Concept
Based Questions

ALGEBRA OF MATRICES

1. **If two matrices A an B are of order $p\times q$ and $r\times s$ respectively, can be substracted only, if**
   1) $p=q$ 2) $p=q, r=s$
   3) $p=r, q=s$ 4) $p=r$
2. **If $A=[a_{ij}]$ is a scalar matrix of order $n\times n$ such that $a_{ij}=k$ for all i=j, then trace of A =**
   1) nk 2) n+k 3) $\frac{n}{k}$ 4) 1
3. **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) no identical columns
   4) cannot be determined
4. **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
5. **If A, B are two square matrices of order n and A and B commute (K be a real number). 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
6. **If D_1 and D_2 are two 3 × 3 diagonal matrices then**
   1) D_1D_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
7. **If AB = AC then**
   1) B = C 2) B ≠ C
   3) B need not be equal to C 4) B = -C
8. **If $AB=AC \Rightarrow B=C$, then A is**
   1) non-singular 2) singular
   3) symmetric 4) Skew symmetric
9. **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
10. **If $A=\begin{bmatrix}1 & \omega & \omega^2\\ \omega & \omega^2 & 1\\ \omega^2 & 1 & \omega\end{bmatrix}$ then A is**
    1) Nilpotent 2) involutary
    3) Symmetric 4) Idempotent
11. **A skew - symmetric matrix S satisfies the relation $S^2+I=0$, where I is a unit matrix then S is**
    1) Idempotent 2) Orthogonal
    3) involutary 4) Nilpotent
12. **If $A=\begin{bmatrix}1 & 2-3i & 3+4i\\ 2+3i & 0 & 4-5i\\ 3-4i & 4+5i & 2\end{bmatrix}$ then A is**
    1) Hermitian 2) Skew-Hermitian
    3) Symmetric 4) Skew-Symmetric
13. **If A and B are square matrices of size $n\times n$ such that $A^2-B^2=(A-B)(A+B)$, then which of the following will be always true.**
    1) AB=BA
    2) Either A or B is a zero matrix
    3) Either A or B is an identity matrix
    4) A=B

14. If B is an idempotent matrix and $A = I - B$ then $AB =$

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

15. If A is a symmetric or skew-symmetric matrix then A^2 is

1) symmetric 2) skew-symmetric
3) Diagonal 4) scalar or matrix

16. 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

17. If a matrix A is both symmetric and skew-symmetric then A is

1) I 2) O
3) Both 1 and 2 4) Diagonal matrix

18. If A is a 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

19. If A is a skew-symmetric matrix and n is even positive integer, then A^n is

1) a symmetric matrix
2) skew-symmetric matrix
3) diagonal matrix
4) triangular matrix

20. If $A = \left[a_{ij}\right]_{3\times3}$ 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

21. 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) Nilpotent matrix

22. If A is a skew-symmetric matrix of order n,and C is a column matrix of order n, then C^TAC is

1) A Identity matrix of order n
2) A unit matrix of order one
3) A zero matrix of order one
4) A zero matrix of order n.

DETERMINANTS AND INVERSE OF A MATRIX

23. A and B are square matrices of order 3×3, A is an orthogonal matrix and B is a skew symmetric matrix. Which of the following statement is not true

1) $|A| = \pm1$ 2) $|B| = 0$
3) $|AB| = 1$ 4) $|AB| = 0$

24. 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 $a_1B_1 + a_2B_2 + a_3B_3 =$

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

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

1) not changed 2) doubled
3) multiplied by 4 4) multiply by 1/2

26. If A is a 3×3 singular matrix then A (Adj. A) =

1) $|A|I$ 2) I 3) O 4) ±1

27. If A and B are two non-singular matrices then $|Adj(AB)| =$

1) $|Adj(B)||Adj A|$ 2) $|Adj A||Adj B|$
3) Both (1) and (2) 4) $|A||B|$

28. $A_{3\times3}$ is a nonsingular matrix $\Rightarrow A^2(\text{Adj } A) =$

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

29. 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) $AdjA = I$

30. If $\Delta = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$ then $\begin{vmatrix} A_1 & A_2 & A_3 \\ B_1 & B_2 & B_3 \\ C_1 & C_2 & C_3 \end{vmatrix} =$

(A_1, A_2, A_3...are cofactors)

1) $\frac{\Delta^2}{2}$ 2) 2Δ 3) Δ^2 4) Δ

31. Given $a_i^2 + b_i^2 + c_i^2 = 1 \ (i = 1,2,3)$ and $a_i a_j + b_i b_j + c_i c_j = 0 \ (i \neq j, i, j = 1,2,3)$ then the value of $\begin{vmatrix} a_1 & a_2 & a_3 \\ b_1 & b_2 & b_3 \\ c_1 & c_2 & c_3 \end{vmatrix}$ is

1) 0 2) $\frac{1}{2}$ 3) ± 1 4) 2

32. If A, B are square matrices of order 3, then

1) $AB = 0 \Rightarrow |A| = 0 \text{ and } |B| = 0$

2) $AB = 0 \Rightarrow |A| = 0 \text{ or } |B| = 0$

3) $(A+B)^{-1} = A^{-1} + B^{-1}$

4) adj (AB) = (adjA) (adjB)

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

1) Both are 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

34. If A is an orthogonal matrix, then A^{-1} equals

1) A 2) A^T 3) AA^T 4) I

35. The inverse of a symmetric matrix is (if exists)

1) Diagonal matrix

2) Symmetric matrix

3) Skew - symmetric matrix 4) Can't say

36. The inverse of a skew symmetric matrix (if it exists) is

1) a symmetric matrix

2) a skew symmetric matrix

3) a diagonal matrix

4) none of a matrix is unique

37. The inverse of a skew symmetric matrix of odd order is

1) a symmetric matrix

2) a skew symmetric matrix

3) diagonal matrix 4) does not exist

38. If A is a square matrix of order 3 then $|Adj\,(Adj\,A^2)| =$

1) $|A|^2$ 2) $|A|^4$ 3) $|A|^8$ 4) $|A|^{16}$

LINEAR EQUATIONS

39. The system of equations which can be solved by cramer's rule have

1) unique solution

2) no solution

3) infinitely many solutions

4) two solutions

40. Let AX = B be a system of non homogeneous equations and det A = 0 then the system has

1) infinity solutions

2) unique solution

3) no solution

4) infinity solutions or no solution

41. The system AX = B of (n –a) equations in (n –a) unknowns has infinitely many solutions if

1) det A $\neq 0$, (adj A) (B) = 0

2) $|A| = 0, (adj\,A)(B) = 0$

3) $|A| = 0, (adj\,A)(B) \neq 0$

4) Identity matrix

42. The system of equations which can be solved by matrix inversion method have
1) unique solution
2) no solution
3) infinitely many solutions
4) two solutions

43. consider the system of equations $a_i x + b_i y + c_i z = 0$ (where i=1,2,3), if

$\begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = 0$, then the system has

1) only one solution
2) one solution (0,0,0) and one more solution
3) no solution
4) infinite solutions

44. If A is invertible matrix and B is another matrix such that (AB) exists then
1) rank (AB) = rank (A)
2) rank (AB) = rank (B)
3) rank (AB) > rank (A)
4) rank (AB) > rank (B)

45. If A is a non zero column matrix of order $m \times 1$ amd B is a non zero row matrix of order $1 \times n$ then rank of AB is
1) 0 2) 1 3) m 4) n

46. If $A_{3\times3} \cdot X_{3\times1} = D_{3\times1}$ is a consistent system of equations having unique solution then rank (A)
1) 3 2) 2 3) 1 4) 0

47. If $A = \left[a_{ij}\right]_{m\times n}$ is a matrix of rank r then
1) $r = \min\{m, n\}$ 2) $r < \min\{m, n\}$
3) $r \le \min\{m, n\}$ 4) $r = \max\{m, n\}$

KEY

01) 3	02) 1	03) 2	04) 3	05) 1
06) 1	07) 3	08) 1	09) 2	10) 3
11) 2	12) 1	13) 1	14) 2	15) 1
16) 3	17) 2	18) 2	19) 1	20) 3
21) 2	22) 3	23) 3	24) 1	25) 2
26) 1	27) 3	28) 1	29) 4	30) 3
31) 3	32) 2	33) 1	34) 2	35) 2
36) 2	37) 4	38) 3	39) 1	40) 4
41) 2	42) 1	43) 4	44) 2	45) 2
46) 1	47) 3			

EXERCISE-I

CRTQ & SPQ LEVEL-I

FORMATION OF MATRICES

C.R.T.Q Class Room Teaching Questions

1. For 2×3 matrix $A = \left[a_{ij}\right]$ whose elements are given by $a_{ij} = \frac{(i+j)^2}{2}$ then A is equal to

1) $\begin{bmatrix} 2 & 8 & \frac{9}{2} \\ 8 & \frac{9}{2} & \frac{25}{2} \end{bmatrix}$ 2) $\begin{bmatrix} 2 & \frac{9}{2} & 8 \\ \frac{9}{2} & 8 & \frac{25}{2} \end{bmatrix}$

3) $\begin{bmatrix} 2 & \frac{9}{2} & 8 \\ 8 & \frac{9}{2} & \frac{25}{2} \end{bmatrix}$ 4) $\begin{bmatrix} 2 & \frac{25}{2} & 8 \\ \frac{9}{2} & \frac{9}{2} & 8 \end{bmatrix}$

2. 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) $r = y = -z$

S.P.Q. Student Practice Questions

3. If $a_{ij} = \frac{1}{2}(3i - 2j)$ and $A = \left[a_{ij}\right]_{2\times2}$, then A is equal to

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

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

4. 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

SUM AND DIFFERENCE OF THE MATRICES AND SCALAR MULTIPLE OF A MATRIX

C.R.T.Q Class Room Teaching Questions

5. 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) $\begin{pmatrix} -5 & -7 \\ -5 & -1 \end{pmatrix}$

6. If I $=\begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, B $=\begin{pmatrix} 0 & 1 \\ -1 & 0 \end{pmatrix}$ and $C=\begin{pmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{pmatrix}$ then C=

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

3) $I\cos\theta - B\sin\theta$ 4) $-I\cos\theta + B\sin\theta$

7. If $A=\begin{bmatrix} 1 & 2 \\ 2 & 5 \end{bmatrix}$, $B=\begin{bmatrix} 4 & 3 \\ 0 & 2 \end{bmatrix}$ and 2A+C=B then C =

1) $\begin{bmatrix} 6 & 7 \\ 4 & 12 \end{bmatrix}$ 2) $\begin{bmatrix} 2 & -1 \\ -4 & -8 \end{bmatrix}$

3) $\begin{bmatrix} 3 & -1 \\ -4 & 8 \end{bmatrix}$ 4) $\begin{bmatrix} -6 & -7 \\ -4 & -12 \end{bmatrix}$

8. If A$=\begin{pmatrix} 0 & 2 \\ 3 & -4 \end{pmatrix}$, kA$=\begin{pmatrix} 0 & 3a \\ 2b & 24 \end{pmatrix}$ then the values of k, a, b are respectively.

1) -6, -12, -18 2) -6, 4, 9

3) -6, -4, -9 4) -6, 12, 18

S.P.Q. Student Practice Questions

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

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

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

11. If $A=\begin{bmatrix} 9 & 1 \\ 4 & 3 \end{bmatrix}$, $B=\begin{bmatrix} 1 & 5 \\ 6 & 11 \end{bmatrix}$ and 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) $\begin{bmatrix} -16 & 14 \\ 21 & 32 \end{bmatrix}$

MULTIPLICATION OF MATRICES

C.R.T.Q Class Room Teaching Questions

12. If(1 2 3) B =(3 4)then order of the matrix B is

1) 3×1 2) 3×2 3) 2×4 4) 5×2

13. 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

14. 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 exist and BA does not exist

4) AB does not exist and BA exist

15. If$\begin{bmatrix} m & n \end{bmatrix}\begin{bmatrix} m \\ n \end{bmatrix}=[25]$ and $m<n$, then $(m,n)=$

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

16. If $A=\begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix}$ and $A^n=0$, then the minimum value of 'n' is

1) 2 2) 3 3) 4 4) 5

17. 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) $(bx^2-2hxy+ay^2)$

18. If A = diagonal (3,3,3) then A^4 =

1) 12A 2) 81A
3) 684A 4) 27A

19. If $A=\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ then A^5 =

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

20. If $A=\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, then A^2-4A is equal to

1) $2I_3$ 2) $3I_3$ 3) $4I_3$ 4) $5I_3$

21. If $\begin{pmatrix} 1 & -\tan\theta \\ \tan\theta & 1 \end{pmatrix}\begin{pmatrix} 1 & \tan\theta \\ -\tan\theta & 1 \end{pmatrix}^{-1}=$ $\begin{pmatrix} a & -b \\ -b & a \end{pmatrix}$

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

22. 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

23. A fruit shop ... oranges ... dozen mangoes, 6 dozen bananas ... selling prices are Rs 60, Rs40, ... each respectively. Using matrix algebra ... the value of the fruits in the shop ...

