3. MATRICES

1. Product of all real values of 'b' such that there is no solution to the system of equations $2x+5y+z=19$, $-4x+by+6z=-42$, $-3y-bz=81$ is ____ **[AP EAMCET 17-09-20_Shift-2]**
   1. -30
   2. -48
   3. -24
   4. -18

2. For $M=\begin{bmatrix}3 & -4\\ 1 & -1\end{bmatrix}$ and for any $n\in N$ the matrix $M^{n+1}-M^{n}=$ **[AP EAMCET 17-09-20_Shift-2]**
   1. $\begin{bmatrix}2 & 4\\ 1 & -2\end{bmatrix}$
   2. $\begin{bmatrix}2 & -4\\ 1 & -2\end{bmatrix}$
   3. $\begin{bmatrix}2 & -4\\ 1 & 2\end{bmatrix}$
   4. $\begin{bmatrix}2 & 4\\ 1 & 2\end{bmatrix}$

3. Which of the following is false?
   1) If A is a skew symmetric matrix of order 5×5 ,then the rank of A is less than 5
   2) If P is a nonzero column matrix and Q is a non-zero row matrix, then the rank of PQ is 1
   3) Rank of $\begin{bmatrix}1 & 2 & 3\\ 2 & 3 & 4\\ 5 & 6 & 7\end{bmatrix}$ is 2
   4) If the lines $a_r x+b_r y+c_r=0(r=1,2,3)$ are distinct and intersect at a point, then rank of $\begin{bmatrix}a_1 & b_1 & c_1\\ a_2 & b_2 & c_2\\ a_3 & b_3 & c_3\end{bmatrix}$ *is* 3

   [AP EAMCET 18-09-20_Shift-1]
   1. 1
   2. 2
   3. 3
   4. 4

4. Choose the correct option about the matrices given below

$$A=\begin{bmatrix}\cos\frac{\pi}{4} & \sin\frac{\pi}{4} & 0\\ -\sin\frac{\pi}{4} & \cos\frac{\pi}{4} & 0\\ 0 & 0 & 1\end{bmatrix}, B=\begin{bmatrix}1 & 0 & 0\\ 0 & \cos\frac{\pi}{3} & \sin\frac{\pi}{3}\\ 0 & -\sin\frac{\pi}{3} & \cos\frac{\pi}{3}\end{bmatrix}$$

$$C=\begin{bmatrix}\cos\frac{\pi}{6} & 0 & \sin\frac{\pi}{6}\\ 0 & 1 & 0\\ -\sin\frac{\pi}{6} & \cos\frac{\pi}{6} & 0\end{bmatrix}, D=\begin{bmatrix}\cos\frac{\pi}{2} & \sin\frac{\pi}{2} & 0\\ -\sin\frac{\pi}{2} & \cos\frac{\pi}{2} & 0\\ 0 & 0 & 1\end{bmatrix}$$

   [AP EAMCET 18-09-20_Shift-1]
   1. $A^{2020}=I$
   2. $B^{2020}=I$
   3. $D^{2019}=I$
   4. $B^{2032}=I$

5. If $A=\begin{bmatrix}a+ib & c+id\\ -c+id & a-ib\end{bmatrix}$ and $A^{-1}=\begin{bmatrix}a-ib & -c-id\\ c-id & a+ib\end{bmatrix}$. Find $\left(a^2+b^2+c^2+d^2\right)$ **[AP EAMCET 18-09-20_Shift-1]**
   1. 1
   2. -1
   3. i
   4. $-i$

6. Find the value of 'k' , if $\begin{vmatrix}k-2 & 2k-3 & 3k-4\\ k-4 & 2k-9 & 3k-16\\ k-8 & 2k-27 & 3k-64\end{vmatrix}=0$ **[AP EAMCET 18-09-20_Shift-1]**
   1. 1
   2. 2
   3. 3
   4. 4

7. Let M=$\begin{bmatrix}1 & 1\\ 0 & 1\end{bmatrix}$ and N=$\begin{bmatrix}1 & 0\\ 0 & 2\end{bmatrix}$. Then $NM^{10}N^{-1}=$ **[AP EAMCET 18-09-20_Shift-2]**
   1. $\begin{bmatrix}1 & 5\\ 0 & 1\end{bmatrix}$
   2. $\begin{bmatrix}1 & -5\\ 0 & 1\end{bmatrix}$
   3. $\begin{bmatrix}1 & -10\\ 0 & 1\end{bmatrix}$
   4. $\begin{bmatrix}1 & 10\\ 0 & 1\end{bmatrix}$

8. If A is a skew-symmetric matrix then (given $n \in N$):

i) A^{2n} is skew-symmetric matrix

ii) A^{2n+1} is skew-symmetric matrix

[AP EAMCET 18-09-20_Shift-2]

1. (i) is true, (ii) is false
2. both (i) & (ii) are true
3. both (i) & (ii) are false
4. (i) is false, (ii) is true

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9. The rank of $\begin{vmatrix} 2 & 1 & 1 \\ 0 & 3 & -1 \\ 1 & -1 & 1 \end{vmatrix}$ is----

[AP EAMCET 18-09-20_Shift-2]

1. 1 2. 2
3. 3 4. 4

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10 If Q is the inverse of A, when

$A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$ and $10 \times Q = \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & x \\ 1 & -2 & 3 \end{bmatrix}$,

find x= **[AP EAMCET 18-09-20_Shift-2]**

1. 2 2. 3
3. 4 4. 5

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11. If $\theta \in (0, \frac{\pi}{2})$, then

$$\begin{vmatrix} (\sin\theta + \operatorname{cosec}\theta)^2 & (\sin\theta - \operatorname{cosec}\theta)^2 & 2020 \\ (\cos\theta + \sec\theta)^2 & (\cos\theta - \sec\theta)^2 & 2020 \\ (\tan\theta + \cot\theta)^2 & (\tan\theta - \cot\theta)^2 & 2020 \end{vmatrix} =$$

[AP EAMCET 21-09-20_Shift-1]

1. 1 2. -1
3. 0 4. 2020

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12. Let M and N be two invertible square matrices over R of order 2 such that N is diagonal. Then MNM^{-1} is diagonal ____

[AP EAMCET 21-09-20_Shift-1]

1. For all M
2. Only when M is a scalar matrix
3. For all diagonal matrices M
4. M must be a null matrix

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13. Let a, $b \in R - \{0\}$, and I_2 be the identity matrix of order 2. Then the rank of the (block) matrix $\begin{bmatrix} aI_2 & bI_2 \\ aI_2 & bI_2 \end{bmatrix}$ is

[AP EAMCET 21-09-20_Shift-1]

1. 2 2. 1
3. 4 4. 3

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14. The value of $\begin{vmatrix} \log_5 729 & \log_3 5 \\ \log_5 27 & \log_9 25 \end{vmatrix} \times \begin{vmatrix} \log_3 5 & \log_{27} 5 \\ \log_5 9 & \log_5 9 \end{vmatrix}$ is

[AP EAMCET 21-09-20_Shift-1]

2. 6

$g_5 9$ 4. $(\log_3 5) \times (\log_5 81)$

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15. If $\begin{bmatrix} 1 & -1 & x \\ 1 & x & 1 \\ x & -1 & 1 \end{bmatrix}$ has no inverse , then the real value of x is **[AP EAMCET 21-09-20_Shift-2]**

1. 2 2. 3
3. 0 4. 1

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16. Determinant of skew-symmetric matrix of order "3" is always

[AP EAMCET 21-09-20_Shift-2]

