix and B is skew - symmetric then A - B =

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

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

24. If $A=[a_{ij}]_{3\times 3}$ is a square matrix so that $a_{ij}=i^2-j^2$,

then A is a

1) unit matrix 2) symmetric marix

3) skew symmetric matrix

4) orthogonal matrix

25. If $A = \begin{bmatrix} 1 & 1 & 3 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{bmatrix}$ then A^3 is a

1) diagonal matrix 2) square matrix
3) null matrix 4) Unit Matrix

26. If D_1 and D_2 are two 3 x 3 diagonal matrices then :
1) $D_1 D_2$ is a diagonal matrix
2) $D_1 + D_2$ is a diagonal matrix
3) $D_1^2 + D_2^2$ is a diagonal matrix
4) 1, 2, 3 are correct

27. If $A \neq I$ is an idempotent matrix, then A is a
1) non singular matrix 2) singular matrix
3) square mtrix 4) row matrix

28. $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 1 & 0 \end{bmatrix}, B = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 4 & 5 \end{bmatrix},$

$Tr(AB) = \lambda$ Tr (A).Tr (B) then λ =

1) 1 2) 0 3) $\frac{6}{5}$ 4) $\frac{20}{27}$

29. If $A \begin{pmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & k \end{pmatrix}$ is an idempotent matrix then k=
1) 2 2) -2 3) 3 4) -3

30. If $\begin{pmatrix} 2 & 4 \\ -1 & k \end{pmatrix}$ is an nilpotent matrix of index '2' then k=
1) 2 2) -2 3) 3 4) -3

Determinants **:**

31. $\begin{vmatrix} (a-x)^2 & (b-x)^2 & (c-x)^2 \\ (a-y)^2 & (b-y)^2 & (c-y)^2 \\ (a-z)^2 & (b-z)^2 & (c-z)^2 \end{vmatrix} =$

1) (x-y) (y-z) (z-x)(a-b)(b-c) (c-a)
2) (x+y) (y+z) (z+x)(a-b)(b-c) (c-a)
3) 2(x-y) (y-z) (z-x) (a-b) (b-c) (c-a)
4) a+b+c

32. $\begin{vmatrix} \frac{a^2+b^2}{c} & c & c \\ a & \frac{b^2+c^2}{a} & a \\ b & b & \frac{c^2+a^2}{b} \end{vmatrix}$

1) 4 abc 2) abc 3) -4abc 4) 2abc

33. $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}^2 =$

1) $\begin{vmatrix} 2bc-a^2 & b^2 & c^2 \\ c^2 & 2ac-b^2 & a^2 \\ a^2 & b^2 & 2ab-c^2 \end{vmatrix}$ 2) $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$

3) $\begin{vmatrix} 2bc-a^2 & c^2 & b^2 \\ c^2 & 2ac-b^2 & a^2 \\ b^2 & a^2 & 2ab-c^2 \end{vmatrix}$ 4) $(a+b+c)^2$

34. $\begin{vmatrix} b+c & a+b & a \\ c+a & b+c & b \\ a+b & c+a & c \end{vmatrix} =$

1) $a^3+b^3+c^3$ 2) 3abc
3) $a^3+b^3+c^3-3abc$ 4) $a^2+b^2+c^2-ab-bc-ca$

35. Det $\begin{bmatrix} -2a & a+b & c+a \\ b+a & -2b & b+c \\ c+a & c+b & -2c \end{bmatrix} =$
1) (a+b)(b+c)(c+a) 2) (a-b) (b-c) (c-a)
3) 4(a+b)(b+c)(c+a) 4) 4(a-b) (b-c) (c-a)

36. Det $\begin{bmatrix} 1+a^2-b^2 & 2ab & -2b \\ 2ab & 1-a^2+b^2 & 2a \\ 2b & -2a & 1-a^2-b^2 \end{bmatrix}$
1) $(a^2+b^2)^3$ 2) $(1+a^2+b^2)^3$
3) $(2-a^2-b^2)$ 4) $(2-a^2-b^2)^2$