1) 7200 2) 7000
3) 2700 4) 7500

S.P.Q. Student Practice Questions

24. The order of $[x\ y\ z]\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix}$

1) 3 × 1 2) 1 × 1
3) 1 × 3 4) 3 × 3

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

26. If $A=\begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ then A^5 =

1) 243 2) 81A
3) 243A 4) 81I

27. If $[x\ \ y\ \ z]\begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix}=$

1) $[ax^2+by^2+cz^2+2hxy+2gxz+2fyz]$
2) $[ax^2+by^2+cz^2+hxy+gxz+fyz]$
3) $[2ax^2+2by^2+2cz^2+hxy+gxz+fyz]$
4) $[2ax^2+2by^2+2cz^2+2hxy+2gxz+2fyz]$

28. 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

29. If $A=\begin{bmatrix}2 & 1\\ 3 & 0\end{bmatrix}$ 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) $\begin{bmatrix}4 & 12\\ -12 & -4\end{bmatrix}$

30. 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

31. If $A=\begin{bmatrix}0 & 1\\ 1 & 0\end{bmatrix}$ then $A^{2016}=$

1) I 2) 0

3) A 4) A^2

32. 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) $[19]$

33. If $A=\begin{bmatrix}0 & c & -b\\ -c & 0 & a\\ b & -a & 0\end{bmatrix}$ 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

PROBLEMS BASED ON INDUCTION

C.R.T.Q Class Room Teaching Questions

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

35. $\begin{bmatrix}i & 0 & 0\\ 0 & i & 0\\ 0 & 0 & i\end{bmatrix}$ 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) $\begin{bmatrix}-i & 0 & 0\\ 0 & -i & 0\\ 0 & 0 & -i\end{bmatrix}$

36. If $A=\begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix}$ and $I=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$, then which one of the following holds for all $n\geq 1$ (by the principle of mathematical induction)

1) $A^n=nA+(n-1)I$

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

3) $A^n=nA-(n-1)I$

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

S.P.Q. Student Practice Questions

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

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

38. 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) $\begin{bmatrix}1+2p & -4\\ -p & 1-2p\end{bmatrix}$

39. If $A=\begin{pmatrix}1 & 1\\ 1 & 1\end{pmatrix}$, $n \in N$ then $A^n =$

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

TRACE OF MATRIX

C.R.T.Q Class Room Teaching Questions

40. If $Tr(A)=6 \Rightarrow Tr(4A)=$
1) 3/2 2) 2
3) 12 4) 24

41. If Tr (A)=3, Tr(B)=5 then Tr(AB) =
1) 15 2) 5
3) 3/5 4) Cannot say

42. 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

S.P.Q. Student Practice Questions

43. If Tr (A) = 2+i $\Rightarrow$ Tr [(2-i)A] =
1) 2+i 2) 2-i
3) 3 4) 5

44. If Tr (A) = 8, Tr(B) = 6, $\Rightarrow$ Tr (A - 2B) =
1) -4 2) 4
3) 2 4) 11

TRANSPOSE AND PROPERTIES OF TRANSPOSE OF MATRIX

C.R.T.Q Class Room Teaching Questions

45. If A is a 3 × 4 matrix and B is matrix such that A^TB and BA^T are both defined then order of B is
1) 3 × 4 2) 4 × 3
3) 3 × 3 4) 4 × 4

46. $\begin{bmatrix}r+4 & 6\\ 3 & r+3\end{bmatrix}=\begin{bmatrix}5 & r+2\\ r+5 & 4\end{bmatrix}^T$ then r=
1) 1 2) 2 3) 3 4) -1

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

48. 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

S.P.Q. Student Practice Questions

49. If $O(A)=2\times3, O(B)=3\times2$, and $O(C)=3\times3$, which one of the following is not defined
1) $CB+A^T$ 2) BAC
3) $C(A+B^T)^T$ 4) $C(A+B^T)$

50. 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 $(A^TB)^TC^T$ is
1) 4 × 5 2) 3 × 7
3) 4 × 3 4) 5 ×7

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

1) $AA^T = A^TA = I$ 2) $AA^T = A^TA = -I$
3) $AA^T = A^TA = 0$ 4) $AA^T = A^TA = A$

52. Which of the following is not true, if A and B are two matrices each of order $n \times n$, then

1) $(A+B)^T = A^T + B^T$
2) $(A-B)^T = A^T - B^T$
3) $(AB)^T = A^T B^T$
4) $(ABC)^T = C^T B^T A^T$

SYMMETRIC, SKEW SYMMETRIC MATRICES & SPECIAL TYPES OF MATRICES

C.R.T.Q Class Room Teaching Questions

53. 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

54. $\begin{pmatrix} 2 & 3 & 5 \\ 4 & 1 & 2 \\ 1 & 2 & 1 \end{pmatrix} = P+Q$, where P is a symmetric and Q is a skew-symmetric then Q=

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

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

55. 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) involutary 4) orthogonal matrix

S.P.Q. Student Practice Questions

56. $A = \begin{bmatrix} x & -7 \\ 7 & y \end{bmatrix}$ is a skew-symmetric matrix, then $(x,y)=$

1) (1,-1) 2) (7,-7)
3) (0,0) 4) (14,-14)

57. $\begin{bmatrix} 1 & 6 \\ 7 & 2 \end{bmatrix}$=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) $\begin{bmatrix} 0 & 13/2 \\ 13/2 & 0 \end{bmatrix}$

58. 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

DETERMINANTS AND ITS PROPERTIES

C.R.T.Q Class Room Teaching Questions

59. If $A = \begin{bmatrix} a & c & b \\ b & a & c \\ c & b & a \end{bmatrix}$ then the cofactor of a

in $A+A^T$ is

1) $-\left(2a(b+c)-(b+c)^2\right)$

2) $ac-b^2$

3) a^2-bc

4) $2a(a+c)-(a+c)^2$

60. The value of $\begin{vmatrix} 2+i & 2-i \\ 1+i & 1-i \end{vmatrix}$ is $\{\because i^2=-1\}$

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

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

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

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

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

63. If $\begin{vmatrix} \lambda^2+3\lambda & \lambda-1 & \lambda+3 \\ \lambda+1 & 2-\lambda & \lambda-4 \\ \lambda-3 & \lambda+4 & 3\lambda \end{vmatrix}$

$= p\lambda^4+q\lambda^3+r\lambda^2+s\lambda+t$ then $t=$

1) 16 2) 17
3) 18 4) 19

64. 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) 1 2) 0
3) -1 4) 2

65. If $a \neq b$, b, c satisfy $\begin{vmatrix} a & 2b & 2c \\ 3 & b & c \\ 4 & a & b \end{vmatrix} = 0$, th

$abc=$

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

66. $\begin{vmatrix} \log e & \log e^2 & \log e^3 \\ \log e^2 & \log e^3 & \log e^4 \\ \log e^3 & \log e^4 & \log e^5 \end{vmatrix} =$

1) 0 2) 1
3) 4 loge 4) 5 loge

67. If $\begin{vmatrix} a & a & x \\ m & m & m \\ b & x & b \end{vmatrix} = 0$ then $x=$

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

68. The value of a third order determinan is 11, then the value of the square o the deter-minant formed by th cofactors will be

1) 11 2) 121 3) 1331 4) 1464

69. If matrix A is an circulant matrix whose elements of first row are a, b, c all > such that abc = 1 and $A^TA=I$ then $a^3+b^3+c^3$ equals

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

70. In a third order determinant, each element of the first column consists of sum of two terms, each element of the second column consists of sum of three terms and each element of the third column consits of sum of fou terms,.Then it can be decomposed into n determinants, where n has value

1) 1 2) 9 3) 16 4) 24

S.P.Q. Student Practice Questions

71. 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) $bc - a^2$

72. 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) $-2x-8y$

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

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

74. $\det\begin{bmatrix} 1990 & 1991 & 1992 \\ 1991 & 1992 & 1993 \\ 1992 & 1993 & 1994 \end{bmatrix}=$

1) 1992 2) 1993 3) 1994 4) 0

75. $\begin{vmatrix} (b+c)^2 & a^2 & b^2 \\ b^2 & (c+a)^2 & b^2 \\ c^2 & c^2 & (a+b)^2 \end{vmatrix}$

$=\lambda abc(a+b+c)^3$ then $\lambda=....$

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

76. If $1,\omega,\omega^2$ are the cube roots of unity then $\begin{vmatrix} 1 & \omega & \omega^2 \\ \omega & \omega^2 & 1 \\ \omega^2 & 1 & \omega \end{vmatrix}=.....$

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

77. $\begin{vmatrix} a-b & p-q & x-y \\ b-c & q-r & y-z \\ c-a & r-p & z-x \end{vmatrix}=$

1) 0 2) 1
3) abc 4) xyz

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

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

79. 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) $\frac{3\sqrt{3}}{8}$

80. Det $\begin{bmatrix} 0 & p-q & p-r \\ q-p & 0 & q-r \\ r-p & r-q & 0 \end{bmatrix}=$

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

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

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

82. If $\begin{vmatrix} 1+x & 2 & 3 \\ 1 & 2+x & 3 \\ 1 & 2 & 3+x \end{vmatrix}=0$ then $x=$

1) 1 2) -1 3) -6 4) 6

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

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

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

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

ADJOINT OF A MATRIX

C.R.T.Q Class Room Teaching Questions

85. 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

86. Adj

$$\begin{bmatrix} 1 & 0 & 2 \\ -1 & 1 & -2 \\ 0 & 2 & 1 \end{bmatrix} = \begin{bmatrix} 5 & a & -2 \\ 1 & 1 & 0 \\ -2 & -2 & b \end{bmatrix} \Rightarrow [a\ b] =$$

1) $[-4\ \ 1]$ 2) $[-4\ \ -1]$
3) $[4\ \ 1]$ 4) $[4\ \ -1]$

87. If A is a 3x3 matrix and $|adjA| = 16$ then $|A| =$

1) 4 2) -4 3) ± 4 4) 8

88. If det $(A_{3\times 3}) = 6$, then det (adj 2A)=

1) 144 2) $2^2 \times 3^8$
3) $3^3 \times 2^4$ 4) $3^2 \times 2^8$

S.P.Q. Student Practice Questions

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

90. If A_{3x3} and det A = 5 then det (adj A) =

1) 5 2) 25 3) 125 4) 1/5

91. If A is a square matrix such that $A\ adj(A) = diag(k,k,k)$ then $|adjA| =$

1) k 2) k^2 3) k^3 4)

INVERSE OF A MATRIX

C.R.T.Q Class Room Teaching Questions

92. 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)

93. 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

94. If $|A| \neq 0$ and $(A-2I)(A-3I) = 0$ the $A^{-1} =$

1) $\frac{A-5I}{6}$ 2) $\frac{5I-A}{5}$
3) $\frac{5A-I}{6}$ 4) $\frac{5I-A}{6}$

S.P.Q. Student Practice Questions

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

96. The matrix A is such that $A\begin{bmatrix}-1 & 2\\ 3 & 1\end{bmatrix}=\begin{bmatrix}-4 & 1\\ 7 & 7\end{bmatrix}$ then A =

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

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

97. If A is a 3×3 non singular matrix and $|adjA|=|A|^x$, $|adj(adjA)|=|A|^y$, $|A^{-1}|=|A|^z$, then the values of x,y,z in descending order.