1. 0
2. 1
3. Depends on elements
4. -1

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17. If A= $\begin{bmatrix} 3 & 0 & 0 \\ 0 & 5 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ and $B = A^3$, then $B^{-1} =$

[AP EAMCET 21-09-20_Shift-2]

1. $\begin{bmatrix} -3 & 0 & 0 \\ 0 & -5 & 0 \\ 0 & 0 & -4 \end{bmatrix}$ 2. $\begin{bmatrix} -27 & 0 & 0 \\ 0 & -125 & 0 \\ 0 & 0 & -64 \end{bmatrix}$

3. $\begin{bmatrix} \frac{1}{27} & 0 & 0 \\ 0 & \frac{1}{125} & 0 \\ 0 & 0 & \frac{1}{64} \end{bmatrix}$ 4. $\begin{bmatrix} \frac{-1}{27} & 0 & 0 \\ 0 & \frac{-1}{125} & 0 \\ 0 & 0 & \frac{-1}{64} \end{bmatrix}$

18. For any $a,b,c \in R$, the determinant

$$\begin{vmatrix} bc & b+c & 1 \\ ca & c+a & 1 \\ ab & a+b & 1 \end{vmatrix}$$ is equal to

[AP EAMCET 21-09-20_Shift-2]

1. $a\left(b^2-c^2\right)+b\left(c^2-a^2\right)+c\left(a^2-b^2\right)$
2. $a(b-c)+b(c-a)+c(a-b)$
3. $(a-b)(b-c)(c-a)$
4. abc

19. If $\vec{a},\vec{b},\vec{c}$ are coterminous edges of a parallelepiped such that $\begin{vmatrix} \vec{a}.\vec{a} & \vec{a}.\vec{b} & \vec{a}.\vec{c} \\ \vec{b}.\vec{a} & \vec{b}.\vec{b} & \vec{b}.\vec{c} \\ \vec{c}.\vec{a} & \vec{c}.\vec{b} & \vec{c}.\vec{c} \end{vmatrix}=16$ then find the volume of the parallelepiped

[22-09-20_Shift-1]

1. 32
2. 16
3. 4
4. 8

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

$C=\begin{bmatrix} 2 & 0 & 1 \\ 0 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$ then $((((ABC)^{-1})^T)^{-1})^T=$

[AP EAMCET 22-09-20_Shift-1]

1. $\begin{bmatrix} 64 & 39 & 28 \\ 29 & 16 & 11 \\ 11 & 2 & 5 \end{bmatrix}$
2. $\begin{bmatrix} 63 & 39 & 20 \\ 29 & 16 & 11 \\ 10 & 2 & 5 \end{bmatrix}$
3. $\begin{bmatrix} 64 & 39 & 27 \\ 28 & 15 & 11 \\ 11 & 2 & 5 \end{bmatrix}$
4. $\begin{bmatrix} 61 & 39 & 28 \\ 29 & 16 & 11 \\ 11 & 0 & 5 \end{bmatrix}$

21. If $f(x)=\begin{vmatrix} \cos x & x & 1 \\ 2\sin x & x^2 & 2x \\ \tan x & x & 1 \end{vmatrix}$ then the value of $f'(x)$ at $x=0$ is equal to

[AP EAMCET 22-09-20_Shift-1]

1. -1
2. 1
3. 2
4. 0

22. If $f(x)=\begin{vmatrix} \cos(x+a+b) & \sin(x+a+b) & 10 \\ \cos(x+b+c) & \sin(x+b+c) & 10 \\ \cos(x+c+a) & \sin(x+c+a) & 10 \end{vmatrix}$

then $f(2019)^{f(2020)}-f(2020)^{f(2019)}=$

[AP EAMCET 22-09-20_Shift-2]

1. 1
2. -1
3. 0
4. 2

23. Let $A=\begin{bmatrix} 2 & -1 & 3 \\ 1 & 1 & -1 \\ 0 & 0 & 1 \end{bmatrix}$ and $D=\begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$. The system AX=D has

[AP EAMCET 22-09-20_Shift-2]

1. No solution
2. A unique solution
3. More than one but finite solutions
4. Infinitely many solutions

24. Let A be square matrix of order 3. Choose the correct option regarding the following statements :

1) there exists a matrix B of order 3 such that AB= I_3
2) there exists a matrix C of order 3 such that CA= I_3
3) A is invertible.

[AP EAMCET 22-09-20_Shift-2]

1. Only 3 implies 1 and 2
2. 1,2 and 3 are equivalent statements
3. In 1 and 2 ,B can be different from C
4. None of the options are correct

25. If a=1+2+4+…….upto n terms , b=1+3+9+…..upto n terms and c=1+5+25+…..upto n terms then

$$\Delta=\begin{vmatrix} a & 2b & 4c \\ 2 & 2 & 2 \\ 2^n & 3^n & 5^n \end{vmatrix}=$$

[AP EAMCET 23-09-20_Shift-1]

1. $(30)^n$
2. $(10)^n$
3. 0
4. $2^n+3^n+5^n$

26. Evaluate A^2+2I if A= $\begin{bmatrix} 1 & 0 \\ 1 & 2 \end{bmatrix}$

[AP EAMCET 23-09-20_Shift-1]

1. 2A
2. 3A
3. 4A
4. 5A

27. Find the rank of the matrix $\begin{bmatrix} 1 & 4 & -1 \\ 2 & 3 & 0 \\ 0 & 1 & 2 \end{bmatrix}$

[AP EAMCET 23-09-20_Shift-1]

1. 1
2. 2
3. 3
4. 4

28. The system of equations $2x+y-5=0$, $x-2y+1=0$ and $2x-14y-a=0$ is consistent. Then a is equal to

1. 11
2. 12
3. 16
4. -16

29. Let $M = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ and I be the identity matrix of order 3. Then M^2-4M=

1. 5I
2. 3I
3. 2I
4. I

30. $If\ A=\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix} and\ A^3 = \begin{bmatrix} \cos 3\theta & m \\ n & \cos 3\theta \end{bmatrix}$, the values of m and n respectively are

1. $-\sin 3\theta$, $\cos 3\theta$
2. $\sin 3\theta$, $-\cos 3\theta$
3. $-\sin 3\theta$, $\sin 3\theta$
4. $\sin 3\theta$, $-\sin 3\theta$

31. If $ax^4+bx^3+cx^2+50x+d=\begin{vmatrix} x^3-14x^2 & -x & 3x+\lambda \\ 4x+1 & 3x & x-4 \\ -3 & 4 & 0 \end{vmatrix}$,then find λ.