37. Det $\begin{bmatrix} b^2c^2 & bc & b+c \\ c^2a^2 & ca & c+a \\ a^2b^2 & ab & a+b \end{bmatrix} =$
1) 4abc 2) (a-b) (b-c) (c-a)
3) $(a+b+c)^3$ 4) 0

38. If p+q+r = 0 then $\begin{vmatrix} pa & qb & rc \\ qc & ra & pb \\ rb & pc & qa \end{vmatrix} =$

1) $\begin{vmatrix} a & b & c \\ c & a & b \\ b & c & a \end{vmatrix}$ 2) $\begin{vmatrix} p & q & r \\ q & r & p \\ r & p & q \end{vmatrix}$

3) pqr $\begin{vmatrix} a & b & c \\ c & a & b \\ b & c & a \end{vmatrix}$ 4) $abc\begin{bmatrix} p & q & r \\ q & r & p \\ r & p & q \end{bmatrix}$

39. $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix} + \begin{vmatrix} a^2 & -b^2 & -c^2 \\ -a^2 & b^2 & -c^2 \\ -a^2 & -b^2 & c^2 \end{vmatrix} =$

1) 4 2) 2 3) 0 4) $2a^2b^2c^2$

40. The value of $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix}$ is

1) a perfect cube 2) zero
3) a perfect square 4) negative

41. If ω is a cube root of unity then $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$

has a factor

1) $a + b\omega + c\omega^2$ 2) a-b-c

3) $a - b\omega^2 - c\omega$ 4) a+b-c

42. If 'ω' is a cube root of unity then $\begin{vmatrix} -x & b & c \\ b & c & -x \\ c & -x & b \end{vmatrix} =$

1) $(x-b-c)(x-b\omega-c\omega^2)$

2) $(x-b-c)(x-b\omega-c\omega^2)(x-b\omega^2-c\omega)$

3) $(x-b-c)(x-b\omega^2-c\omega)$ 4) 0

43. If ω, ω^2 are the commex cube roots of unity then the value of $\begin{vmatrix} x+1 & \omega & \omega^2 \\ \omega & x+\omega^2 & 1 \\ \omega^2 & 1 & x+\omega \end{vmatrix} =$

1) x^3 2) x^2 3) x^4 4) x^5

44. If 'n' is a natural number then

$\begin{vmatrix} 1 & 1 & 1 \\ a & b & c \\ a^{n+2} & b^{n+2} & c^{n+2} \end{vmatrix}$ has a factor given by

1) (a-b) (b-c) (a+c) 2) (a+b) (b+c) (c+a)
3) (a-b) (b-c) (c-a) 4) abc

45. $\begin{vmatrix} ax & by & cz \\ x^2 & y^2 & z^2 \\ 1 & 1 & 1 \end{vmatrix} =$

1) $\begin{vmatrix} x & y & z \\ a & b & c \\ yz & zx & xy \end{vmatrix}$ 2) $\begin{vmatrix} a & b & c \\ x & y & z \\ yz & zx & xy \end{vmatrix}$

3) $\begin{vmatrix} x^2 & y^2 & z^2 \\ a^2 & b^2 & c^2 \\ 1 & 1 & 1 \end{vmatrix}$ 4) $\begin{vmatrix} x & y & z \\ a^2 & b^2 & c^2 \\ 1 & 1 & 1 \end{vmatrix}$

46. $\begin{vmatrix} b+c & a-b & a \\ c+a & b-c & b \\ a+b & c-a & c \end{vmatrix} =$