1) x,y,z 2) z,y,x
3) z,x,y 4) y,x,z

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

99. If the value of a third order determinant is 11, then the value of the determinant of $A^{-1}=$

1) 11 2) 121 3) 1/11 4) 1/121

100. If $A=\begin{bmatrix}\cos\alpha & -\sin\alpha & 0\\ \sin\alpha & \cos\alpha & 0\\ 0 & 0 & 1\end{bmatrix}$ then $(AdjA)^{-1}=$

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

RANK OF A MATRIX

C.R.T.Q Class Room Teaching Questions

101. 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

102. If I is a (9×9) unit matrix, then rank (I) =

1) 0 2) 3 3) 6 4) 9

103. The ranks of the matrices in descending order

A. $\begin{bmatrix}1 & 4 & -1\\ 2 & 3 & 0\\ 0 & 1 & 2\end{bmatrix}$ B. $\begin{bmatrix}1 & 1 & 1\\ 1 & 1 & 1\\ 1 & 1 & 1\end{bmatrix}$ C. $\begin{bmatrix}1 & 2 & 3\\ 2 & 3 & 4\\ 0 & 1 & 2\end{bmatrix}$

1) A,B,C 2) A,C,B
3) B,C,A 4) C,A,B

S.P.Q. Student Practice Questions

104. The rank of the matrix $\begin{bmatrix}-1 & 2 & 5\\ 2 & -4 & a-4\\ 1 & -2 & a+1\end{bmatrix}$ is

1) 3 if $a=6$ 2) 1 if $a=-6$
3) 3 if $a=2$ 4) 2 if $a=-6$

105. The rank of $\begin{bmatrix}1 & -1 & 1\\ 1 & 1 & -1\\ -1 & 1 & 1\end{bmatrix}$ is :

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

106. The Rank of $\begin{bmatrix}1 & 2 & 3 & 1\\ 2 & 4 & 6 & 2\\ 1 & 2 & 3 & 2\end{bmatrix}$ is

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

SOLUTION OF SIMULTANEOUS EQUATION NON HOMOGENEOUS LINEAR EQUATIONS

C.R.T.Q Class Room Teaching Questions

107. The solution of

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

$3x+2y+4z=5$ is

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

108. 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

109. 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

110. The number of solutions of the equation

$3x+3y-z=5, x+y+z=3, 2x+2y-z=3$

1) 1 2) 0 3) infinite 4) two

S.P.Q. Student Practice Questions

111. The number of solutions of the equa-tions $2x-3y=5$, $x+2y=7$ is ....

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

112. If the system of equations $x+y+z=6$, $x+2y+\lambda z=0$, $x+2y+3z=10$ has no solution, then $\lambda=$

1) 2 2) 3 3) 4 4) 5

113. 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

114. If $x+y+z=1, ax+by+cz=k$, $a^2x+b^2y+c^2z=k^2$ has unique solution then $x=$.......

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

3) $\frac{(k-a)(b-k)}{(b-c)(c-a)}$ 4) $(k-a)(k-b)(k-c)$

115. Solution of the system of equations

$\frac{2}{x}+\frac{3}{y}+\frac{10}{z}=4, \frac{4}{x}-\frac{6}{y}+\frac{5}{z}=1,$

$\frac{6}{x}+\frac{9}{y}-\frac{20}{z}=2, (x,y,z)=$

1) (1,2,3) 2) (2,3,5)
3) (3,2,5) 4) (5,3,2)

116. If the system of equation $2x-3y+4z=0$, $5x-2y-z=0$, $21x-8y+az=0$ has infinity solution then $a=$

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

117. 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

1) 1 2) 0 3) -1 4) all the above

118. If the system of equations

$2x+3ky+(3k+4)z=0$

$x+(k+4)y+(4k+2)z=0$,

$x+2(k+4)y+(3k+4)z=0$

has non trivial solution then k=

1) -8 or $\frac{1}{2}$ 2) 8 or $-\frac{1}{2}$

3) -4 or $\frac{1}{2}$ 4) 4 or $-\frac{1}{2}$

HOMOGENEOUS LINEAR EQUATIONS

C.R.T.Q Class Room Teaching Questions

119. If x,y,z not all zeros and the equation $x+y+z=0$, $(1+a)x+(2+a)y-8z=0$, $x-(1+a)y+(2+a)z=0$ have non trivial solution then a =

1) $2+\sqrt{15}$ 2) $3\pm\sqrt{15}$

3) $\sqrt{15}$ 4) $-5\pm2\sqrt{2}$

7. If $\begin{bmatrix} \lambda^2-2\lambda+1 & \lambda-2 \\ 1-\lambda^2+3\lambda & 1-\lambda^2 \end{bmatrix} = A\lambda^2+B\lambda+C$ where A,B,C are matrices then B + C =

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

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

8. If $A=\begin{bmatrix} 0 & x \\ y & 0 \end{bmatrix}$ and $A^3+A=O$ then

1) xy = 0 2) $xy=\frac{1}{2}$

3) xy = -1 4) xy =1

9. If $A=\begin{pmatrix} \cos^2\alpha & \cos\alpha\sin\alpha \\ \cos\alpha\sin\alpha & \sin^2\alpha \end{pmatrix}$ and $B=\begin{pmatrix} \cos^2\beta & \cos\beta\sin\beta \\ \cos\beta\sin\beta & \sin^2\beta \end{pmatrix}$ are two matrices such that the product AB is the null matrix then $\alpha-\beta=$

1) 0

2) multiple of π

3) an odd multiple of $\frac{\pi}{2}$

4) can not be determind

10. If A,B are two square matrices such that AB=B; BA=A and $n\in N$ then $(A+B)^n=$

1) $2^n(A+B)$ 2) $2^{n-1}(A+B)$

3) $2^{n+1}(A+B)$ 4) $2^{n/2}(A+B)$

11. The number of 2×2 matrices that can be formed by using 1,2,3,4 without repetition is

1) 24 2) 12

3) 6 4) 256

SPECIAL TYPES OF MATRICES, 3 MATRICES SYMMETRIC & SKEW-

SYMMETRIC MATRICES

C.R.T.Q Class Room Teaching Questions

12. If $\left[3x^2+10xy+5y^2\right]=[x\ y]A\begin{bmatrix} x \\ y \end{bmatrix}$, 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) $\begin{bmatrix} 3 & 5 \\ 5 & 5 \end{bmatrix}$

13. A square matrix A is said to be nilpotent of index m. If $A^m=0$ now, if for this A,

$(I-A)^n=I+A+A^2+A^3+...+A^{m-1}$,

then n is equal to

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

14. Let A be the set of all 3×3 skew-symmetric matrices whose entries are either $-1,0,or\,1$ if there are exactly three 0's, three 1's then the number of such matrices is

1) 3 2) 6 3) 8 4) 9

15. The maximum number of different possible non-zero entries in a skew-symmetric matrix of order 'n' is

1) $\frac{1}{2}(n^2-n)$ 2) $\frac{1}{2}(n^2+n)$

3) n^2 4) (n^2-n)

S.P.Q. Student Practice Questions

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

17. 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

C.R.T.Q Class Room Teaching Questions

18. If $r^2=a^2+b^2+c^2, s^2=ab+bc+ca$ then $\begin{vmatrix} r^2 & s^2 & s^2 \\ s^2 & r^2 & s^2 \\ s^2 & s^2 & r^2 \end{vmatrix}=$

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

19. 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) $\frac{1}{n}A$

20. If $A_k=\begin{bmatrix} k & k-1 \\ k-1 & k \end{bmatrix}$ then $|A_1|+|A_2|+....+|A_{2015}|=$

1) 0 2) 2015 3) $(2015)^2$ 4) $(2015)^3$

21. Matrix A is given by $A=\begin{bmatrix} 6 & 11 \\ 2 & 4 \end{bmatrix}$ then the determinant of $A^{2015}-6A^{2014}$ is

1) 2^{2016} 2) $(-11)2^{2015}$
3) $-2^{2015}\times 7$ 4) $(-9)2^{2014}$

22. If $\begin{vmatrix} x^n & x^{n+2} & x^{n+3} \\ y^n & y^{n+2} & y^{n+3} \\ z^n & z^{n+2} & z^{n+3} \end{vmatrix}$

$=(x-y)(y-z)(z-x)\left(\frac{1}{x}+\frac{1}{y}+\frac{1}{z}\right)$

then value of n is

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

23. 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) $\sin x$ 2) $\cos x$
3) $\sin x.\cos x$ 4) $\sin x - \cos x$

24. If $\begin{vmatrix} a & b & c \\ m & n & p \\ x & y & z \end{vmatrix}=k$, then $\begin{vmatrix} 6a & 2b & 2c \\ 3m & n & p \\ 3x & y & z \end{vmatrix}=$

1) k/6 2) 2k 3) 3k 4) 6k

25. If $\begin{vmatrix} a+b & b+c & c+a \\ c+a & a+b & b+c \\ b+c & c+a & a+b \end{vmatrix}=r\times$ det of circulant matrix whose elements of first column are a,b,c then 'r' equals

1) 5 2) 6 3) -2 4) 2

26. If x,y,z are integers in A.P lying between 1 and 9 and $x51, y41$ and $z31$ are three digit numbers, then the value of $\begin{vmatrix} 5 & 4 & 3 \\ x51 & y41 & z31 \\ x & y & z \end{vmatrix}$ is:

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

27. If the entries in a 3×3 determinant are either 0 or 1, then the greatest value of their determinants is

1) 1 2) 2 3) 3 4) 9

28. 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) $a^2+b^2+c^2$

29. The roots of $\begin{vmatrix} x & a & b & 1 \\ \lambda & x & b & 1 \\ \lambda & \mu & x & 1 \\ \lambda & \mu & v & 1 \end{vmatrix} = 0$ are independent of :

1) λ, μ, v 2) a, b

3) λ, μ, v, a, b 4) 0,a

30. If [.] denotes the greatest integer less than or equal to the real number under consideration, and $-1 \le x < 0$; $0 \le y < 1; 1 \le z < 2$, then the value of the determinant $\begin{vmatrix} [x]+1 & [y] & [z] \\ [x] & [y]+1 & [z] \\ [x] & [y] & [z]+1 \end{vmatrix}$ is

1) $[x]$ 2) $[y]$

3) $[z]$ 4) $[x]+[y]+[z]$

31. If α is the repeated root of quadratic equation $f(x)=0$ and $A(x), B(x)$ and $C(x)$ are polynomials of degree 3,4 and 5 respectivelty, then

$$\phi(x) = \begin{vmatrix} A(x) & B(x) & C(x) \\ A(\alpha) & B(\alpha) & C(\alpha) \\ A^1(\alpha) & B^1(\alpha) & C^1(\alpha) \end{vmatrix}$$ is divisible by

1) $f(x)$ 2) $A(x)$

3) $B(x)$ 4) $C(x)$

32. If $D_k = \begin{vmatrix} 1 & n & n \\ 2k & n^2+n+2 & n^2+n \\ 2k-1 & n^2 & n^2+n+2 \end{vmatrix}$ and $\sum_{k=1}^{n} D_k = 48$, then 'n' equals

1) 4 2) 6

3) 8 4) 10

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

1) 0

2) $\sqrt{\frac{3}{2}(a^2+b^2+c^2)}$

3) $-\sqrt{\frac{3}{2}(a^2+b^2+c^2)}$

4) $0, \pm\sqrt{\frac{3}{2}(a^2+b^2+c^2)}$

34. If $a,b,c>0$ and $x,y,z \in R$ then the determinant:

$$\begin{vmatrix} (a^x+a^{-x})^2 & (a^x-a^{-x})^2 & 1 \\ (b^y+b^{-y})^2 & (b^y-b^{-y})^2 & 1 \\ (c^z+c^{-z})^2 & (c^z-c^{-z})^2 & 1 \end{vmatrix}$$ is equal to :

1) $a^x b^y c^z$ 2) $a^{-x} b^{-y} c^{-z}$

3) 0 4) $a^{2x} b^{2y} c^{2z}$

35. If $A = \begin{vmatrix} 1+\cos\alpha & 1+\sin\alpha & 1 \\ 1+\cos\beta & 1+\sin\beta & 1 \\ 1 & 1 & 1 \end{vmatrix} \ne 0$, then

1) $\alpha = \beta$

2) $\alpha \ne \beta + n\pi$, n being any integer

3) $\alpha \ne \beta + \pi/2$

4) $\alpha \ne \beta - \pi/2$

36. 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

37. If $a=\cos\frac{4\pi}{3}+i\sin\frac{4\pi}{3}$ then $\begin{vmatrix}1 & 1 & 1\\ 1 & a & a^2\\ 1 & a^2 & a\end{vmatrix}=$

1) purely real
2) purely imaginary
3) complex number
4) rational

38. $a\neq p, b\neq q, c\neq r$ and $\begin{vmatrix}p & b & c\\ a & q & c\\ a & b & r\end{vmatrix}=0$

then the value of $\frac{p}{p-a}+\frac{q}{q-b}+\frac{r}{r-c}=$

1) 1
2) 2
3) 3
4) c

39. If $\begin{vmatrix}p & q-y & r-z\\ p-x & q & r-z\\ p-x & q-y & r\end{vmatrix}=0$ then the value of $\frac{p}{x}+\frac{q}{y}+\frac{r}{z}$ is

1) 0
2) 1
3) 2
4) $4pqr$

40. 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

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

then $\Delta_1=$

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

41. If $\begin{vmatrix}(1+x) & (1+x)^2 & (1+x)^3\\ (1+x)^4 & (1+x)^5 & (1+x)^6\\ (1+x)^7 & (1+x)^8 & (1+x)^9\end{vmatrix}$

$=a_0+a_1x+a_2x^2+\ldots\ldots,$

then, a_1 is equal to

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

42. If y = cos x, $y_n=\frac{d^n(\cos x)}{dx^n}$ then

$\begin{vmatrix}y_4 & y_5 & y_6\\ y_7 & y_8 & y_9\\ y_{10} & y_{11} & y_{12}\end{vmatrix}=\ldots.$

1) 0
2) -cosx
3) cosx
4) sin x

43. The value of the determinant

$\begin{vmatrix}\sin\theta & \cos\theta & \sin 2\theta\\ \sin\left(\theta+\frac{2\pi}{3}\right) & \cos\left(\theta+\frac{2\pi}{3}\right) & \sin\left(2\theta+\frac{4\pi}{3}\right)\\ \sin\left(\theta-\frac{2\pi}{3}\right) & \cos\left(\theta-\frac{2\pi}{3}\right) & \sin\left(2\theta-\frac{4\pi}{3}\right)\end{vmatrix}$