1. 2
2. -2
3. 1
4. -1

32. If A is a 3×3 matrix and the matrix obtained by replacing the elements of A with their corresponding cofactors is $\begin{bmatrix} 1 & -2 & 1 \\ 4 & -5 & -2 \\ -2 & 4 & 1 \end{bmatrix}$ then a possible value of the determinant of A is

[TS EAMCET 09-09-20_Shift-1]

1. 4
2. 3
3. 2
4. 1

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

[TS EAMCET 09-09-20_Shift-1]

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

34. The equations $x+y+z=3, x+2y+2z=6\ and\ x+ay+3z=b$ have **[TS EAMCET 09-09-20_Shift-1]**

1. No solution when $a \neq 3$,b is any value
2. Infinite number of solutions when $b \neq 9$
3. Unique solution when $a \neq 3$,b is any value
4. Unique solution when a=3 and $b \neq 9$

35. Let B ,C be $_{n \times n}$ matrices such that A = B + C, BC = CB and C^2 is a null matrix, then $B^{2020}\left[B+(2021)C\right]=$

[TS EAMCET 09-09-20_Shift-2]

1. A^{2020}
2. Null zero matrix of order $_{n \times n}$
3. A^{2021}
4. B^{2021}

36. If the system of equations $\begin{bmatrix} \alpha & -1 & -1 \\ 1 & -\alpha & -1 \\ 1 & -1 & -\alpha \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} \alpha-1 \\ \alpha-1 \\ \alpha-1 \end{bmatrix}$ is inconsistent, then α = **[TS EAMCET 09-09-20_Shift-2]**

1. 1
2. -2
3. -1
4. 2

37. For the system S of linear equations $x+y+z=3, 2x+2y-z=3, x+y+\lambda z=1$
The incorrect option among the following statement is **[TS EAMCET 09-09-20_Shift-2]**

1. S has infinitely many solutions, if $\lambda = -1$
2. S has no solution, if $\lambda = -2$
3. S has no unique solution for any real λ
4. S is consistent for all $\lambda \in R$

38. If A,B are two non singular matrices of order 3, $|B|=k$, a positive integer, then match the items of list –I with the items of list-II

List I	List II
A) $\left\|k^{-1}A^{-1}\right\|$	I) $BA^{K}+A^{K}B$
B) $\left\|Adj\left(A^{-1}\right)\right\|$	II) $\frac{BAdj(B)}{\|B\|}$
C) $BAB^{-1}=I \Rightarrow BA^{K}B^{-1}=$	III) $\frac{1}{\|B\|^{3}\|A\|}$
D) $Adj\left(Adj\left(A^{-1}\right)\right)=$	IV) $\frac{1}{\|A\|}\left(A^{-1}\right)$
	V) $\frac{1}{\|A\|^{2}}$

[TS EAMCET 10-09-20_Shift-1]

1. A B C D
   III V II IV
2. A B C D
   III IV I II
3. A B C D
   I V II IV
4. A B C D
   III IV II I

39. All the real values of p,q so that the system of equations 2x+py+6z=8, x+2y+qz=5, x+y+3z=4 may have no solutions are

[TS EAMCET 10-09-20_Shift-1]

1. $p=2, q\neq 3$
2. $p=2, q=\frac{15}{2}$
3. $p\neq 2, q=3$
4. $p=3, q=\frac{15}{4}$

40. If p and q are two distinct real 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 solution, then $p^2+q^2-pq=$

[TS EAMCET 10-09-20_Shift-1]

1. 15
2. 9
3. 3
4. 6

41. Let $A=\begin{bmatrix}1 & 4 & 2\\ 2 & -1 & 4\\ -3 & 7 & -6\end{bmatrix}$ and $B=\left[b_{ij}\right]_{3\times3}$ with

$b_{11}=2, b_{13}=-2, b_{12}=0$ is such that

$$AB=\begin{bmatrix}2 & 14 & -4\\ 4 & 1 & -8\\ -6 & 15 & 12\end{bmatrix}, \text{then } |B|+trace(B)=$$

[TS EAMCET 10-09-20_Shift-2]

1. -2
2. 10
3. -8
4. 6

42. A is a $m\times n$ matrix of ranks 4. If A contains an m^{th} order non singular sub matrix and $A^{T}A$ is a 7×7 matrix, then the number of rows of A is

[TS EAMCET 10-09-20_Shift-2]

1. 5
2. 6
3. 7
4. 4

43. If C and D are two $n\times n$ non-singular matrices over the set of real numbers R such that CD=-DC, then n is **[TS EAMCET 10-09-20_Shift-2]**

1. a natural number of the form $3k+5, k\in N$
2. an odd integer
3. an even integer
4. equal to one

44. A value of θ in $\left(0,\frac{\pi}{2}\right)$ and satisfying

$$\begin{vmatrix}1+\sin^2\theta & \cos^2\theta & 4\sin4\theta\\ \sin^2\theta & 1+\cos^2\theta & 4\sin4\theta\\ \sin^2\theta & \cos^2\theta & 1+4\sin4\theta\end{vmatrix}=0 \text{ is}$$

[TS EAMCET 11-09-20_Shift-1]

1. $\frac{\pi}{4}$
2. $\frac{\pi}{3}$
3. $\frac{5\pi}{24}$
4. $\frac{7\pi}{24}$

45. Let $[A]_{3\times3}$ be a non-singular matrix such that

$A^{-1}=\frac{1}{3}\left(A^2-5A+7I\right)$ then

$17A^8-85A^7+119A^6-51A^5-19A^4$

$+95A^3-133A^2+58A+I=$

[TS EAMCET 11-09-20_Shift-1]

1. 0
2. A
3. A+I
4. A^2+A+I

46. If $\begin{bmatrix}2&1&1\\0&3&-1\\1&-1&1\end{bmatrix}\begin{bmatrix}x\\y\\z\end{bmatrix}=\begin{bmatrix}1\\1\\0\end{bmatrix}, then \begin{bmatrix}x\\y\\z\end{bmatrix}=$

[TS EAMCET 11-09-20_Shift-1]

1. $\begin{bmatrix}1\\1\\0\end{bmatrix}+K\begin{bmatrix}3\\1\\-2\end{bmatrix}, K\in R$
2. $\begin{bmatrix}1\\1\\0\end{bmatrix}+K\begin{bmatrix}1\\-2\\3\end{bmatrix}, K\in R$
3. $\begin{bmatrix}1\\1\\0\end{bmatrix}+K\begin{bmatrix}-2\\1\\3\end{bmatrix}, K\in R$
4. $\begin{bmatrix}1\\0\\-1\end{bmatrix}+K\begin{bmatrix}-2\\1\\3\end{bmatrix}, K\in R$

47. Let I be a unit matrix of order 6. Let $A=(a_{ij})$ be a square matrix of order 6 such that

$a_{ij}=\begin{cases}1, & if\ i+j=7\\0, & if\ i+j\neq 7\end{cases}$ then $(A(adjA)A^{-1})A^2=$

[TS EAMCET 11-09-20_Shift-2]

1. I
2. A
3. -A
4. -I

48. Let $a,b,c\notin\{0,1\}$. If the system of equations

$\prod_1\equiv x+ay+az=0, \prod_2\equiv bx+y+bz=0$

$\prod_3\equiv cx+cy+z=0$ has a non-trivial solution, then the system of equations

$\prod_1=a, \prod_2=b, \prod_3=c$ has

[TS EAMCET 11-09-20_Shift-2]

1. unique solution
2. infinite number of solutions
3. no solution
4. unique solution only when $a=b=c$

49. A is a singular matrix of order five. B is another matrix having the rank $\rho(B)$ equal to the rank $\rho(A)$ and B has a non-zero minor of order 3. Then which one of the following is true?