1) $a^3+b^3+c^3 - 3abc$ 2) 0
3) $3abc - a^3 - b^3 - c^3$ 4) 3abc

47. $\begin{vmatrix} 0 & c & b \\ c & 0 & a \\ b & a & 0 \end{vmatrix}^2 = ...$

1) 0 2) 2abc 3) $a^2b^2c^2$ 4) $4a^2 b^2 c^2$

48. $\begin{vmatrix} l^2-m^2 & a-b & x^3-y^3 \\ m^2-n^2 & b-c & y^3-z^3 \\ n^2-l^2 & c-a & z^3-x^3 \end{vmatrix} = ...$

1) $\sum l^2bz^3$ 2) $-\sum l^2bz^3$

3) $\sum m^2cx^3$ 4) 0

49. If x is a positive integer, then

$$\begin{vmatrix} x! & (x+1)! & (x+2)! \\ (x+1)! & (x+2)! & (x+3)! \\ (x+2)! & (x+3)! & (x+4)! \end{vmatrix} =$$

1) 2x!(x+1)!   2) 2x!(x+1)! (x+2) !
3) 2x!(x+3) !   4 (x+1)!(x+2)!(x+3)!

50. The value of $\begin{vmatrix} (a+d)(a+2d) & a+2d & a \\ 2d(a+2d) & d & d \\ 2d(a+3d) & d & d \end{vmatrix}$ is

1) 4d   2) $4d^2$ 3) $4d^3$ 4) $4d^4$

51. The value of the determinant

$$\begin{vmatrix} x+1 & x+2 & x+4 \\ x+3 & x+5 & x+8 \\ x+7 & x+10 & x+14 \end{vmatrix}$$

1) -2   2) x^2+2 3) 2   4) x + 2

52. If f(x) = $\begin{vmatrix} 2\cos x & 1 & 0 \\ x-\frac{\pi}{2} & 2\cos x & 1 \\ 0 & 1 & 2\cos x \end{vmatrix}$ then

$\frac{df}{dx}$ at x=$\frac{\pi}{2}$ is

1) 0   2) 2   3) $\frac{\pi}{2}$ 4) 8

53. $$\begin{vmatrix} \sqrt{13}+\sqrt{3} & 2\sqrt{5} & \sqrt{5} \\ \sqrt{15}+\sqrt{26} & 5 & \sqrt{10} \\ 3+\sqrt{65} & \sqrt{15} & 5 \end{vmatrix}$$

1) $15\sqrt{2}-25\sqrt{3}$ 2) $15\sqrt{5}-25\sqrt{6}$
3) $25\sqrt{2}+15\sqrt{3}$ 4) 0

54. If f(x)= $\begin{vmatrix} \sin^2 x & \cos^2 x & 1 \\ \cos^2 x & \sin^2 x & 1 \\ x-12 & 12 & 2 \end{vmatrix}$ then $f^1\left(\frac{\pi}{2}\right) =$

1) -1   2) 0   3) +1   4) ± 1

55. If A= $\begin{bmatrix} Cos\theta & Sin\theta \\ -Sin\theta & Cos\theta \end{bmatrix}$ then $\underset{n\to\infty}{Lt}\frac{1}{n}|A^n| =$

1) I   2) 0   3) A   4) $\frac{1}{n}A$

56. If A= $\begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ then the general solution of $\sin\theta = |A^2-4A+3I|$ is

1) $n\pi$ 2) $2n+1\frac{\pi}{2}$

3) $n\pi+(-1)^n\frac{\pi}{2}$ 4) $2n\pi$, $n\in z$

***<u>Solved for X</u>* :**

57. If $\begin{vmatrix} x & 2 & 7 \\ 5 & 0 & 2 \\ 3 & -4 & 6 \end{vmatrix}$ = -180 then x =

1) 3   2) 2   3) 0   4) 1

58. $\begin{vmatrix} x+2 & 2x+3 & 3x+4 \\ 2x+3 & 3x+4 & 4x+5 \\ 3x+5 & 5x+8 & 10x+17 \end{vmatrix} = 0 \; then \; x =$