1) 0
2) $\sin\theta$
3) $\cos\theta$
4) $\sin\theta+\cos\theta$

44. If a, b, c are sides of a triangle an

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

1) Δ ABC is equilateral
2) Δ ABC is right angled isosceles
3) Δ ABC is isosceles
4) Δ ABC is a right angle

45. With the usual notation in a ΔABC, $\begin{vmatrix}1 & 1 & 1\\ \sin A & \sin B & \sin C\\ \sin^2 A & \sin^2 B & \sin^2 C\end{vmatrix}=$

1) $\frac{1}{8R^3}(a-b)(b-c)(c-a)$
2) $8R^3$
3) $(a-b)(b-c)(c-a)$
4) $\frac{1}{8R}(a-b)(a-c)(b-a)$

46. If $f(\theta)=\begin{vmatrix} \cos\theta & 1 & 0 \\ 1 & 2\cos\theta & 1 \\ 0 & 1 & 2\cos\theta \end{vmatrix}$ then range of $f(\theta)$ is

1) $[0,1]$ 2) $[-1,0]$ 3) $[-1,1]$ 4) $\left[0,\frac{1}{2}\right]$

S.P.Q. Student Practice Questions

47. If A and B are square matrices of order 3 such that $|A|=-1, |B|=3$ then $|3AB|=$

1) -9 2) -81 3) -27 4) 81

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

Then $x=$

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

49. $\begin{vmatrix} a+b+nc & (n-1)a & (n-1)b \\ (n-1)c & b+c+na & (n-1)b \\ (n-1)c & (n-1)a & (c+a+nb) \end{vmatrix} =$

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

50. Let $\begin{vmatrix} x & 2 & x \\ x^2 & x & 6 \\ x & x & 6 \end{vmatrix} = ax^4+bx^3+cx^2+dx+e$, then the value of $5a+4b+3c+2d+e$ is equal to

1) 0 2) -16 3) 16 4) -11

51. If A, B, C are the angles of a ΔABC, then $\begin{vmatrix} \sin^2 A & \cot A & 1 \\ \sin^2 B & \cot B & 1 \\ \sin^2 C & \cot C & 1 \end{vmatrix} =$

1) $\frac{a^2+b^2+c^2}{4\Delta}$ 2) $\frac{a^2+b^2+c^2}{4R^2\Delta}$

3) $\frac{a^2+b^2+c^2}{16R^2\Delta}$ 4) 0

52. $\begin{vmatrix} 2 & a+b+c+d & ab+cd \\ a+b+c+d & 2(a+b)(c+d) & ab(c+d)+cd(a+b) \\ ab+cd & ab(c+d)+cd(a+b) & 2abcd \end{vmatrix}$

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

53. If f (x) = tan x and A, B, C are the angles of ΔABC, then

$\begin{vmatrix} f(A) & f(\pi/4) & f(\pi/4) \\ f(\pi/4) & f(B) & f(\pi/4) \\ f(\pi/4) & f(\pi/4) & f(C) \end{vmatrix} =$

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

54. If $\Delta_1 = \begin{vmatrix} a_1^2+b_1+c_1 & a_1a_2+b_2+c_2 & a_1a_3+b_3+c_3 \\ b_1b_2+c_1 & b_2^2+c_2 & b_2b_3+c_3 \\ c_3c_1 & c_3c_2 & c_3^2 \end{vmatrix}$

and $\Delta_2 = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$, then $\frac{\Delta_1}{\Delta_2}$ is equal to

1) $a_1b_2c_3$ 2) $a_1a_2a_3$
3) $a_3b_2c_1$ 4) $a_1b_1c_1+a_2b_2c_2+a_3b_3c_3$

55. Let $\Delta = \begin{vmatrix} a & a+b & a+b+c \\ 3a & 4a+3b & 5a+4b+3c \\ 6a & 9a+6b & 11a+9b+6c \end{vmatrix}$ where a=1, b=ω and c=ω^2 then $\Delta=$

1) ω 2) $-\omega^2$ 3) 1 4) -1

56. If the determinant

$\begin{vmatrix} b-c & c-a & a-b \\ b'-c' & c'-a' & a'-b' \\ b''-c'' & c''-a'' & a''-b'' \end{vmatrix}$ is expressible as

$m\begin{vmatrix} a & b & c \\ a' & b' & c' \\ a'' & b'' & c'' \end{vmatrix}$, then the value of m is

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

57. Let t be a positive integer and

$\Delta_t = \begin{vmatrix} 2t-1 & m^2-1 & \cos^2(m^2) \\ {}^mC_t & 2^m & \cos^2(m) \\ 1 & m+1 & \cos(m^2) \end{vmatrix}$ then the value of $\sum_{t=0}^{m}\Delta_t$ is equal to

1) 2^m 2) 0 3) $2^m\cos^2(2^m)$ 4) m^2

58. If $D=\begin{vmatrix}10! & 11! & 12!\\ 11! & 12! & 13!\\ 12! & 13! & 14!\end{vmatrix}$ then $\frac{D}{(10!)^3}-4=$

1) 2900
2) 2800
3) 2700
4) 2600

59. The value of the determinant
$\begin{vmatrix}\sin\alpha\cos\beta & \cos\alpha\cos\beta & -\sin\alpha\sin\beta\\ \sin\alpha\sin\beta & \cos\alpha\sin\beta & \sin\alpha\cos\beta\\ \cos\alpha & -\sin\alpha & 0\end{vmatrix}$ is

1) independent of α
2) Independent of β
3) independent of α and β
4) cannot be said

60. $f(x)=\begin{vmatrix}x+\lambda & x & x\\ x & x+\lambda & x\\ x & x & x+\lambda\end{vmatrix}$ then
$f(3x)-f(x)=$

1) $3x\lambda^2$
2) $6x\lambda^2$
3) $x\lambda^2$
4) $9x\lambda^2$

61. The number of distinct real roots of
$\begin{vmatrix}\sin x & \cos x & \cos x\\ \cos x & \sin x & \cos x\\ \cos x & \cos x & \sin x\end{vmatrix}=0$ in the interval
$-\frac{\pi}{4}\le x\le\frac{\pi}{4}$ is

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

62. The sum of two non integral roots of
$\begin{vmatrix}x & 3 & 4\\ 5 & x & 5\\ 4 & 2 & x\end{vmatrix}=0$ is

1) 4
2) -4
3) -25
4) 25

63. If $\begin{vmatrix}a & b & a\alpha+b\\ b & c & b\alpha+c\\ a\alpha+b & b\alpha+c & 0\end{vmatrix}=0$ and α is not a root of $ax^2+2bx+c=0$, then

1) a,b,c are in A.P
2) a,b,c are in G.P
3) a,b,c are in H.P
4) a,b,c are in A.G.P

64. 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
$f^1(\pi)=$

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

65. Let
$\Delta(x)=\begin{vmatrix}\cos^2 x & \cos x\sin x & -\sin x\\ \cos x\sin x & \sin^2 x & \cos x\\ \sin x & -\cos x & 0\end{vmatrix}$
then $\int_0^{\pi/2}\left[\Delta(x)+\Delta^1(x)\right]dx$ equals

1) $\pi/3$
2) $\pi/2$
3) 2π
4) $3\pi/2$

66. If $a_1 b_1 c_1$, $a_2 b_2 c_2$ and $a_3 b_3 c_3$ are 3-digit even natural numbers and
$\Delta=\begin{vmatrix}c_1 & a_1 & b_1\\ c_2 & a_2 & b_2\\ c_3 & a_3 & b_3\end{vmatrix}$, then Δ is

1) divisible by 2 but not necessarily by 4
2) divisible by 4 but not necessarily by 8
3) divisible by 8
4) divisible by 25

67. If $f(x)=\det\begin{bmatrix} x^n & \sin x & \cos x \\ \angle n & \sin\left(\frac{n\pi}{2}\right) & \cos\left(\frac{n\pi}{2}\right) \\ a & a^2 & a^3 \end{bmatrix}$ the value of $\frac{d^n}{dx^n}(f(x))$ at $x=0$ is

1) -1 2) 0 3) 1 4) a^6

ADJOINT MATRIX

C.R.T.Q Class Room Teaching Questions

68. If A and B are square matrices of same order and A is non -singular, then for a positive integer 'n', $\left(A^{-1}BA\right)^n$ is equal to

1) $A^{-n}B^nA^n$ 2) $A^nB^nA^{-n}$

3) $A^{-1}B^nA$ 4) $n\left(A^{-1}BA\right)$

69. If A is orthogonal matrix of order 3 then $\det(adj2A)=$

1) 4 2) 16 3) 27 4) 64

S.P.Q. Student Practice Questions

70. 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

71. If $A=\begin{bmatrix} 1 & 2 & -1 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$ then $\det(adj(adjA))$ is

1) $(14)^4$ 2) $(14)^3$ 3) $(14)^2$ 4) $(14)^1$

72. If $A=\begin{bmatrix} 0 & 1 & -1 \\ 2 & 1 & 3 \\ 3 & 2 & 1 \end{bmatrix}$, then $[A(adjA)A^{-1}]A=$

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

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

73. If $S=\begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}, A=\frac{1}{2}\begin{bmatrix} b+c & c-a & b-a \\ c-b & c+a & a-b \\ b-c & a-c & a+b \end{bmatrix}$, then $SAS^{-1}=$

1) $\begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$ 2) $\frac{1}{2}\begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$

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

74. $A(\alpha,\beta)=\begin{bmatrix} \cos\alpha & \sin\alpha & 0 \\ -\sin\alpha & \cos\alpha & 0 \\ 0 & 0 & e^{\beta} \end{bmatrix}$

$\Rightarrow [A(\alpha,\beta)]^{-1}=$

1) $A(-\alpha,\beta)$ 2) $A(-\alpha,-\beta)$

3) $A(\alpha,-\beta)$ 4) $A(\alpha,\beta)$

75. A nontrivial solution of the system of equations $x+\lambda y+2z=0, 2x+\lambda z=0, 2\lambda x-2y+3z=0$ is given by $x:y:z=$

1) 1:2:−2 2) 1:−2:2

3) 2:1:2 4) 2:1:−2

76. If 'ω' is cube root of unity and $x+y+z=a$, $x+\omega y+\omega^2 z=b$, $x+\omega^2 y+\omega z=c$ then which of the following is correct

1) $x=\frac{a+b+c}{3}$ 2) $y=\frac{a+b\omega^2+\omega c}{3}$

3) $z=\frac{a+b\omega+\omega^2 c}{3}$ 4) All the above

77. If the trivial solution is the only solution of the system of equations $x-ky+z=0$, $kx+3y-kz=0$, $3x+y-z=0$. Then the set of all values of k is

1) $\{2,-3\}$ 2) $R-\{2\}$

3) $R-\{2,-3\}$ 4) $R-\{-3\}$

78. If the system of equations $ax+y+z=0$, $x+by+z=0, x+y+cz=0(a,b,c\neq 1)$ has a non trivial solution then

$\frac{1}{1-a}+\frac{1}{1-b}+\frac{1}{1-c}=$

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

79. The system of equations $(\cos 2\theta)x+4y+3z=0$, $2x+7y+7z=0$ has non trivial solution then

$\sin 3\theta+2\cos 2\theta=$

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

80. If the system of linear equations $x+2y+3z=\lambda x$, $3x+y+2z=\lambda y$, $2x+3y+z=\lambda z$ has non trivial solution then $\lambda=$

1) 6 2) 12 3) 18 4) 16

81. The number of values of k for which the linear equations $4x+ky+2z=0$, $kx+4y+z=0$, $2x+2y+z=0$ posses a non zero solution is:

1) 3 2) 2 3) 1 4) zero

INVERSE MATRIX

C.R.T.Q Class Room Teaching Questions

82. Let $A=\begin{bmatrix}1 & -1 & 1\\ 2 & 1 & -3\\ 1 & 1 & 1\end{bmatrix}$ and

$10B=\begin{bmatrix}4 & 2 & 2\\ -5 & 0 & \alpha\\ 1 & -2 & 3\end{bmatrix}$.