[TS EAMCET 11-09-20_Shift-2]

1. B is a 4×4 matrix
2. $\rho(A)=\rho(B)=4$, irrespective of the order of B
3. $\rho(A)=\rho(B)=3$, when all the fourth order minors of A are zero
4. |B|=0

50. 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 lines

$a_ix+b_iy+c_i=0 (i=1,2,3)$ represent

[TS EAMCET 11-09-20_Shift-2]

1. Parallel lines if $\frac{a_i}{a_j}\neq\frac{b_i}{b_j}\neq\frac{c_i}{c_j}(i\neq j)$
2. Coincident lines if $\frac{a_i}{a_j}=\frac{b_i}{b_j}(i\neq j)$
3. Concurrent lines but not coincident if $\frac{a_i}{a_j}=\frac{b_i}{b_j}=\frac{c_i}{c_j}(i\neq j)$
4. Concurrent lines if $\frac{a_i}{a_j}\neq\frac{b_i}{b_j}\neq\frac{c_i}{c_j}(i\neq j)$

51. For a square matrix B of order 3, if $B^T=B^{-1}$ and $|B|=1$, then $|B-I|=$

[TS EAMCET 14-09-20_Shift-1]

1. 1
2. -1
3. 2|B|
4. $|B^T|$-1

52. The rank of

$$A=\begin{bmatrix}1 & x & x+1\\ 2x & x^2-x & x^2+x\\ 3x(x-1) & x\left(x^2-3x+2\right) & x\left(x^2-1\right)\end{bmatrix}$$ is

[TS EAMCET 14-09-20_Shift-1]

1. 3; for all $x\in R$
2. 2; only for $x=-1$
3. 2; for all $x\neq 0$ and $x\neq -1$
4. 3; only for $x=0$

53. If a and b are any two real numbers, then

$$\begin{vmatrix}2a-2b-4 & 4a & 4a\\ 4 & 2-b-a & 4\\ 2b & 2b & b-a-2\end{vmatrix}=$$

[TS EAMCET 14-09-20_Shift-2]

1. $4\left[(a+b)^3+8(a+b)^2+16(a+b)+8\right]$
2. $\frac{1}{2}(a+b+2)^3$
3. $2\left[(a+b)^3+6(a+b)^2+12(a+b)+8\right]$
4. $(a+b+2)^3$

54. Let $A=\begin{bmatrix}2 & -2 & -4\\ -1 & 3 & 4\\ 1 & -2 & x\end{bmatrix}$ and $A^2=A$. If r is the rank of A, then $r+x=$

[TS EAMCET 14-09-20_Shift-2]

1. -3
2. 2
3. 1
4. -1

55. The equation whose roots are the values of the equation $\begin{vmatrix}1 & -3 & 2\\ 1 & 6 & 4\\ 1 & 3x & x^2\end{vmatrix}=0$ is

[AP EAMCET 19-08-2021_Shift-1]

1. $x^2+x+2=0$
2. $x^2+x-2=0$
3. $x^2+2x+2=0$
4. $x^2-x-2=0$

56. Let a,b be non zero real numbers such that $ab=\frac{5}{2}$ and given $A=\begin{bmatrix}a & -b\\ b & a\end{bmatrix}$ and $AA^T=20I$ (I is a unit matrix). Then the equation whose roots are a and b is

[AP EAMCET 19-08-2021_Shift-1]

1. $x^2\mp 10x+5=0$
2. $2x^2\pm 10x+5=0$
3. $x^2-5x+\frac{5}{2}=0$
4. $x^2-25x+\frac{5}{2}=0$

57. If $A=\begin{bmatrix}1 & -1 & 1\\ 2 & 1 & -3\\ 1 & 1 & 1\end{bmatrix}, 10B=\begin{bmatrix}4 & 2 & 2\\ -5 & 0 & \alpha\\ 1 & -2 & 3\end{bmatrix}$ and $B=A^{-1}$ then the value of α is

[AP EAMCET 19-08-2021_Shift-1]

1. 2
2. 0
3. 5
4. 4

58. The rank the matrix $\begin{bmatrix}4 & 2 & (1-x)\\ 5 & k & 1\\ 6 & 3 & (1+x)\end{bmatrix}$ is 1, then

[AP EAMCET 19-08-2021_Shift-1]

1. $k=\frac{5}{2}, x=\frac{1}{5}$
2. $k=\frac{5}{2}, x\neq\frac{1}{5}$
3. $k=\frac{1}{5}, x=\frac{5}{2}$
4. $k\neq\frac{5}{2}, x=\frac{1}{5}$

59. If $a_1,a_2,\ldots,a_9$ are in G.P. then

$$\begin{vmatrix}\log a_1 & \log a_2 & \log a_3\\ \log a_4 & \log a_5 & \log a_6\\ \log a_7 & \log a_8 & \log a_9\end{vmatrix}=$$

1. $\log\left(a_1,a_2,\ldots,a_n\right)$
2. 1
3. $\left(\log a_9\right)^9$
4. 0

60. The value of $\begin{vmatrix}b+c & a & a\\ b & c+a & b\\ c & c & a+b\end{vmatrix}$ is

[AP EAMCET 19-08-2021_Shift-1]

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

61. Let A, B, C, D be square real matrices such that $C^T = DAB, D^T = ABC, S = ABCD$ then S^2 is equal to

[AP EAMCET 19-08-2021_Shift-2]

1. S
2. BCD
3. S^T
4. $(S^T)^2 = (S^2)^T$

62. $A = \begin{vmatrix} a^2 & 15 & 31 \\ 12 & b^2 & 41 \\ 35 & 61 & c^2 \end{vmatrix}$ and $B = \begin{vmatrix} 2a & 3 & 5 \\ 2 & 2b & 8 \\ 1 & 4 & 2c-3 \end{vmatrix}$ are two matrices such that the sum of the principal diagonal elements of both A and B are equal, then the product of the principal diagonal elements of B is______

[AP EAMCET 19-08-2021_Shift-2]

1. 4
2. 0
3. -4
4. -12

63. Let a, b, c be such that $b+c \neq 0$ and

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

Then the value of $'n'$ is

[AP EAMCET 19-08-2021_Shift-2]

1. Zero
2. Any even integer
3. Any odd integer
4. Any integer

64. The trace of the matrix $A = \begin{bmatrix} 1 & -5 & 7 \\ 0 & 7 & 9 \\ 11 & 8 & 9 \end{bmatrix}$ is

[AP EAMCET 20-08-2021_Shift-1]

1. 17
2. 25
3. 3
4. 12

65. If A, B, C are the angles of a triangle then the system of equations $-x + y\cos C + z\cos B = 0$, $x\cos C - y + z\cos A = 0$, $x\cos B + y\cos A - z = 0$

[AP EAMCET 20-08-2021_Shift-1]

1. Only zero solution
2. A non-zero solution for all triangle ΔABC
3. Only zero solution but for certain values of A, B, C
4. A non-zero solution if ΔABC is an equilateral triangle& not for all triangles

66. If $\begin{bmatrix} 1 & -\tan\theta \\ \tan\theta & 1 \end{bmatrix}\begin{bmatrix} 1 & \tan\theta \\ -\tan\theta & 1 \end{bmatrix} = \begin{bmatrix} a & -b \\ b & a \end{bmatrix}$ then **[AP EAMCET 20-08-2021_Shift-1]**

1. $a = 1, b = 1$
2. $a = \sin 2\theta, b = \cos 2\theta$
3. $a = \cos 2\theta, b = \sin 2\theta$
4. $a = 0, b = 0$

67. If $Z_1 = 2+3i, Z_2 = 3+2i$ where $i = \sqrt{-1}$ then $\begin{bmatrix} z_1 & z_2 \\ -\overline{z}_2 & \overline{z}_1 \end{bmatrix}\begin{bmatrix} \overline{z}_1 & -z_2 \\ \overline{z}_2 & z_1 \end{bmatrix} =$

[AP EAMCET 20-08-2021_Shift-1]

1. $13I$
2. I
3. $26I$
4. Zero matrix

68. What is the value of $\begin{vmatrix} a & b & c \\ a-b & b-c & c-a \\ b+c & c+a & a+b \end{vmatrix} = ?$

[AP EAMCET 20-08-2021_Shift-1]