1) -1,-2   2) 1,2   3) 1,-2   4) -1,2

59. The solution set of $\begin{vmatrix} a & a & x \\ m & m & m \\ b & x & b \end{vmatrix} = 0$ is

1) {a,b}   2) {0,b}   3) {m,a}   4) {a,0}

60. If x = -9 is a root of $\begin{vmatrix} x & 3 & 7 \\ 2 & x & 2 \\ 7 & 6 & x \end{vmatrix} = 0$ then the other roots are

1) 7, -2   2) -7,2   3) 7,2   4) -7,-2

61. If x = -1 is a root of the equation $\begin{vmatrix} 2-x & 3 & 3 \\ 3 & 4-x & 5 \\ 3 & 5 & 4-x \end{vmatrix} = 0$ then the other roots are

1) 0,11   2) 11,12   3) 0, 12   4) 1,11

62. If $\begin{vmatrix} 3 & 1 & 9 \\ 2x & 2 & 6 \\ x^2 & 3 & 3 \end{vmatrix} = 0$ then

1) x = 1 (or) 3 2)x = 1 or 2
3) x = 3 or 2 4) x = 4 or 5

63. The value of $\begin{vmatrix} 1+x & 2 & 3 \\ 1 & 2+x & 3 \\ 1 & 2 & 3+x \end{vmatrix}$ is

1) $(x-6)x^2$ 2) $(x+6)x$
3) $(x+6)x^2$ 4) $x - 6$

64. If a+b+c = 0; x $\neq$ 0 and $\begin{vmatrix} a-x & c & b \\ c & b-x & a \\ b & a & c-x \end{vmatrix} =$ 0 then x =

1) $\pm\sqrt{\frac{3}{2}\left(a^2+b^2+c^2\right)}$ 2) $\pm(a^2+b^2+c^2)$
3) $\pm(a+b+c)$ 4) $\pm(a^3+b^3+c^3)$

65. If . $a \neq b \neq c$ Then one 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 given by
1) x = a 2) x = b 3) x = c 4) x = 0

66. $\begin{vmatrix} 1+x & 1-x & 1-x \\ 1-x & 1+x & 1-x \\ 1-x & 1-x & 1+x \end{vmatrix} = 0$ then x =

1) 1,1 2) 1,-1 3) 0,-1 4) 0,3

67. If $\begin{vmatrix} 2bc-a^2 & c^2 & b^2 \\ c^2 & 2ca-b^2 & a^2 \\ b^2 & a^2 & 2ab-c^2 \end{vmatrix} = 0$ then

$a^3+b^3+c^3-3abc$ = ...
1) 1 2) 2 3) 0 4) 3

68. If $\begin{vmatrix} x^2+x & x+1 & x-2 \\ 2x^2+3x-1 & 3x & 3x-3 \\ x^2+2x+3 & 2x-1 & 2x-1 \end{vmatrix} = Ax+B$

1) A and B are independent of x
2) A and B are dependent of x
3) A dependent on x but B does not depend on x
4) B depends on x but A does not depend on x

69. If $\begin{vmatrix} t_1+x & a+x & a+x \\ b+x & t_2+x & a+x \\ b+x & b+x & t_3+x \end{vmatrix} = A+Bx$ then

1) A and B are independent of x
2) A and B are dependent on x
3) A is independent of x but B depends on x
4) A depends on x but B is independent of x

70. If det

$$\begin{bmatrix} x & x+y & x+y+z \\ 2x & 3x+2y & 4x+3y+2z \\ 3x & 6x+3y & 10x+6y+3z \end{bmatrix} = 64 \quad then \quad x =$$

1) 0 2) 64 3) 4 4) 8

71. $\begin{vmatrix} x^2+3 & x-1 & x+3 \\ x+1 & -2x & x-4 \\ x-3 & x+4 & 3x \end{vmatrix} =$