If B is the inverse of A, then α is :

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

83. A is an involutary matrix given by $A=\begin{bmatrix}0 & 1 & -1\\ 4 & -3 & 4\\ 3 & -3 & 4\end{bmatrix}$ then the inverse of $\frac{A}{2}$ will be

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

84. If $A=\begin{bmatrix}a & b\\ 0 & c\end{bmatrix}$ then $A^{-1}+(A-aI)(A-cI)=$

1) $\frac{1}{ac}\begin{bmatrix}a & b\\ 0 & -c\end{bmatrix}$ 2) $\frac{1}{ac}\begin{bmatrix}-a & b\\ 0 & c\end{bmatrix}$

3) $\frac{1}{ac}\begin{bmatrix}c & -b\\ 0 & a\end{bmatrix}$ 4) $\frac{1}{ac}\begin{bmatrix}c & b\\ 0 & a\end{bmatrix}$

S.P.Q. Student Practice Questions

85. Let $A_\alpha=\begin{bmatrix}\cos\alpha & -\sin\alpha & 0\\ \sin\alpha & \cos\alpha & 0\\ 0 & 0 & 1\end{bmatrix}$

I) $A_\alpha A_\beta=A_{\alpha+\beta}$ II) $A_\alpha B_\beta=A_{\alpha\beta}$

III) $(A_\alpha)^{-1}=-A_\alpha$ IV) $(A_\alpha)^{-1}=A_{-\alpha}$

Then which of the above statements is / are correct

1) only II and III 2) only II and IV

3) only I and III 4) only I and IV

86. If the product of the matrix

$B=\begin{bmatrix}2 & 6 & 4\\ 1 & 0 & 1\\ -1 & 1 & -1\end{bmatrix}$ with a matrix A has

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

1) $\begin{bmatrix}-3 & -5 & 5\\ 0 & 9 & 14\\ 2 & 2 & 6\end{bmatrix}$ 2) $\begin{bmatrix}-3 & 5 & 5\\ 0 & 0 & 9\\ 2 & 14 & 16\end{bmatrix}$

3) $\begin{bmatrix}-3 & -5 & -5\\ 0 & 9 & 2\\ 2 & 14 & 6\end{bmatrix}$ 4) $\begin{bmatrix}-3 & -3 & -5\\ 0 & 9 & 2\\ 2 & 14 & 16\end{bmatrix}$

SOLUTIONS OF SIMULTANEOUS EQUATION

C.R.T.Q Class Room Teaching Questions

87. If A, B, C are the angles of a triangle, the system of equations
$(\sin A)x+y+z=\cos A$
$x+(\sin B)y+z=\cos B$
$x+y+(\sin C)z=1-\cos C$ has

1) no solution 2) unique solution

3) infinitely many solutions

4) finitely many solutions

PROPERTIES

C.R.T.Q Class Room Teaching Questions

5. If A, B and C are $n \times n$ matrices and $\det(A)=2, \det(B)=3$ and $\det(C)=5$, then the value of the $\det\left(A^2BC^{-1}\right)$ is equal to

1) $\frac{6}{5}$ 2) $\frac{12}{5}$ 3) $\frac{18}{5}$ 4) $\frac{24}{5}$

6. If $\begin{vmatrix} 1 & 4 \\ 1 & 3 \end{vmatrix} + \begin{vmatrix} \frac{1}{2} & 4 \\ \frac{1}{3} & 3 \end{vmatrix} + \begin{vmatrix} \frac{1}{4} & 4 \\ \frac{1}{9} & 3 \end{vmatrix} + \ldots\infty =$

1) 1 2) -1
3) 0 4) ∞

7. The maximum and minimum values of (3×3) determinant whose elements belong to $\{0,1,2,3\}$ is

1) ± 9 2) ± 15
3) ± 54 4) ± 32

8. Let $A = \begin{bmatrix} 1+x^2-y^2-z^2 & 2(xy+z) & 2(zx-y) \\ 2(xy-z) & 1+y^2-z^2-x^2 & 2(yz+x) \\ 2(zx+y) & 2(yz-x) & 1+z^2-x^2-y^2 \end{bmatrix}$ then det A is equal to

1) $(1+xy+yz+zx)^3$ 2) $\left(1+x^2+y^2+z^2\right)^3$
3) $(xy+yz+zx)^3$ 4) $\left(1+x^3+y^3+z^3\right)^2$

9. Let $ax^7+bx^6+cx^5+dx^4+ex^3+fx^2+gx+h$

$= \begin{vmatrix} x+1 & x^2+2 & x^2+x \\ x^2+x & x+1 & x^2+2 \\ x^2+2 & x^2+x & x+1 \end{vmatrix}$ then

1) $g=3$ and $h=-5$ 2) $g=-3$ and $h=-5$
3) $g=3$ and $h=9$ 4) $g=-3, h=9$

10. If $A = \begin{bmatrix} a & b & c \\ p & q & r \\ x & y & z \end{bmatrix}$ and $\det A = 6$,

If $B = \begin{bmatrix} p+x & q+y & r+z \\ a+x & b+y & c+z \\ a+p & b+q & c+r \end{bmatrix}$, then

1) $\det B = 6$ 2) $\det B = -6$
3) $\det B = 12$ 4) $\det B = -12$

11. Let $D_1 = \begin{vmatrix} a & b & a+b \\ c & d & c+d \\ a & b & a-b \end{vmatrix}$ and

$D_2 = \begin{vmatrix} a & c & a+c \\ b & d & b+d \\ a & c & a+b+c \end{vmatrix}$ then the value

$\frac{D_1}{D_2}$ where $b \neq 0$ and $ad \neq bc$, is

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

12. If $x^a y^b = e^m, x^c y^d = e^n$, $\Delta_1 = \begin{vmatrix} m & b \\ n & d \end{vmatrix}$, a

$\Delta_2 = \begin{vmatrix} a & m \\ c & n \end{vmatrix}$ and $\Delta_3 = \begin{vmatrix} a & b \\ c & d \end{vmatrix}$, then t values of x and y are

1) $\frac{\Delta_1}{\Delta_3}$ and $\frac{\Delta_2}{\Delta_3}$

2) $\frac{\Delta_2}{\Delta_1}$ and $\frac{\Delta_3}{\Delta_1}$

3) $\log\left(\frac{\Delta_1}{\Delta_3}\right)$ and $\log\left(\frac{\Delta_2}{\Delta_3}\right)$

4) e^{Δ_1/Δ_3} and e^{Δ_2/Δ_3}

13. The value of the determinant

$\Delta = \begin{vmatrix} \frac{1-a_1^3b_1^3}{1-a_1b_1} & \frac{1-a_1^3b_2^3}{1-a_1b_2} & \frac{1-a_1^3b_3^3}{1-a_1b_3} \\ \frac{1-a_2^3b_1^3}{1-a_2b_1} & \frac{1-a_2^3b_2^3}{1-a_2b_2} & \frac{1-a_2^3b_3^3}{1-a_2b_3} \\ \frac{1-a_3^3b_1^3}{1-a_3b_1} & \frac{1-a_3^3b_2^3}{1-a_3b_2} & \frac{1-a_3^3b_3^3}{1-a_3b_3} \end{vmatrix}$ is

1) 0
2) dependent only on a_1, a_2, a_3
3) dependent only on b_1, b_2, b_3
4) dependent on $a_1, a_2, a_3, b_1, b_2, b_3$

14. Let $\{D_1, D_2, D_3.....D_n\}$ be the set of all third order determinants that can be formed with the distinct non-zero real numbers $a_1, a_2, ..., a_9$ then

1) $\sum_{i=1}^{n} D_i = 1$ 2) $\sum_{i=1}^{n} D_i = 0$

3) $D_i = D_j$ for all i, j 4) None of the above

15. If

$$\Delta = \begin{vmatrix} \cos(\alpha_1-\beta_1) & \cos(\alpha_1-\beta_2) & \cos(\alpha_1-\beta_3) \\ \cos(\alpha_2-\beta_1) & \cos(\alpha_2-\beta_2) & \cos(\alpha_2-\beta_3) \\ \cos(\alpha_3-\beta_1) & \cos(\alpha_3-\beta_2) & \cos(\alpha_3-\beta_3) \end{vmatrix}$$

then Δ equals

1) $\cos\alpha_1 \cos\alpha_2 \cos\alpha_3 \cos\beta_1 \cos\beta_2 \cos\beta_3$

2) $\cos\alpha_1 + \cos\alpha_2 + \cos\alpha_3 + \cos\beta_1 + \cos\beta_2 + \cos\beta_3$

3) $\cos(\alpha_1-\beta_1)\cos(\alpha_2-\beta_2)\cos(\alpha_3-\beta_3)$

4) 0

16. If

$$\Delta(x) = \begin{vmatrix} e^x & \sin 2x & \tan x^2 \\ \ln(1+x) & \cos x & \sin x \\ \cos x^2 & e^x - 1 & \sin x^2 \end{vmatrix} = A + Bx + Cx^2 + ...$$

then B is equal to

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

S.P.Q. Student Practice Questions

17. If $f(x) = \begin{bmatrix} \sin x & \operatorname{cosec} x & \tan x \\ \sec x & x\sin x & x\tan x \\ x^2-1 & \cos x & x^2+1 \end{bmatrix}$ then

$\int_{-a}^{a} |f(x)|\,dx$ equals

1) 1 2) -1

3) 2a 4) 0

18. If $\begin{vmatrix} 1 & 1 & 1 \\ {}^{m}C_1 & {}^{m+3}C_1 & {}^{m+6}C_1 \\ {}^{m}C_2 & {}^{m+3}C_2 & {}^{m+6}C_2 \end{vmatrix} = 2^{\alpha}3^{\beta}5^{\gamma}$ then

$\alpha+\beta+\gamma$ is equal

1) 3 2) 5

3) 7 4) 0

19. Let $\Delta(x) = \begin{vmatrix} x+a & x+b & x+a-c \\ x+b & x+c & x-1 \\ x+c & x+d & x-b+d \end{vmatrix}$ and

$\int_0^2 \Delta(x)\,dx = -16$, where a, b, c, d are in A.P. then the common difference

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

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

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

3) $25\sqrt{2}-15\sqrt{3}$ 4) 0

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

1) nr 2) 0

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

22. The value of the determinant

$$\begin{vmatrix} 1 & e^{i\pi/3} & e^{i\pi/4} \\ e^{-i\pi/3} & 1 & e^{2i\pi/3} \\ e^{-i\pi/4} & e^{-2i\pi/3} & 1 \end{vmatrix}$$

where $i = \sqrt{-1}$, is

1) $2+\sqrt{2}$ 2) $-(2+\sqrt{2})$

3) $-2+\sqrt{3}$ 4) $2-\sqrt{3}$

23. A triangle has vertices $A_i(x_i,y_i)$ for $i = 1, 2, 3$. Then

$$\begin{vmatrix} x_2-x_3 & y_2-y_3 & y_1(y_2-y_3)+x_1(x_2-x_3) \\ x_3-x_1 & y_3-y_1 & y_2(y_3-y_1)+x_2(x_3-x_1) \\ x_1-x_2 & y_1-y_2 & y_3(y_1-y_2)+x_3(x_1-x_2) \end{vmatrix}=0$$

means

1) medians of the triangle A_1,A_2,A_3 are concurrent;
2) the triangle A_1,A_2,A_3 is right angled at A_3;
3) the triangle A_1,A_2,A_3 is an equilateral triangle;
4) altitudes of the triangle A_1,A_2,A_3 are concurrent.

24. For a fixed poitive integer n, let

$$D=\begin{vmatrix} (n-1)! & (n+1)! & (n+3)!/n(n+1) \\ (n+1)! & (n+3)! & (n+5)!/(n+2)(n+3) \\ (n+3)! & (n+5)! & (n+7)!/(n+4)(n+5) \end{vmatrix}$$

then $\dfrac{D}{(n-1)!(n+1)!(n+3)!}$ is equal to

1) - 8 2) - 16 3) - 32 4). - 64

25. If $f(x),g(x)$ and $h(x)$ are three polynomials of degree '2' and

$$\phi(x)=\begin{vmatrix} f(x) & g(x) & h(x) \\ f'(x) & g'(x) & h'(x) \\ f''(x) & g''(x) & h''(x) \end{vmatrix}$$, then $\phi'(x)$ is

1) a one degree polynomial
2) a three degree polynomial
3) a two degree polynomial
4) a constant

26. If $f(x)=\begin{vmatrix} \cos(x+x^2) & \sin(x+x^2) & -\cos(x+x^2) \\ \sin(x-x^2) & \cos(x-x^2) & \sin(x-x^2) \\ \sin 2x & 0 & \sin(2x^2) \end{vmatrix}$

then $f^1(0)=$

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

27. If $f(x)=\begin{vmatrix} 1 & 2x & 3x^2 \\ 3 & a & 27 \\ 1 & 3 & 9 \end{vmatrix}$ and $\int_0^3 f(x)dx=0$,

then a is equal to

1) 3 2) 6
3) 9 4) any real number

28. If $g(x)=\begin{vmatrix} a^{-x} & e^{x\log_e a} & x^2 \\ a^{-3x} & e^{3x\log_e a} & x^4 \\ a^{-5x} & e^{5x\log_e a} & 1 \end{vmatrix}$ then

1) $g(x)+g(-x)=0$ 2) $g(x)-g(-x)=0$
3) $g(x).g(-x)=0$ 4) None of these

INVERSE OF A MATRIX

C.R.T.Q Class Room Teaching Questions

29. If $P=\begin{bmatrix} \frac{\sqrt{3}}{2} & \frac{1}{2} \\ \frac{-1}{2} & \frac{\sqrt{3}}{2} \end{bmatrix}, A=\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and

$Q=PAP^T$ and $X=P^TQ^{2015}P$, then X is

1) $\begin{bmatrix} 1 & 2015 \\ 0 & 1 \end{bmatrix}$ 2) $\begin{bmatrix} 1 & 0 \\ 2015 & 1 \end{bmatrix}$

3) $\begin{bmatrix} 2015 & 1 \\ 0 & 1 \end{bmatrix}$ 4) $\begin{bmatrix} 1 & 1 \\ 0 & 2015 \end{bmatrix}$

30. If $A=\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & -2 & 4 \end{bmatrix}, I=\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ and

$A^{-1}=\frac{1}{6}(A^2+\alpha A+\beta I)$ then

1) $\alpha=-6,\beta=11$ 2) $\alpha=6,\beta=-11$
3) $\alpha=-6,\beta=-11$ 4) $\alpha=6,\beta=11$

EXERCISE-IV

LEVEL-IV

These questions have Statement-I & statement-II. Each question has four choices (1),(2),(3),(4) out of which only one is correct. Choose the correct choice as per following.