1. $a^3+b^3+c^3+3abc$
2. $a^3+b^3+c^3-3abc$
3. $a^3+b^3+c^3-6abc$
4. $a^3+b^3+c^3+6abc$

69. If $k \in R$ and $\det A = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \\ a_3 & b_3 & c_3 \end{vmatrix} = k$ then

$\det B = \begin{vmatrix} a_1 & b_1 & c_1 \\ a_2+2a_1 & b_2+2b_1 & c_2+2c_1 \\ a_3 & b_3 & c_3 \end{vmatrix}$ is equal to

[AP EAMCET 20-08-2021_Shift-2]

1. 0
2. 2K
3. K
4. K^2

70. If $A=\begin{bmatrix}\sqrt{2020} & \sqrt{2021} & \sqrt{2022} & \sqrt{2023}\\ \sqrt{4040} & \sqrt{4042} & \sqrt{4044} & \sqrt{4046}\\ \sqrt{6060} & \sqrt{6063} & \sqrt{6066} & \sqrt{6069}\\ \sqrt{8080} & \sqrt{8084} & \sqrt{8088} & \sqrt{8092}\end{bmatrix}$ then the rank of A is

[AP EAMCET 20-08-2021_Shift-2]

1. 1 2. 2
3. 3 4. 4

---

71. If $\begin{vmatrix}x & x^2 & 1+x^3\\ y & y^2 & 1+y^3\\ z & z^2 & 1+z^3\end{vmatrix}=0$ and x, y, z are all distinct, then xyz =

[AP EAMCET 20-08-2021_Shift-2]

1. -1 2. 1
3. 0 4. 3

---

72. Let A be a $n\times n$ matrix such that A is upper–triangular. Then adj(A) =

[AP EAMCET 20-08-2021_Shift-2]

1. Lower triangular matrix
2. Upper triangular matrix
3. diagonal matrix
4. scalar matrix

---

73. Let Z_1, Z_2, Z_3 be three non zero complex numbers such that $a=|Z_1|, b=|Z_2|, c=|Z_3|$, if the determinant $\begin{vmatrix}a & b & c\\ b & c & a\\ c & a & b\end{vmatrix}=0$, then

[AP EAMCET 20-08-2021_Shift-2]

1. $|Z_1|=|Z_2|=|Z_3|=abc$
2. $|Z_1|+|Z_2|+|Z_3|=0$
3. $|Z_1|+|Z_2|+|Z_3|=abc$
4. $|Z_1-Z_2|=|Z_2-Z_3|$

---

74. What is the rank of the matrix $\begin{bmatrix}1 & 1 & 1\\ 1 & 1 & 1\\ 1 & 1 & 1\end{bmatrix}$

[AP EAMCET 23-08-2021_Shift-1]

1. 2 2. 1
3. 3 4. 0

---

75. $\begin{bmatrix}1 & 2 & 3\\ -1 & 1 & 2\\ 3 & 0 & 2\end{bmatrix}^{\begin{vmatrix}2022 & 2024\\ 2021 & 2023\end{vmatrix}} =$

[AP EAMCET 23-08-2021_Shift-1]

1. $\begin{bmatrix}8 & 4 & 11\\ 4 & -1 & 3\\ 9 & 6 & 13\end{bmatrix}$ 2. $\begin{bmatrix}8 & 4 & 13\\ 4 & -1 & 3\\ 9 & 6 & 12\end{bmatrix}$

3. $\begin{bmatrix}8 & 4 & 13\\ 4 & -1 & 3\\ 9 & 6 & 13\end{bmatrix}$ 4. $\begin{bmatrix}8 & 4 & 11\\ 4 & 1 & 13\\ 9 & 6 & 13\end{bmatrix}$

---

76. If ω is a root of the equation $x+\frac{1}{x}+1=0$, then $\begin{vmatrix}1 & 1+\omega & 1+\omega+\omega^2\\ 3 & 4+3\omega & 5+4\omega+3\omega^2\\ 6 & 9+6\omega & 11+9\omega+6\omega^2\end{vmatrix}=$

[AP EAMCET 23-08-2021_Shift-1]

1. 1 2. -1
3. 0 4. $1+\omega$

---

77. Let $A=\begin{bmatrix}2 & -5\\ 3 & 1\end{bmatrix}$ what is $f(A)=?$ where $f(x)=x^3-2x^2-5$.

[AP EAMCET 23-08-2021_Shift-1]

1. $\begin{bmatrix}-50 & 70\\ 42 & 36\end{bmatrix}$ 2. $\begin{bmatrix}-50 & 70\\ 42 & -36\end{bmatrix}$

3. $\begin{bmatrix}-50 & 70\\ -42 & -36\end{bmatrix}$ 4. $\begin{bmatrix}-50 & 70\\ -42 & 36\end{bmatrix}$

78. If $A=\begin{bmatrix}2&1&3\\-1&2&0\\4&1&3\end{bmatrix}$, $B=\begin{bmatrix}3&2&1\\1&2&3\\3&1&0\end{bmatrix}$ then $\det\left(2B^{-1}A^{-1}\right)=$

[AP EAMCET 23-08-2021_Shift-2]

1. $\frac{1}{6}$
2. $\frac{-1}{24}$
3. $\frac{1}{3}$
4. $\frac{-1}{6}$

79. What are the values of (x,y,z,t) where

$$3\begin{bmatrix}x&y\\z&t\end{bmatrix}=\begin{bmatrix}x&6\\-1&2t\end{bmatrix}+\begin{bmatrix}4&x+y\\z+t&3\end{bmatrix}=?$$

[AP EAMCET 23-08-2021_Shift-2]

1. $[1]$
2. $\begin{bmatrix}2&2\\2&2\end{bmatrix}$
3. $\begin{bmatrix}3&3&3\end{bmatrix}$
4. $\begin{bmatrix}1&1&1\\1&1&1\\1&1&1\end{bmatrix}$

80. If A is a non–singular matrix such that $A.A^T=A^T.A$ and $B=A^{-1}.A^T$ then

[AP EAMCET 23-08-2021_Shift-2]

1. $A.B^T=I$
2. $B.B^T=I$
3. $A^T.B^T=I$
4. $B^{-1}.B^T=I$

81. Let $0\neq a\in z$ and $A=\begin{bmatrix}a&a&a-y\\a&a+x&a\\a&a&a\end{bmatrix}$ be a matrix. Then equation det A = 16 represents

[AP EAMCET 24-08-2021_Shift-2]

1. A parabola
2. A circle
3. An ellipse
4. A rectangular hyperbola

82. Let A be a 2×2matrix with real entries. Let I be the 2×2 identity matrix. $Tr(A)$ denotes the sum of diagonal entries of A. Assume that $A^2=I$.