$px^4 + Qx^3 + rx^2 + sx + t$ then $t = ...$
1) 48 2) 0 3) 23 4) -23

72. If $\begin{vmatrix} a+x & b+x & c+x \\ b+x & c+x & a+x \\ c+x & a+x & b+x \end{vmatrix} = 0$ then $x =$

1) $-\frac{1}{3}\left(\sum a\right)$ 2) $-\frac{1}{3}\left(\sum ab\right)$

3) - abc 4) $\sum ab$

73. If x+y+z=0 and $\begin{vmatrix} xa & yb & zc \\ yc & za & xb \\ zb & xc & ya \end{vmatrix} =$

k $\begin{vmatrix} a & b & c \\ b & c & a \\ c & a & b \end{vmatrix}$ then k=

1) x+y+z 2) xy+yz+zx
3) xyz 4) $x^2+y^2+z^2$

74. If $\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} \neq 0$,

$\begin{vmatrix} a_1+b_1x & a_1x+b_1 & c_1 \\ a_2+b_2x & a_2x+b_2 & c_2 \\ a_3+b_3x & a_3x+b_3 & c_3 \end{vmatrix}$=0 then x=

1) +1 2)-1 3)0 4) ± 1

75. $\begin{vmatrix} Cos\frac{\pi}{3} & Cos\frac{2\pi}{3} & 1 \\ -1 & Cos\frac{\pi}{3} & Cos\frac{2\pi}{3} \\ Cos\frac{\pi}{3} & -1 & Cos\frac{\pi}{3} \end{vmatrix} =$

1) 7/4 2) 4/7 3) -7/4 4) 1/2

76. If

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

then k is equal to

1) 1 2) 4 3) 6 4) 8

<u>MiscellaneousProblems</u> :

77. If $f(x)=\begin{vmatrix} \sec x & \cos x \\ \cos^2 x & \cos^2 x \end{vmatrix}$ then $\int_0^{\pi/2} f(x) =$

1) 1/2 2) 1/3 3) 0 4) 1

78. If a, b c are the p^th^, q^th^, r^th^ terms in H.P. then

$\begin{vmatrix} bc & p & 1 \\ ca & q & 1 \\ ab & r & 1 \end{vmatrix} =$

1) 1 2) 0 3) abc 4) none

79. $\begin{vmatrix} 1+i & 1-i & 1 \\ 1-i & i & 1+i \\ i & 1+i & 1-i \end{vmatrix}$ is a

1) real number 2) irrational number
3)complex member 4) none

80. ω is a complex cube root of unity then

$\begin{vmatrix} 1 & 1+\omega & 1+\omega^2 \\ 1+\omega & 1+\omega^2 & 1 \\ 1+\omega^2 & 1 & 1+\omega \end{vmatrix}$

1) 4 2) 1 3) 0 4) -1

81. $\begin{vmatrix} 1+\cos\alpha & 1+\sin\alpha & 1 \\ 1-\sin\alpha & 1+\cos\alpha & 1 \\ 1 & 1 & 1 \end{vmatrix} = ...$

1) 1 2) -1 3) 2 4) -2

82. If a, b , c are Pth, Qth, Rth terms of a G.P. and $a>0, b>0, c>0$ then $\begin{vmatrix} \log a & P & 1 \\ \log b & Q & 1 \\ \log c & R & 1 \end{vmatrix} = ...$

1) $a^P b^Q c^R$ 2) 1 3) 0 4) PQR

83. If $D_r = \begin{vmatrix} r-1 & n & 6 \\ (r-1)^2 & 2n^2 & 4n-2 \\ (r-1)^3 & 3n^3 & 3n^2-3n \end{vmatrix}$

then $\sum_{r=1}^{n} D_r =$

1) nr 2) 0
3) $\frac{n(n-1)}{2} - r^2$ 4) $2n-n^2$

84. In a square matrix, the elements of a column are 2, 5k + 1, 3 and the cofactors of another column are 1 - 5k, 2, 4k - 2. Then k =