1) Statement-I & statement-II both are true & statement-II is the correct explanation of Statement-1.
2) Statement-I and statement-II both are ture & Statement-II is not explain statement-I.
3) Statement-I is true but Statement-II is false.
4) Statement-I is false but Statement-II is true.

1. Statement-I: Rank of matrix is defined for only square matrices.
Statement-II: Trace of matrices of a matrix is defined for square matrices only.

2. If $A=\left[a_{ij}\right]$ is a square matrix such that

List -I	List-II
A) $a_{ij}=1\ if\ i=j$, $=0$ if $i\neq j$	1. Symmetric matrix
B) $a_{ij}=0\ if\ i\neq j$	2. Skew symmetric matrix
C) $a_{ij}=0\ if\ i>j$	3. Unit matrix
D) $a_{ij}=i^2-j^2\ \forall i,j$	4. Diagonal matrix
	5. Upper triangular

Correct match of List -I from List-II

	A	B	C	D
1)	3	4	5	1
2)	3	4	5	2
3)	3	5	4	2
4)	1	5	3	2

3. **Statement-I:** Let A be a square matrix given by
$$A=\begin{pmatrix}1&2&4\\6&8&2\\2&-2&7\end{pmatrix}=P+Q,\ P \text{ is symmetric}$$
matrix, Q is skew symmetric matric then
Q is given by $\begin{pmatrix}0&-2&1\\2&0&2\\-1&-2&0\end{pmatrix}$
Statement-II: For every square matrix A, $A-A^T$ is skew symmetric.

4. Let
$A=\begin{pmatrix}i&0\\0&i\end{pmatrix}, B=\begin{pmatrix}0&-i\\-i&0\end{pmatrix}, i=\sqrt{-1}$ then
Statement-I: $(A+B)(A-B)=A^2-B^2$
Statement-II: $AB=BA$

5. **Statement-I:** The system of non-homogeneous equations $2x+3y+6z=8$, $x+2y+3z=5$, $x+y+3z=4$ has no solution.
Statement-II: detA=0and $(adjA)B=0$ where
$$A=\begin{bmatrix}2&3&6\\1&2&3\\1&1&3\end{bmatrix} \text{ and } B=\begin{bmatrix}8\\5\\4\end{bmatrix}$$

6. **Statement-I:** Let A be an unknown matrix of order 2×2 and I be an identitiy matrix of order 2×2,then $A^2=I$,is satisfied by more than one matrix of order 2×2.
Statement-II: All matrices of the form
$\begin{bmatrix}\pm\sqrt{1-\alpha\beta}&\alpha\\\beta&\mp\sqrt{1-\alpha\beta}\end{bmatrix}$ are involutary matrices for all real values of $\alpha\ and\ \beta$ such that $1-\alpha\beta>0$.

7. **Statement-I:** If A is matrix of order 3×3,then
$$|\underbrace{adj\ adj....adj}_{n\,times}\ A|=|A|^{2^n}$$
(Where $|A|$ represents determinant of A)
Statement-II: If A is a matrix of order $n\times n$, then $|adj\ A|=|A|^n$.

8. **Statement-I:** The determinant of a matrix $A=\left[a_{ij}\right]_{5\times5}$ is 0 where $a_{ij}+a_{ji}=0$ for i and j.

Statement-II: The determinant of a skew-symmetric matrix of odd order is zero.

9. **Statement-I:** If

$$f(x)=\begin{vmatrix}-1 & \sin\theta\tan\theta & -1\\ \theta & \sin x & x\\ 1 & \tan x-\tan\theta & 0\end{vmatrix}$$ then the value of $f'(\theta)$ is $\cos\theta$

Statement-II: If $f(x)=\begin{vmatrix}f_1 & f_2 & f_3\\ g_1 & g_2 & g_3\\ h_1 & h_2 & h_3\end{vmatrix}$

$$\Rightarrow f'(x)=\begin{vmatrix}f_1' & f_2' & f_3'\\ g_1 & g_2 & g_3\\ h_1 & h_2 & h_3\end{vmatrix}+\begin{vmatrix}f_1 & f_2 & f_3\\ g_1' & g_2' & g_3'\\ h_1 & h_2 & h_3\end{vmatrix}+\begin{vmatrix}f_1 & f_2 & f_3\\ g_1 & g_2 & g_3\\ h_1' & h_2' & h_3'\end{vmatrix}$$

where f_i, g_i, h_i (i=1,2,3) are polynomials in x.

10. **Statement-I:** The systemof the equations $2x+4y+1=0, 4x+8y+3=0$ has no solution

Statement-II: The system of equations $a_1x+b_1y+c_1=0, a_2x+b_2y+c_2=0$ has no solution, if $\frac{a_1}{a_2}=\frac{b_1}{b_2}$

11. **Statement-I:** $A=\begin{bmatrix}1 & 3\\ 5 & 9\end{bmatrix}$ is neither symmetric nor skew symmertic

Statement-II: The matrix A cannot be expressed as a sum of symmetric and anti-symmetric matrices.

12. **Statement-I:** If $a_1, a_2, ...a_n$ are in GP ($a_i>0$ for all i) then

$$\begin{vmatrix}\log a_n & \log a_{n+1} & \log a_{n+2}\\ \log a_{n+3} & \log a_{n+4} & \log a_{n+5}\\ \log a_{n+6} & \log a_{n+7} & \log a_{n+8}\end{vmatrix}=0$$

Statement-II: The determinant of 3×3 matrix is zero when elements of each row are in A.P.

13. **Statement-I:** If a, b, c are distinct and x, y, z are not all zero given that $ax+by+cz=0$, $bx+cy+az=0$, $cx+ay+bz=0$, then $a+b+c\neq0$

Statement-II: $a^2+b^2+c^2>ab+bc+ca$ if a,b,c are distinct.

14. **Statement-I:** There are only finitely many 2×2 matrices which commute with the matrix $\begin{bmatrix}1 & 2\\ -1 & -1\end{bmatrix}$

Statement-II: If A is non-singular, then it commutes with I, adj A and A^{-1}

15. **Statement-I:** If the system of equations $3x-2y+z=0, \lambda x-14y+15z=0$, $x+2y-3z=0$ has nonzero solutions, then $\lambda=$

Statement-II: If the system of equation AX=0 has a nonzero solution then A is singular.

16. **Let α,β,γ be the roots of the equation $x^3+ax+b=0$; a, b, $\in R$.**

Statement-I: $\begin{vmatrix}\alpha & \beta & \gamma\\ \beta & \gamma & \alpha\\ \gamma & \alpha & \beta\end{vmatrix}=0$

Statement-II: Any cubic equation has at least one real root.

17. **Statement I: If A is square matrix such that $A^2=A$ then $(I+A)^3-7A=I$**

Statement II: Let A=$\begin{bmatrix}0 & \alpha\\ 0 & 0\end{bmatrix}$ and $(A+I)^{50}-50A=\begin{bmatrix}a & b\\ c & d\end{bmatrix}$ then $a+b+c+d=$

18. $\Delta=\begin{vmatrix}a^n & a^{n+1} & a^{n+2}\\ b^n & b^{n+1} & b^{n+2}\\ c^n & c^{n+1} & c^{n+2}\end{vmatrix}(n\in N)$

Statement-I: Factors of Δ are $(a-b)(b-c)(c-a)$

Statement-II: Taking the value of n=1 then the value of the above determinant (abc) (a-b) (b-c) (c-a)

INTEGER & NUMERICAL
ANSWER TYPE QUESTIONS

1. $A=\begin{bmatrix}0&1\\3&0\end{bmatrix}$ and $A^8+A^6+A^4+A^2+I$; $V=\begin{bmatrix}0\\11\end{bmatrix}$ (where I is the 2×2 identity matrix), then the product of all elements of matrix V is_____

2. If $\begin{bmatrix}a&b\\c&1-a\end{bmatrix}$ is an idempotent matrix and $f(x)=x-x^2$ and $bc=1/4$, then the value of $1/f(a)$ is_____

3. Let x be the solution set of the equation $A^x=I$. Where $A=\begin{bmatrix}0&1&-1\\4&-3&4\\3&-3&4\end{bmatrix}$ and I is the corresponding unit matrix and $x\le N$, then the minimum value of $\Sigma(\cos^x\theta+\sin^x\theta),\theta\in R$._____

4. $A=\begin{bmatrix}1&\tan x\\\tan x&1\end{bmatrix}$ and $f(x)$ is defined as $f(x)=\det(A^TA^{-1})$ then the value of $\underbrace{f(f(f(f....f(x))))}_{n\text{ times}}$ is $(n\ge2)$_____

5. The equation $\begin{bmatrix}1&2&2\\1&3&4\\3&4&K\end{bmatrix}\begin{bmatrix}x\\y\\z\end{bmatrix}=\begin{bmatrix}0\\0\\0\end{bmatrix}$ has a solution for (x,y,z) besides $(0,0,0)$. Then the value of K is_____

6. If A is an idempotent matrix satisfying, $(I-0.4A^{-1})=I-\alpha A$, where I is the unit matrix of the same order as that of A, then the value of $|9\alpha|$ is equal to_____

7. Let $A=\begin{bmatrix}3x^2\\1\\6x\end{bmatrix}$, $B=[a\ \ b\ \ c]$, and
$C=\begin{bmatrix}(x+2)^2&5x^2&2x\\5x^2&2x&(x+2)^2\\2x&(x+2)^2&5x^2\end{bmatrix}$
be three matrices, where a,b,c and $n\in$... Given that $tr(AB)=tr(C)x\in R$, whe... $tr(A)$ denotes trace of A. If $f(x)=a$... $+bx+c$, then the value of $f(1)$ is_____

8. Let A be the set of all 3×3 skew-symmet... matrices whose entries are either -1, 0, 1. If there are exactly three 0's, three 1... and three (-1)'s, then number of su... matrices ϕ is_____

9. Let $A=[a_{ij}]_{3\times3}$ be a matrix such th... $AA^T=4I$ and $a_{ij}+2c_{ij}=0$, where c_{ij} is t... cofactor of a_{ij} and I is the unit matrix... order 3.
$\begin{vmatrix}a_{11}+4&a_{12}&a_{13}\\a_{21}&a_{22}+4&a_{23}\\a_{31}&a_{32}&a_{33}+4\end{vmatrix}5\lambda\begin{vmatrix}a_{11}+1&a_{12}&a_{13}\\a_{21}&a_{22}+1&a_{23}\\a_{31}&a_{32}&a_{33}+1\end{vmatrix}=$
then the value of 10λ is_____

10. Let S be the set which contains all possi... values of l,m,n,p,q,r for whi... $A=\begin{bmatrix}l^2-3&p&0\\o&m^2-8&q\\r&0&n^2-15\end{bmatrix}$ be a n... singular idempotent matrix. Then the su... of all the elements of the set S is_____

11. If A is a diagonal matrix of order 3×3 conmmutative with every square matrix... order 3×3 under multiplication an... $tr(A)=12$, then value of $|A|^{1/2}$ is_____

12. If A is a square matrix of order 3 such that $|A|=2$, then $\left|\left(adj\ A^{-1}\right)^{-1}\right|$ is______

13. $m=[-3\ \ 4]+n[4\ \ -3]=[10\ \ -11]$
$\Rightarrow 3m+7n=$______

14. If $A=\begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix}$ and $A^2=I$ then $nx=$______

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

16. If $A=\begin{bmatrix} x & 1 & 4 \\ -1 & 0 & 7 \\ -4 & -7 & 0 \end{bmatrix}$ such that $A^1=-A$, then $x=$______

17. If $5A=\begin{bmatrix} 3 & -4 \\ 4 & x \end{bmatrix}$ and $AA^T=A^TA=I$ then $x=$______

18. If $A=\begin{bmatrix} -1 & 2 & 3 \\ 2 & 5 & 6 \\ 3 & x & 7 \end{bmatrix}$ is a symmetric matrix, then $x=$______

19. If $A=\begin{bmatrix} 0 & 2 & 1 \\ -2 & 0 & -2 \\ -1 & x & 0 \end{bmatrix}$ is a skew-symmetric matrix, then $x=$______

20. If $A=\begin{bmatrix} 1 & 3 & -5 \\ 2 & -1 & 5 \\ 1 & 0 & 1 \end{bmatrix}$ then the trace of A is______

21. If A is a skew-symmetric matrix, then trace of A is______

22. If $A=\begin{bmatrix} x^2 & 6 & 8 \\ 3 & y^2 & 9 \\ 4 & 5 & z^2 \end{bmatrix}, B^T=\begin{bmatrix} 2x & 3 & 5 \\ 2 & 2y & 6 \\ 1 & 4 & 2z-3 \end{bmatrix}$ where x,y,z are real and trace of B=trace of A^T then $\frac{1}{x}+\frac{1}{y}+\frac{1}{z}-xyz=$______

23. If $f(x)=\begin{vmatrix} 1 & x & x+1 \\ 2x & x(x-1) & (x+1)x \\ 3x(x-1) & x(x-1)(x-2) & (x-1)x(x+1) \end{vmatrix}$ then $f(100)$ is equal to

24. The parameter on which the value of the determinant
$$\begin{vmatrix} 1 & a & a^2 \\ \cos(p-d)x & \cos px & \cos(p+d)x \\ \sin(p-d)x & \sin px & \sin(p+d)x \end{vmatrix}$$
depend upon how many parameters from a, p, x, d?