Statement I : if $A\neq I$ and $A\neq -I$ then $\det A=-1$

Statement II : if $A\neq I$ and $A\neq -I$ then $TrA\neq 0$ **[AP EAMCET 24-08-2021_Shift-2]**

1. Statement I is true, statement II is true; statement II is a correct explanation for statement I.
2. Statement I is true, statement II is true; statement II is not a correct explanation for statement I
3. Statement I is true, statement II is false
4. Statement I is false, statement II is true

83. The sum of two lower triangular matrices is always ___

[AP EAMCET 24-08-2021_Shift-2]

1. An upper triangular matrix
2. An lower triangular matrix
3. A diagonal matrix
4. A scalar matrix

84. Which of the following matrix has rank 3?

[AP EAMCET 24-08-2021_Shift-1]

1. $\begin{bmatrix}10&11&12\\11&12&13\\12&13&14\end{bmatrix}$
2. $\begin{bmatrix}0&-51&101\\51&0&-581\\-101&581&0\end{bmatrix}$
3. $\begin{bmatrix}0&1&2\\-1&0&5\\-2&7&0\end{bmatrix}$
4. $\begin{bmatrix}1&2&3\\2&4&6\\3&6&9\end{bmatrix}$

85. If ω is a complex cube root of unity and $A=\begin{bmatrix}\omega&0\\0&\omega\end{bmatrix}$ then $A^{50}=$

[AP EAMCET 24-08-2021_Shift-1]

1. ω^2A
2. ωA
3. A
4. 0

86. If a square matrix A is such that

$$\left(A^T-\frac{1}{2}I\right)\left(A-\frac{1}{2}I\right)=\left(A^T+\frac{1}{2}I\right)\left(A+\frac{1}{2}I\right)=I,$$

where I is a unit matrix, then A is

[AP EAMCET 24-08-2021_Shift-1]

1. Symmetric matrix
2. Equal to $\frac{3}{4}I$
3. Skew symmetric matrix
4. Equal to $\frac{-3}{4}I$

87. The system of equations

$2x+6y=-11, 6x+20y-6z=-3, 6y-18z=-1$

are **[AP EAMCET 24-08-2021_Shift-1]**

1. Inconsistent
2. Consistent with unique solution
3. Consistent with countable infinite many solutions
4. Consistent with infinitely many solutions

88. Let $A=\begin{bmatrix}1 & -1 & 2\\ 0 & 3 & 4\end{bmatrix}, B=\begin{bmatrix}4 & 0 & -3\\ -1 & -2 & -3\end{bmatrix}$

$C=\begin{bmatrix}2 & -3 & 0 & 1\\ 5 & -1 & -4 & 2\\ -1 & 0 & 0 & 3\end{bmatrix}$. What is $A^TB=?$

[AP EAMCET 24-08-2021_Shift-1]

1. $\begin{bmatrix}4 & 0 & -3\\ -7 & -6 & -6\\ 4 & -8 & -18\end{bmatrix}$
2. A^TB is not defined
3. $\begin{bmatrix}4 & -7 & 4\\ 0 & -6 & -8\\ -3 & 12 & 6\end{bmatrix}$
4. $A^TB=0$

89. If A and B are two square matrices with det A = 5 and det $\left(B^T.A^T\right)=-15$, then det B is equal to

[AP EAMCET 25-08-2021_Shift-1]

1. 3
2. –3
3. 0
4. 1

90. If $\Delta_k=\begin{vmatrix}1 & 0 & 0\\ 0 & k & k-1\\ 0 & k-1 & k\end{vmatrix}$ then

$\Delta_1+\Delta_2+.....+\Delta_{20}=$

[AP EAMCET 25-08-2021_Shift-1]

1. 200
2. 40
3. 0
4. 400

91. The values of 'x' for which the given matrix

$\begin{bmatrix}-x & x & 2\\ 2 & x & -x\\ x & -2 & -2\end{bmatrix}$ will be non–singular are

[AP EAMCET 25-08-2021_Shift-1]

1. $-2\le x\le 2$
2. For all x other than 2 and –2
3. $x\ge 2$
4. $x\le -2$

92. If a,b,c are real numbers such that

$a^2+b^2+c^2-ab-bc-ca\le 0$, then

$$\begin{vmatrix}(a-b+1)^5 & b^7-c^7 & c^9-a^9\\ a^{11}-b^{11} & (b-c+2)^3 & c^{13}-a^{13}\\ a^{15}-b^{15} & b^{17}-c^{17} & (c-a+3)^1\end{vmatrix}=$$

[AP EAMCET 25-08-2021_Shift-1]

1. 2abc
2. 0
3. 24 abc
4. 24

93. If $a=\frac{x}{y-z}, b=\frac{y}{z-x}$ & $c=\frac{z}{x-y}$ where x,y,z Are not all zero, then what is the value of $ab+bc+ca=?$

[AP EAMCET 25-08-2021_Shift-1]

1. 0
2. –1
3. +1
4. 2

94. If A is a matrix $\begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix}$, then

$A^n=\begin{bmatrix}1 & 0\\ n & 1\end{bmatrix}, \forall n\in N$

[AP EAMCET 25-08-2021_Shift-2]

1. Not true for $n=3$
2. Not true for $n=2$
3. True for $n=3$
4. Not true for $n=1$

95. The number of solutions of the following system of linear homogeneous equations $x-y+z=0, x+2y-z=0, 2x+y+3z=0$ is ______ **[AP EAMCET 25-08-2021_Shift-2]**

1. 1
2. 8
3. Countable infinite
4. Un countable

96. The system of equations $x+2y=3, 3x+6y=a-2$ has no solution **[AP EAMCET 25-08-2021_Shift-2]**

1. If $a=11$
2. If $a \neq -9$
3. If $a \neq 9$
4. If $a \neq 11$

97. If each element, of a determinant of third order with value A, is multiplied by 3, then the value of newly formed determinant is ____**[AP [EAMCET 25-08-2021_Shift-2]**

1. 3A
2. 9A
3. 27A
4. –27A

98. If the determinant $\begin{vmatrix} \cos 2x & \sin^2 x & \cos 2x \\ \sin^2 x & \cos 2x & \cos^2 x \\ \cos 2x & \cos^2 x & \cos 2x \end{vmatrix}$ is expanded in powers of *cosx*, then the constant term in the expansion is **[AP EAMCET 25-08-2021_Shift-2]**

1. 1
2. –1
3. 0
4. 2

99. Let $A=\begin{bmatrix} 1 & 3 \\ 4 & -3 \end{bmatrix}$, Let $S=\left\{\begin{bmatrix} x \\ y \end{bmatrix} \in R^2 / A\begin{bmatrix} x \\ y \end{bmatrix}=3\begin{bmatrix} x \\ y \end{bmatrix}\right\}$ what is the cardinality of S? **[AP EAMCET 25-08-2021_Shift-2]**

1. 1
2. Countable infinite
3. $|S|>1$ but S is finite
4. Uncountable

00. The value of the determinant $\begin{vmatrix} a+b & a+2b & a+3b \\ a+2b & a+3b & a+4b \\ a+4b & a+5b & a+6b \end{vmatrix}$ is ______ **[AP EAMCET 23-08-2021_Shift-1]**

1. a
2. b
3. 0
4. a+b

101. If $A_\alpha=\begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, then determinant of $A_{\pi/5}A_{\pi/4}A_{3\pi/10}=$ **[TS EAMCET 04-08-2021_Shift-2]**

1. $\sqrt{2}$
2. $\frac{1}{\sqrt{2}}$
3. 0
4. 1

102 If $\begin{vmatrix} 2 & 2k & 1 \\ 1 & k-1 & 1 \\ 2 & 1 & k+1 \end{vmatrix}=Ak^2+Bk+C$, then $A+B+C=$ **[TS EAMCET 04-08-2021_Shift-2]**

1. 0
2. 1
3. -1
4. 2

103. If the system of equations $3x-2y+z=0$, $\lambda x-14y+15z=0$, $x+2y-3z=0$ has a solution other than $x=y=z=0$, then $\lambda=$ **[TS EAMCET 04-08-2021_Shift-1]**