1) 0 2) 1/6 3) 6 4) -1/6

85. $If \begin{bmatrix} a & c & b \\ b & a & c \\ c & b & a \end{bmatrix}$ is a singular matrix and a,b,c are distinct, then

1) a + b + c = 0
2) $a^2 + b^2+c^2 - bc - ca - ab = 0$
3) $a^2+b^2+c^2 + 3abc = 0$
4) a = b = c

86. $If \begin{bmatrix} a & b & c \\ b & c & a \\ c & a & b \end{bmatrix}$ is a singular matrix and a, b, c are positive, then
1) a + b + c = 0 2) a =b=c
3) $a^2+b^2+c^2+3abc=0$ 4) $a^2+b^2+c^2-3abc \neq 0$

87. A and B are square matrices of order 3 x 3, A is an orthogonal matrix and B is a skew symmetric matrix. Which of the following statements is not true
1) $|A| = \pm 1$ 2) $|B| = 0$ 3) $|AB| = 1$
4) $|AB| = 0$

88. If α, β, γ are the cube roots of 8 then $\begin{vmatrix} \alpha & \beta & \gamma \\ \beta & \gamma & \alpha \\ \gamma & \alpha & \beta \end{vmatrix} =$
1) 0 2) 1 3) 8 4) 2

89. $\begin{vmatrix} \cos^2 x & \cos x \sin x & -\sin x \\ \cos x \sin x & \sin^2 x & \cos x \\ \sin x & -\cos x & 0 \end{vmatrix}$ then det A =
1) 0 2) -1 3) 1 4) 2

90. $If\ \theta = \frac{\pi}{12}$ and $A = \begin{bmatrix} \cos\theta & \sin\theta \\ \sin\theta & \cos\theta \end{bmatrix} then\ \det(A^6) =$
1) 27/64 2) 3/2 3) -1 4) 9/16

91. If A is an orthogonal matrix then sum of the squares of the elements of the every row is
1) zero 2) 1 3) 4 4) 16

92. $\begin{vmatrix} 1 & \cos\alpha & \cos\beta \\ \cos\alpha & 1 & \cos\gamma \\ \cos\beta & \cos\gamma & 1 \end{vmatrix} = \begin{vmatrix} 0 & \cos\alpha & \cos\beta \\ \cos\alpha & 0 & \cos\gamma \\ \cos\beta & \cos\gamma & o \end{vmatrix}$ then
1) $\cos\alpha + \cos\beta + \cos\gamma = 0$
2) $\cos\alpha . \cos\beta . \cos\gamma = 0$
3) $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$
4) $\sum \cos\alpha \cos\beta = 0$

Inverse and Adjoint of a Matrix :

93. $Let\ A = \begin{bmatrix} -1 & 1 & 1 \\ 1 & -1 & 1 \\ 1 & 1 & -1 \end{bmatrix} then\ |Adj(AdjA)|$
1) 16 2) 256 3) 64 4) 8

94. If A = $\begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$ then $A^{-1} =$
1) $A^2 - 23I$ 2) $\frac{A^2 - 23I}{40}$
3) $23I - A^2$ 4) $\frac{23I - A^2}{40}$

95. Let A and B be two non-singular matrices which commute. The A^{-1}, B^{-1}
1) do not commute 2) commute
3) $AB = A^{-1} B^{-1}$ 4) $(AB)^{-1} = AB$

96. A = $\begin{bmatrix} -1 & -2 & -2 \\ 2 & 1 & -2 \\ 2 & -2 & 1 \end{bmatrix}$ then Adj A =
1) A^T 2) $3A^T$ 3) A^{-1} 4) $-A^T$

97. $A = \begin{bmatrix} 1 & 0 \\ 4 & 1 \end{bmatrix}$, det $(4A^{-1})$
1) 16 2) 8 3) 4 4) 1