25. If $1,\omega,\omega^2$ are the cube roots of unity, then
$$\Delta=\begin{vmatrix} 1 & \omega^n & \omega^{2n} \\ \omega^n & \omega^{2n} & 1 \\ \omega^{2n} & 1 & \omega^n \end{vmatrix}$$ is equal to

26. The value of the determinant
$$\begin{vmatrix} 10! & 11! & 12! \\ 11! & 12! & 13! \\ 12! & 13! & 14! \end{vmatrix}$$
is $A(10!\,11!\,12!)$. Find A.

27. For all values of A, B, C and P,Q,R, the value of
$$\begin{vmatrix} \cos(A-P) & \cos(A-Q) & \cos(A-R) \\ \cos(B-P) & \cos(B-Q) & \cos(B-R) \\ \cos(C-P) & \cos(C-Q) & \cos(C-R) \end{vmatrix}$$ is

28. The numberof distinct real roots of
$$\begin{vmatrix} \sin x & \cos x & \cos x \\ \cos x & \sin x & \cos x \\ \cos x & \cos x & \sin x \end{vmatrix}=0$$
in the interval $-\frac{\pi}{4}\leq x\leq\frac{\pi}{4}$ is

29. Let $\Delta_1 = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix}$ and

$\Delta_2 = \begin{vmatrix} \alpha_1 & \beta_1 & \gamma_1 \\ \alpha_2 & \beta_2 & \gamma_2 \\ \alpha_3 & \beta_3 & \gamma_3 \end{vmatrix}$, then $\Delta_1 \times \Delta_2$ can be expressed as the sum of how many determinants?

30. If $A - \begin{bmatrix} \cos^2\theta & \sin\theta\cos\theta \\ \sin\theta\cos\theta & \sin^2\theta \end{bmatrix}$,

$B - \begin{bmatrix} \cos^2\phi & \sin\phi\cos\phi \\ \sin\phi\cos\phi & \sin^2\phi \end{bmatrix}$

and q and f differs by $\frac{\pi}{2}$. then $|AB| =$

31. If for $AX = B, B = \begin{bmatrix} 9 \\ 52 \\ 0 \end{bmatrix}$ and

$A^{-1} = \begin{bmatrix} 3 & -\frac{1}{2} & -\frac{1}{2} \\ -4 & \frac{3}{4} & \frac{5}{4} \\ 2 & -\frac{1}{4} & -\frac{3}{4} \end{bmatrix}$ then X is equal to

$\begin{bmatrix} x \\ y \\ z \end{bmatrix}$, Find x+y+z.

32. Let p a non-singular matrix $1 + p + p^2 + \ldots + p^n = 0$ (O denotes the null matrix), then $p^{-1} = p^k$. Find k/n.

33. If then

$P = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 4 \\ 3 & 4 & 5 \end{bmatrix} \begin{bmatrix} -1 & -2 \\ -2 & 0 \\ 0 & -4 \end{bmatrix} \begin{bmatrix} -4 & -5 & -6 \\ 0 & 0 & 1 \end{bmatrix}$ then $P_{22} =$

34. If $C = 2\cos\theta$, then the value of the determinant $\Delta = \begin{vmatrix} C & 1 & 0 \\ 1 & C & 1 \\ 6 & 1 & C \end{vmatrix}$ is $-(xA^2 + yA + zI)$. Find x+y+z.

35. If $\Delta = \begin{vmatrix} x & b & b \\ a & x & b \\ a & a & x \end{vmatrix}$ and $\Delta_2 = \begin{vmatrix} x & b \\ a & x \end{vmatrix}$ ar the given determinants,

then $\frac{d}{dx}(\Delta_1) = A\Delta_2$. Find A.

36. If $a_1, a_2, a_3 \ldots\ldots a_n \ldots\ldots$ are in G.P. the the value of the determinan

$\begin{vmatrix} \log a_n & \log a_{n+1} & \log a_{n+2} \\ \log a_{n+3} & \log a_{n+4} & \log a_{n+5} \\ \log a_{n+6} & \log a_{n+7} & \log a_{n+8} \end{vmatrix}$ is

37. In the determinant $\begin{vmatrix} 0 & 1 & -2 \\ -1 & 0 & 3 \\ 2 & -3 & 0 \end{vmatrix}$, the ratio of the co-factor to its minor o the element -3 is A : 1. Find -2A.

38. If value of a third order determinant i 11, then the value of the determinan formed by the cofactors will be

39. Conside the system of linear equation

$a_1x + b_1y + c_1z + d_1 = 0$,

$a_2x + b_2y + c_2z + d_2 = 0$ and

$a_3x + b_3y + c_3z + d_3 = 0$ Let us denote by $\Delta(a,b,c) \neq 0$, then the value of x in the unique solution of the above equations is $\frac{-A\Delta(bcd)}{\Delta(abc)}$. Find A.

40. If a matrix A is such that $4A^3+2A^2+7A+I=0$, then A^{-1} equals $-(xA^2+yA+zI)$. Find x+y+z ?

41. For how many value(s) of x in the closed interval $[-4,-1]$ is the matrix $\begin{bmatrix} 3 & -1+x & 2 \\ 3 & -1 & x+2 \\ x+3 & -1 & 2 \end{bmatrix}$ singular?

42. If 3, −2 are the Eigen value of a non-singular matrix A and $|A|=4$, then the Eigen values of $adj(A)$ are x and y, where x<0, find x+3y.

43. If the system of linear equations,

$x+y+z=6$

$x+2y+3z=10$

$3x+2y+\lambda z=\mu$

has more two solutions, then $\mu-\lambda^2$ is equal to______

44. The number of all 3×3 matrices A, with enteries from the set $\{-1,0,1\}$ such that the sum of the diagonal elements of AA^T is 3, is

45. Let $A=\begin{bmatrix} x & 1 \\ 1 & 0 \end{bmatrix}$, $x\in R$ and $A^4=[a_{ij}]$. If $a_{11}=109$, then a_{22} is equal to.........

46. Let S be the set of all integer solutions, (x,y,z) of the system of equations x-2y+5z=0 -2x+4y+z=0 -7x+14y+9z=0 such that $15\le x^2+y^2+z^2\le 150$. Then the number of elements in the set S is equal to______.

47. If the system of equations x-2y+3z=9, 2x+y+z=b, x-7y+az=24, has infinity many solutions, then a-b is equal to______

48. The sum of distinct values of λ for which the system of equations

$(\lambda-1)x+(3\lambda+1)y+2\lambda z=0$

$(\lambda-1)x+(4\lambda-2)y+(\lambda+3)z=0$

$2x+(3\lambda+1)y+3(\lambda-1)z=0$

has non-zero solutions, is ______

49. Let I be an identity matrix of order 2×2 and $P=\begin{bmatrix} 2 & -1 \\ 5 & -3 \end{bmatrix}$. Then the value of $n\in N$ for which $P^n=5I-8P$ is equal to ____.

50. Let M be any 3×3 matrix with entries from the set {0, 1, 2}. The maximum number of such matrices, for which the sum of diagonal elements of M^TM is seven, is____

51. Let $P=\begin{bmatrix} 3 & -1 & -2 \\ 2 & 0 & \alpha \\ 3 & -5 & 0 \end{bmatrix}$, where $\alpha\in R$. Suppose $Q=[q_{ij}]$ is a matrix satisfying $PQ=kI_3$ for some non-zero $k\in R$. If $q_{23}=-\dfrac{k}{8}$ and $|Q|=\dfrac{k^2}{2}$, then α^2+k^2 is equal to______.

52. Let $A=\begin{bmatrix} x & y & z \\ y & z & x \\ z & x & y \end{bmatrix}$, where x, y and z are real numbers such that x + y + z > 0 and xyz = 2. If $A^2=I_3$, then the value of $x^3+y^3+z^3$ is______

53. If $A=\begin{bmatrix} 0 & -\tan\left(\frac{\theta}{2}\right) \\ \tan\left(\frac{\theta}{2}\right) & 0 \end{bmatrix}$ and $(I_2+A)(I_2-A)^{-1}=\begin{bmatrix} a & -b \\ b & a \end{bmatrix}$, then $13(a^2+b^2)$ is equal to______

54. If the system of equations
$kx + y + 2z = 1$
$3x - y - 2z = 2$
$-2x - 2y - 4z = 3$
has infinitely many solutions, then k is equal to______.

55. If the matrix $A=\begin{bmatrix}1&0&0\\0&2&0\\3&0&-1\end{bmatrix}$ satisfies the equation $A^{20}+\alpha A^{19}+\beta A=\begin{bmatrix}1&0&0\\0&4&0\\0&0&1\end{bmatrix}$ for some real number α and β, then $\beta-\alpha$ is equal to ___

56. The total number of 3×3 matrices A having enteries from the set (0, 1, 2, 3) such that the sum of all the diagonal entries of AA^T is 9, is equal to _______.

57. Let $P=\begin{bmatrix}-30&20&56\\90&140&112\\120&60&14\end{bmatrix}$ and $A=\begin{bmatrix}2&7&\omega^2\\-1&-\omega&1\\0&-\omega&-\omega+1\end{bmatrix}$ where $\omega=\frac{-1+i\sqrt{3}}{2}$, and I_3 be the identity matrix of order 3. If the determinant of the matrix $(P^{-1}AP-I_3)^2$ is $\alpha\omega^2$, then the value of α is equal to ___.

58. Let $A=\begin{bmatrix}a_1\\a_2\end{bmatrix}$ and $B=\begin{bmatrix}b_1\\b_2\end{bmatrix}$ be two 2×1 matrices with real entries such that $A=xB$, where $X=\frac{1}{\sqrt{3}}\begin{bmatrix}1&-1\\1&k\end{bmatrix}$, and $k\in R$. If $a_1^2+a_2^2(b_1^2+b_2^2)$ and $(k^2+1)b_2^2\neq-2b_1b_2$.

Then the value of k is _

59. If $A=\begin{bmatrix}2&3\\0&-1\end{bmatrix}$, then the value of $\det(A^4)+\det(A^{10}-(\mathrm{Adj}(2A))^{10})$ is eq to----------.

60. If 1, $\log_{10}(4^x-2)$ and $\log_{10}\left(4^x+\frac{18}{5}\right)$ in arithmetic progression for a real num x, then the value of the determinant

$$\begin{vmatrix}2\left(x-\frac{1}{2}\right)&x-1&x^2\\1&0&x\\x&1&0\end{vmatrix}$$ is equal to:

61. Let $A=\begin{bmatrix}a&b\\c&d\end{bmatrix}$ and $B=\begin{bmatrix}\alpha\\\beta\end{bmatrix}\neq\begin{bmatrix}0\\0\end{bmatrix}$ su that AB=B and a+d=2021, then the val of ad-bc is equal to__.

ALGEBRA

62. If x>0 and x,[x],{x} when [.] denot greatest integer function and {.} denot fractional part function, are in A.P then t number of possible values of x is

63. All the values of k for which the quadrat polynomial $f(x)=-2x^2+kx+k^2+5$ h two different zeros and only one of the satisfying $0<x<2$ lie in the minimu possible interval (a,b). Then the value of $+10b$ is

64. Concentric circles of radii 1,2,....100cm ar drawn. The interior of the smallest circle i coloured red and angular regions ar coloured alternately green and red so tha no two adjacent regions are of the sam colour. The total area of the region coloured green is equals to k. (1010π) sq.cm then the value of k is____

65. If $2\log(x-2y)=\log x+\log y$ then the numerical value of $\frac{x}{y}$ is______

66. The number of the roots of the equation $2^x+2^{x-1}+2^{x-2}=7^x+7^{x-1}+7^{x-2}$

67. The integral solutions of the equation $x-1=(x-[x])(x-\{x\})$ where [.] and {.} denotes the greatest integer and fractional part function

68. Let three matrices $A=\begin{bmatrix}2&1\\4&1\end{bmatrix}; B=\begin{bmatrix}3&4\\2&3\end{bmatrix}$ and $C=\begin{bmatrix}3&-4\\-2&3\end{bmatrix}$ then $t_r(A)+t_r\left(\frac{ABC}{2}\right)+t_r\left(\frac{A(BC)^2}{4}\right)+t_r\left(\frac{A(BC)^3}{8}\right)+.....+\infty=$

69. $\begin{vmatrix}x^2-a^2 & x^2-b^2 & x^2-c^2\\(x-a)^3 & (x-b)^3 & (x-c)^3\\(x+a)^3 & (x+b)^3 & (x+c)^3\end{vmatrix}=0$ Where a, b, c are non zero and distinct and $ab+bc+ca\le 0$ then the value of x is

70. If A & B are two 2×2 matrices such then AB = BA and $f(x)=x^2-(\text{Trace}(x))(x)+\det(x)I$ (Where x is a square matrix) then f(AB)-f(BA) = ________

71. Let A be a 3×3 matrix such that $a_{11}=a_{33}=2$ and all the other $a_{ij}=1$. Let $A^{-1}=xA^2+yA+zI$ then find the value of (x + y + z) where I is a unit matrix of order 3.