1. 1
2. 2
3. 3
4. 5

104. If $\Delta=\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}=K(a-b)(b-c)(c-a)$, then K= **[TS EAMCET 04-08-2021_Shift-1]**

1. -1
2. 1
3. 2
4. 3

105. If $x=\alpha, y=\beta, z=\gamma$ is the unique solution of the system of equations $5x-7y+3z=0$, $7x+10y-8z=3$ and $2x+3y-4z+4=0$, then $\beta=$ **[TS EAMCET 04-08-2021_Shift-1]**

1. $\frac{1}{2}$
2. 2
3. -2
4. $\frac{-1}{2}$

106. If $A=\begin{bmatrix}1&0&0\\0&2&0\\0&0&3\end{bmatrix}$, then $adj(adjA)$ is equal to

[TS EAMCET 05-08-2021_Shift-1]

1. A
2. $36A$
3. $6A$
4. $\frac{1}{6}A$

107. If $A=\begin{bmatrix}1&-1&1\\2&-1&0\\1&0&0\end{bmatrix}$ then $A^5=$

[TS EAMCET 05-08-2021_Shift-1]

1. A
2. Identity matrix
3. Null matrix
4. A^{-1}

108. Let A and B be two 3×3 non singular matrices, such that $\det(A^TBA)=27$ and $\det(AB^{-1})=8$. then $\det(B^TA^{-1}B)=$

[TS EAMCET 05-08-2021_Shift-1]

1. $\frac{3}{32}$
2. $\frac{1}{16}$
3. 1
4. 16

109. Let $B=\begin{bmatrix}1&2\\0&1\end{bmatrix}$ and A be 2×2matrix satisfying $(A^T)^{-1}=A$. If $X=ABA^T$, then $A^TX^{2021}A=$

[TS EAMCET 05-08-2021_Shift-2]

1. $\begin{bmatrix}1&2^{2021}\\0&1\end{bmatrix}$
2. $\begin{bmatrix}1&2021\\0&1\end{bmatrix}$
3. $\begin{bmatrix}1&0\\0&1\end{bmatrix}$
4. $\begin{bmatrix}1&4042\\0&1\end{bmatrix}$

110. If A is a 3×3matrix such that $|A|=27, Adj\ A=k.A^T$, then $k^2-3k+5=$

[TS EAMCET 05-08-2021_Shift-2]

1. 5
2. 3
3. 0
4. 2

111. If the system of equations $2x+9y+5z=8$, $2x+3y-z=-4$, $x-2z=-5$ have infinite number of solutions $x=-5+at,\ y=2+bt$, $z=ct, t\in R$ then a,b,c respectively are

[TS EAMCET 05-08-2021_Shift-2]

1. 1,1,1
2. 2,1,1
3. -2,-1,1
4. 2,-1,1

112. A and B are two 3×3 non-singular matrices such that $adjA=|A|B$. If $tr(X)$ denotes the trace of a square matrix X and $C=\begin{bmatrix}4&4&7\\3&-2&5\\-2&3&6\end{bmatrix}$ then, $\sum_{k=1}^{\infty}tr\left(\frac{1}{3^k}(AB)^kC\right)=$

[TS EAMCET 06-08-2021_Shift-2]

1. 12
2. 4
3. 81
4. ∞ (infinite)

113. Let $A=\begin{bmatrix}1&-4&7\\0&3&-5\\-2&5&-9\end{bmatrix}, B=\begin{bmatrix}a\\-b\\-c\end{bmatrix}$. If A and $[A:B]$ have same rank, then

[TS EAMCET 06-08-2021_Shift-2]

1. $2a+b+c=0$
2. $a=\frac{b+c}{2}$
3. $b=\frac{a+c}{2}$
4. $c=\frac{a+b}{2}$

114. In matrix notation, if the system of equations $\begin{bmatrix}1\\-1\\2\end{bmatrix}\begin{bmatrix}1&-1&2\end{bmatrix}\begin{bmatrix}x\\y\\z\end{bmatrix}=\begin{bmatrix}5\\-5\\10\end{bmatrix}$ has infinite number of solutions, then all these solutions lie on

[TS EAMCET 06-08-2021_Shift-2]

1. A line on XY plane
2. a plane not parallel to any of the coordinate planes
3. the YZ plane
4. the ZX plane

115. If $P=\begin{pmatrix}1 & \alpha & 3\\ 1 & 3 & 3\\ 2 & 4 & 4\end{pmatrix}$ is the adjoint of a 3×3 matrix A and det(A) = 4, then $\alpha=$

[TS EAMCET 06-08-2021_Shift-1]

1. 22
2. 11
3. 3
4. 4

116. If $\begin{vmatrix}\alpha & \beta & \gamma\\ a & b & c\\ l & m & n\end{vmatrix}=(-1)^k\begin{vmatrix}m & n & l\\ b & c & a\\ \beta & \gamma & \alpha\end{vmatrix}$, then the least value of K is

[TS EAMCET 06-08-2021_Shift-1]

1. 2
2. 3
3. 4
4. 5

117. If the system of equations $x+y+z=1, x+2y+4z=K, x+4y+10z=K^2$ is consistent then K=

[TS EAMCET 06-08-2021_Shift-1]

1. 1,-2
2. -1,2
3. 1,2
4. -1,-2

118. For i = 1,2,3 and j = 1,2,3

If $a_i^2+b_i^2+c_i^2=1, a_ia_j+b_ib_j+c_ic_j=0,\ \forall i\neq j$

and $A=\begin{bmatrix}a_1 & a_2 & a_3\\ b_1 & b_2 & b_3\\ c_1 & c_2 & c_3\end{bmatrix}$ then det (AA^T) =

[AP EAMCET 04-07-2022_Shift-1]

1. 0
2. 1
3. –1
4. 3

119. If $A=\frac{1}{7}\begin{bmatrix}3 & -2 & 6\\ -6 & -3 & 2\\ -2 & 6 & 3\end{bmatrix}$

[AP EAMCET 04-07-2022_Shift-1]

1. $A^{-1}=A$
2. $A^{-1}=A^T$
3. A^{-1} does not exist
4. $A^{-1}=-A$

120. If $A=\begin{bmatrix}\alpha^2 & 5\\ 5 & -\alpha\end{bmatrix}$ and

det $\left(A^{10}\right)=1024, then\ \alpha=$

[AP EAMCET 04-07-2022_Shift-1]

1. –2
2. –1
3. –3
4. 0

121. Let $A=\begin{bmatrix}5 & \sin^2\theta & \cos^2\theta\\ -\sin^2\theta & -5 & 1\\ \cos^2\theta & 1 & 5\end{bmatrix}$. Then maximum value of det (A) is

[AP EAMCET 04-07-2022_Shift-1]

1. –125
2. 200
3. $-\frac{255}{2}$
4. 145

122. If $A=\begin{bmatrix}2 & -3\\ -4 & 1\end{bmatrix}$,then $\left(A^T\right)^2+(12A)^T=$

[AP EAMCET 04-07-2022_Shift-2]

1. $5\begin{bmatrix}8 & 12\\ -9 & 5\end{bmatrix}$
2. $5\begin{bmatrix}8 & -9\\ -12 & 5\end{bmatrix}$
3. $\begin{bmatrix}40 & -45\\ 60 & 25\end{bmatrix}$
4. $\begin{bmatrix}40 & -60\\ -45 & 25\end{bmatrix}$

123. If a, b, c are respectively the 5th ,8th,13th terms of an arithmetic progression ,then

$\begin{vmatrix}a & 5 & 1\\ b & 8 & 1\\ c & 13 & 1\end{vmatrix}=$

[AP EAMCET 04-07-2022_Shift-2]