98. $P = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$, inverse of matrix of P
1) $\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ 2) $\begin{bmatrix} -\cos\theta & \sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$
3) $\begin{bmatrix} -\cos\theta & \sin\theta \\ \sin\theta & -\cos\theta \end{bmatrix}$ 4) $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$

99. $P = \begin{bmatrix} 1 & a & b \\ 0 & x & 0 \\ 0 & 0 & 1 \end{bmatrix}, then\ P^{-1} =$
1) $\frac{1}{x}\begin{bmatrix} x & -a & -bx \\ 0 & 1 & 0 \\ 0 & 0 & x \end{bmatrix}$ 2) $\begin{bmatrix} x & -a & -bx \\ 0 & 1 & 0 \\ 0 & 0 & x \end{bmatrix}$

3) $x\begin{bmatrix} x & -a & -bx \\ 0 & 1 & 0 \\ 0 & 0 & x \end{bmatrix}$ 4) $x^2\begin{bmatrix} x & -a & -bx \\ 0 & 1 & 0 \\ 0 & 0 & x \end{bmatrix}$

100. $A=\begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix} then A^{-1} =$

1) $\begin{bmatrix} -\cos\theta & \sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ 2) $\begin{bmatrix} -\cos\theta & \sin\theta & 0 \\ -\sin\theta & -\cos\theta & 0 \\ 0 & 0 & -1 \end{bmatrix}$

3) $\begin{bmatrix} \cos\theta & \sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{bmatrix}$ 4) $\begin{bmatrix} \cos\theta & -\sin\theta & 0 \\ -\sin\theta & \cos\theta & 0 \\ 0 & 0 & -1 \end{bmatrix}$

101. $ABA^{-1} = X$ then B^2 =----
1) x^2 2) AxA^{-1} 3) Ax^2A^{-1} 4) $A^{-1}x^2A$

102. $A = [4-2,5], B = \begin{bmatrix} 2 \\ 0 \\ 3 \end{bmatrix} then\ Adj\ (BA) =$

1) $\begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{bmatrix}$ 2) $\begin{bmatrix} 8 & -4 & 10 \\ 0 & 0 & 0 \\ 12 & -6 & 15 \end{bmatrix}$

3) $\begin{bmatrix} 8 & 0 & 12 \\ -4 & 0 & -6 \\ 10 & 0 & 5 \end{bmatrix}$ 4) $\begin{bmatrix} 8 & 0 & 12 \\ 10 & 0 & 5 \\ -4 & 0 & -6 \end{bmatrix}$

103. A_{3x3} , det (A. Adj A) = ...
1) det A 2) $(\det A)^2$ 3) $(\det A)^3$
4) $(\det A)^4$

104. If A is a square matrix so that
A adj A = diag (k, k, k) then $|adj\ A| =$
1) k 2) k^2 3) k^3 4) k^4

105. If A is a non singular matrix then which of the following is not true
1) $AdjA = |A|A^{-1}$ 2) $(AdjA)^{-1} = \frac{1}{|A|}A$
3) $\det(A^{-1}) = (\det A)^{-1}$ 4) $AdjA = I$

106. If $adj\ A = \begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 1 \\ 2 & 1 & -1 \end{bmatrix}$ then adj 2 A =

1) $\begin{bmatrix} 2 & -2 & 0 \\ 4 & 6 & 2 \\ 4 & 2 & -2 \end{bmatrix}$ 2) $\begin{bmatrix} 4 & -4 & 0 \\ 8 & 12 & 4 \\ 8 & 4 & -4 \end{bmatrix}$

3) $\begin{bmatrix} 8 & -8 & 0 \\ 16 & 24 & 8 \\ 16 & 8 & -8 \end{bmatrix}$ 4) $\begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 1 \\ 2 & 1 & -1 \end{bmatrix}$

107. If A is 3 x 3 matrix and det adj (A) = k then det (adj 2A) =
1) 2k 2) 8k 3) 16k 4) 64k