72. Find the value of

$$\begin{vmatrix}2 & \alpha+\beta+\gamma+\delta & \alpha\beta+\gamma\delta\\ \alpha+\beta+\gamma+\delta & 2(\alpha+\beta)(\gamma+\delta) & \alpha\beta(\gamma+\delta)+\gamma\delta(\alpha+\beta)\\ \alpha\beta+\gamma\delta & \alpha\beta(\gamma+\delta)+\gamma\delta(\alpha+\beta) & 2\alpha\beta\gamma\delta\end{vmatrix}$$

73. $A=\begin{bmatrix}1 & \tan x\\-\tan x & 1\end{bmatrix}$ then let us define a function $f(x)=\det.(A^TA^{-1})$ then what is the value of $\underbrace{f(f(f(f.....f(x))))}_{n\ \text{times}}$ is $(n\ge2)$

74. Let $A=\begin{pmatrix}1&0&0\\0&1&1\\0&-2&4\end{pmatrix}$ and $6A^{-1}=A^2+\alpha A+\beta I$ then $|\alpha+\beta|$ is equal to

75. The number of integral values of x satisfying the equation $|x|+\left|\frac{4-x^2}{x}\right|=\left|\frac{4}{x}\right|$ is

76. If the roots of the quadratic equation $ax^2+bx-b=0$ where $a,b\in R$ such that $ab>0$ are α and β, then the value of $\left|\log_{|\beta-1|}|\alpha-1|\right|$ is

77. If the sum $\sqrt{1+\frac{1}{1^2}+\frac{1}{2^2}}+\sqrt{1+\frac{1}{2^2}+\frac{1}{3^2}}+\sqrt{1+\frac{1}{3^2}+\frac{1}{4^2}}+.....+\sqrt{1+\frac{1}{(1999)^2}+\frac{1}{(2000)^2}}$ equal to $n-\frac{1}{n}$ where $n\in N$. Find n -2000

78. If the determinant $\begin{vmatrix}a+p & l+x & u+f\\b+q & m+y & v+g\\c+r & n+z & w+h\end{vmatrix}$ splits into exactly K determinants of order 3, each element of which contains only one term, then the value of K, is

79. Let $f(x)=\left[\frac{1}{\cos\{x\}}\right]$ where [y] and {y} denote greatest integer and fractional part function respectively and $g(x)=2x^2-3x(k+1)+k(3k+1)$. if $g(f(x))<0\,\forall x\in R$ then find the number of integral value of k.

80. If $h(x)=Ax^5+B\sin x+C\ln\left(\frac{1+x}{1-x}\right)+7$, Where A, B, C are non-zero real constants and $h\left(\frac{-1}{2}\right)=6$, then find the value of $h\left(\frac{\text{sgn}(e^{-x})}{2}\right)$.

81. Let $f:R\to[0,\infty)$ be defined as $f(x)=\log_e\left(\sqrt{9x^2-12x+\lambda}+1\right)$ be an onto function where λ is a real parameter belong to (0, 10) Find the greatest possible value of λ.

82. Let $\frac{\alpha}{\beta},\frac{\beta}{\alpha}$ be two roots of $(x+1)^n+x^n+1=0$ where $n>2, n\in N$.

Let α,β be roots of $x^2+px+q=0$. If α,β are also roots of $x^{2n}+p^nx^n+q^n=0$ then the smallest positive integral value of n is.

83. If $\sum_{k=1}^{\infty}\frac{k^2}{5^k}=\frac{a}{b}$, where a, b are relatively prime positive integers, than the value of b-2a is equal to:

84. If $\frac{6}{5}b^{\left(\log_b^a\right)\left(\log_{10}^b\right)\left(\log_b^5\right)}-3^{\log_{10}\left(\frac{a}{10}\right)}=9^{\log_{100}^a+\log_{25}^5}$

(where $a,b>0, b\neq 1$) then $\log_4^a=n+f, n$ is an integer and $f\in[0,1)$, where $n=$____

85. The set of real parameter 'a' for which the equation $x^4-2ax^2+x+a^2-a=0$ has all real solutions, is given by $\left[\frac{m}{n},\infty\right)$ where m and n are relatively prime positive integers, then the value of $(m+n)$ is equal to

86. If $\sum_{r=1}^{1003}(r^2+1)r!=a!-b.c!$ where $a,b,c\in N$ then find the unit digit of least value of $(a+b+c)$.

87. Let $\alpha,\beta\in R$ if α,β^2 be the roots of quadratic equation $x^2-px+1=0$ and α^2,β be the roots of quadratic equation $x^2-qx+8=0$, then the value of (r-8) if $\frac{r}{8}$ be arithmetic mean of p and q, is

88. If x is real, then the maximum value of $y=2(3-x)\left(x+\sqrt{x^2+4}\right)$ is k, then k-10

89. Given

$\log_2(\log_{1/2}(\log_2 x))=\log_3(\log_{1/3}(\log_3 y))$
$=\log_5(\log_{1/5}(\log_5^z))=0 (x,y,z\in R^+)$ the cube of greatest of x, y, z is____

90. Let P(a,b,c) be any point on the plane $3x+2y+z=7$ then the least value of $2(a^2+b^2+c^2)$ is

91. Total no. of values of P so that $x^2-x-p=0$ has integral roots where $P\in N$ and $10\le P\le 100$ is equal to____

92. Let $S_n=\sum_{k=1}^{4n}(-1)^{\frac{K(k+1)}{2}}.k^2$ then the digit in the 100^{th} place of S_9 is equal to____

93. The number of solution(s) of the equation $e^x=x^2$ and $e^x=x^3$ are respectively m,n Then $m+n=$____

94. If $\frac{1}{1^2}+\frac{1}{2^2}+\frac{1}{3^2}+.....$ upto ∞ terms $=\frac{\pi^2}{6}$, then value of $\frac{1}{1^2}+\frac{1}{3^2}+\frac{1}{5^2}+.....$ upto ∞ term is $\frac{\pi^2}{n}$ then value of n is____

95. Let p(x) = 0 be a polynomial equation of least possible degree, with rational coefficients, $\sqrt[3]{7}+\sqrt[3]{49}$ as one of its roots. Then the product of all the roots of p(x) = 0 is K then $\frac{K}{7}$ is____

96. The sum of the series

$$\sqrt{1+\frac{1}{1^2}+\frac{1}{2^2}}+\sqrt{1+\frac{1}{2^2}+\frac{1}{3^2}}+.....+\sqrt{1+\frac{1}{999^2}+\frac{1}{1000^2}}$$ is equal to $\frac{100^k-1}{1000}$,

where k =____

97. For $a,b\in R$ if the equation $ax^2+bx+6=0,(a>0)$ does not have two distinct real roots, then the least value of $3a+b+3=$____

98. Let p(x) = x^5+x^2+1 have roots x_1, x_2, x_3, x_4 and x_5, g(x) = x^2-2, then the value of $g(x_1)\,g(x_2)g(x_3)g(x_4)g(x_5)-30g\,(x_1x_2x_3x_4x_5)$, is____

99. If $S_\infty=\frac{1}{1.3.5.7.9}+\frac{1}{3.5.7.9.11}+\frac{1}{5.7.9.11.13}+...$

then the value of $\frac{1}{120S_\infty}$ is____

100. Sum of digits of least two digit positive integer of 'm' which satisfies $(m-[|\sin x|])!=3!5!7!$ where [.] & |.| represents G. I. F and modulus function

101. If A is a square matrix of order n such that $|adj(adj\ A)|=|A|^9$, then the value of n can be____

102. If $\begin{bmatrix}1&1&1\\2&5&7\\2&1&-1\end{bmatrix}\begin{bmatrix}x&u\\y&v\\z&w\end{bmatrix}=\begin{bmatrix}9&2\\52&15\\0&-1\end{bmatrix}$, then

$(x+y+z)-(u+v+w)$, is____

103. If $\begin{bmatrix}2&0&7\\0&1&0\\1&-2&1\end{bmatrix}$ is the inverse of

$\begin{bmatrix}-x&14x&7x\\0&1&0\\x&-4x&-2x\end{bmatrix}$, then $\frac{1}{x}=$

104. $\frac{1}{x}+\frac{2}{y}+\frac{1}{z}=2,\frac{3}{x}-\frac{4}{y}-\frac{2}{z}=1$, and

$\frac{2}{x}+\frac{5}{y}-\frac{2}{z}=3$, Then the value of y is____

105. Suppose A is a 4×4 matrix such that $|A|=4$, find $\left|\frac{adj\ A}{16}\right|$

106. Let a and b be constants and $f(x)=a\sin x\ \ +bx\cos x+2x^2$. If $f(2)=15$ then the value of $f(-2)$ is

107. If A is a 3 x 3 matrix and det A = –2 then det (adj A) =

108. If $A=\begin{bmatrix}-1&-2&-2\\2&1&-2\\2&-2&1\end{bmatrix}, AdjA=xA^T$ then $x=$

109. Number of triplets of a, b & c for which the system of equations, ax - by = 2a - b and (c + 1) x + cy = 10 - a + 3b has infinitely many solutions and x = 1, y = 3 is one of the solutions, is:

110. Given the cubic equation $x^3-2kx^2-4kx+k^2=0$. If one root of the equation is less than 1, other root is in the interval (1, 4) and the 3rd root is greater than 4, then the value of k lies in the interval $\left(a+\sqrt{b}, b\left(a+\sqrt{b}\right)\right)$ where $a,b \in N$. Find the value of $(a+b)^3+(ab+2)^2-2000$

111. Let the equation $(a-1)x^2=x(2b+3)$ be satisfied by three distinct value of x, where $a,b \in R$, if $f(x)=(a-1)x^3+(2b+3)x^2+2x+1$, and f(g(x))=6x−7 where g(x) is a linear function then find the value of g(2) is equal to

112. If $\sum_{r=1}^{\infty}\frac{8}{(2r-1)\sqrt{(2r+3)(2r+5)}+(2r+3)\sqrt{(2r+1)(2r-1)}}$ $=\sqrt{a}+\sqrt{\frac{b}{3}}-\sqrt{c}$ where $a,b,c \in N$ then the value of $\frac{a+b+c}{4}$ is equal to

113. If $A_0=\begin{bmatrix}2 & -2 & -4\\ -1 & 3 & 4\\ 1 & -2 & -3\end{bmatrix}$ and

$B_0=\begin{bmatrix}-4 & -3 & -3\\ 1 & 0 & 1\\ 4 & 4 & 3\end{bmatrix}$ $B_n=\text{adj}(B_{n-1}),\ n \in N$

and I is an identity matrix of order 3 then answer the following questions.

$\det.(A_0+A_0^2B_0^2+A_0^3+A_0^4B_0^4+$ .... 10 terms) is equal to

114. Let A be the set of all 3×3 skew symmetric matrices whose entries are either -1, 0 or 1. If there are exactly th 0's, three 1's and three (−1)'s, then t number of such matrices is____

115. Let $A=\begin{bmatrix}1 & m & n\\ p & q & r\\ 1 & 1 & 1\end{bmatrix}$ and $B=A^2$.

$(l-m)^2+(p-q)^2=9,$

$(m-n)^2+(q-r)^2=16,$

$(n-l)^2+(r-p)^2=25,$ then the value o (det. B-140) equals

116. Let B be a skew symmetric matrix of orde 3×3 with real entries. Given I − B and + B are non-singular matrices. If A = (I- B (I − B)−1, where det. (A) > 0, then th value of det. (2A) − det. (adj A) is____

117. Consider a determinant of order 3 al whose entries are either 0 or 1. Five o these entries are 1 and four of them ar '0'. Also $a_{ij}=a_{ji}\ \forall 1\le i,j\le 3$. If n i number of such determinants , then finc n-10.

118. Given the equations x + [y] + {z} = 3.1, {x} + y + [z] = 4.3 and [x] + {y} + z = 5.4, value of x = ____ Where [.] is G.I.F and {.} is Fractional part function.

119. Let A be greatest integral value of x satisfying $\frac{1}{\log_3\pi}+\frac{1}{\log_4\pi}>x$; B be least value of expression $2\log_{10}x-\log_x(0.01), x>1$; C be the number of digits in 3^{40} (use $\log_{10}3=.477$), then the value of $C+B-A$ is____