1. 0
2. 1
3. abc
4. 520

124. If $A=\begin{bmatrix}1 & 0 & 0\\ a & -1 & 0\\ b & c & 1\end{bmatrix}$ is such that A^2 =I,then

[AP EAMCET 04-07-2022_Shift-2]

1. $b=\frac{ac}{2}$
2. $b=-\frac{ac}{2}$
3. $b=\frac{a+c}{2}$
4. $b=\sqrt{ac}$

125. Let $A=\begin{bmatrix}-2 & x & 1\\ x & 1 & 1\\ 2 & 3 & -1\end{bmatrix}$. If the roots of the equation are l,m and det A=0 then $l^3-m^3=$

[AP EAMCET 04-07-2022_Shift-2]

1. 35
2. -35
3. 19
4. -19

126. If $A=\begin{bmatrix}3 & -3 & 4\\ 2 & -3 & 4\\ 0 & -1 & 1\end{bmatrix}$, *then* AA^T is a

[AP EAMCET 05-07-2022_Shift-1]

1. Symmetric matrix
2. Skew-Symmetric matrix
3. Singular matrix
4. Inverse of A

127. If AX = D represents the system of simultaneous linear equations $x+y+z=6$, 5x-y+2z=3 and 2x+y-z =-5 then (Adj A)D=

[AP EAMCET 05-07-2022_Shift-1]

1. $\begin{bmatrix}8\\ -16\\ 40\end{bmatrix}$
2. $\begin{bmatrix}32\\ 64\\ -160\end{bmatrix}$
3. $\begin{bmatrix}-15\\ 40\\ 75\end{bmatrix}$
4. $\begin{bmatrix}12\\ 24\\ 60\end{bmatrix}$

128. If $A=\begin{bmatrix}1 & 0\\ 2 & 1\end{bmatrix}, B=\begin{bmatrix}1 & 3\\ 0 & 1\end{bmatrix}$ *then* $\frac{1}{2}\det\left(A^6+B^6\right)=$

[AP EAMCET 05-07-2022_Shift-1]

1. -68
2. -106
3. 665
4. 720

129. Let $G(x)=\begin{bmatrix}\cos x & -\sin x & 0\\ \sin x & \cos x & 0\\ 0 & 0 & 1\end{bmatrix}$. If $x+y=0$, then $G(x)G(y)=$

[AP EAMCET 05-07-2022_Shift-1]

1. Null Matrix
2. Skew Symmetric Matrix
3. Identity Matrix
4. Symmetric Matrix

130. If $A=\begin{bmatrix}x & 0\\ 1 & 1\end{bmatrix}$ and $B=\begin{bmatrix}8 & 0\\ 7 & 1\end{bmatrix}$ and $A^3=B$ then $x=$

[AP EAMCET 05-07-2022_Shift-2]

1. -2 or 3
2. -2
3. 2 or -3
4. 2

131. If b and c are non zero real numbers.

$A=\begin{bmatrix}1 & b & c\\ b & 2 & 3\\ c & 3 & 4\end{bmatrix}$ and $B=\begin{bmatrix}0 & b & c\\ -b & 0 & 2\\ -c & -2 & 0\end{bmatrix}$. Then det(A + B) =

[AP EAMCET 05-07-2022_Shift-2]

1. 3
2. 1
3. -1
4. 0

132. If the rank of the matrix $A=\begin{bmatrix}1 & 2 & 1 & -1\\ -1 & 2 & 3 & 5\\ 0 & 1 & k & k\end{bmatrix}$ is 2 and k is a real number, then k is a root of the following quadratic equation

[AP EAMCET 05-07-2022_Shift-2]

1. $x^2+3x+2=0$
2. $x^2+x-2=0$
3. $x^2+x-6=0$
4. $x^2-x-6=0$

133. If the solution of the system of simultaneous equations $\frac{1}{x}+\frac{2}{y}-\frac{3}{z}-1=0$, $\frac{2}{x}-\frac{4}{y}+\frac{3}{z}-1=0$ and $\frac{3}{x}+\frac{6}{y}-\frac{6}{z}-4=0$ is $x=\alpha, y=\beta, z=\gamma$ then $\alpha^2+\gamma^2=$

[AP EAMCET 05-07-2022_Shift-2]

1. 5β
2. β^2
3. 3β
4. $2\beta^2$

134. If $A=\begin{bmatrix}3 & 4\\ 5 & 6\end{bmatrix}$ and $B=\begin{bmatrix}x & 0\\ 0 & y\end{bmatrix}, x, y \in N$, then

[AP EAMCET 06-07-2022_Shift-1]

1. There is exactly one such matrix B such that AB = I
2. There is no matrix B such that AB = BA
3. There exists only a finite number of matrices B such that AB = BA
4. There exist infinite number of matrices B such that AB = BA

135. If A and B are symmetric matrices of same order such that

$AB+BA=X$ and $AB-BA=Y$, then $(XY)^T=$

[AP EAMCET 06-07-2022_Shift-1]

1. XY
2. X^TY^T
3. $-YX$
4. $-Y^TX^T$

136. If the ranks of the matrices

$A=\begin{bmatrix}1 & 0 & 1\\ 2 & 1 & 2\\ 1 & 0 & -1\end{bmatrix}$ and $B=\begin{bmatrix}1 & 2 & 3 & 4\\ 2 & 4 & 6 & -8\end{bmatrix}$ are

r_1 and r_2 respectively then $r_1-r_2=$

[AP EAMCET 06-07-2022_Shift-1]

1. 0
2. 1
3. 2
4. 3

137. If $A=\begin{bmatrix}1 & 1 & 3\\ 1 & 7 & 9\\ 2 & 3 & 7\end{bmatrix}$ then $Tr\left(A^2-A\right)=$

[AP EAMCET 06-07-2022_Shift-1]

1. 0
2. -12
3. 152
4. 125

138. If A= $\begin{bmatrix}x & 1 & 2\\ 2 & 4 & x\\ -3 & 3 & 2\end{bmatrix}$ is a singular matrix and the distinct values of x are x_1 and x_2, then $x_1+x_2+x_1x_2=$ **[AP EAMCET 06-07-2022_Shift-2]**

1. 9
2. 11/3
3. 15/3
4. 7

139. If the system of simultaneous linear equations 3x-4y+kz+13 =0, x+2y-z-9=0 and kx-y+3z+7=0 has a unique solution x= α, $y=\beta, z=\gamma$ for k $\neq$ m and $2\beta-\gamma=8$ then α+m=

[AP EAMCET 06-07-2022_Shift-2]

1. 10
2. 8
3. 5
4. 9

140. If A = $\begin{bmatrix}\sin\alpha & -\cos\alpha\\ \cos\alpha & \sin\alpha\end{bmatrix}$ and $A+A^{-1}=I$ then $\alpha=$

[AP EAMCET 06-07-2022_Shift-2]

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

141. Let $A=\begin{bmatrix}1 & 0 & -1 & -3\\ 0 & 1 & 1 & k-1\\ 0 & 0 & k-1 & 1\end{bmatrix}$ and $k \in \mathbf{R}$ Then the value of k, if exists, for which the rank of A is 2, is

[AP EAMCET 06-07-2022_Shift-2]

1. 1
2. 1/3
3. Does not exist
4. 1,1/3

142. If the system of simultaneous linear equations x + y − z = 6, 3x − y + z = 2 and x + ky + z = -8 has a unique solution x=2,y= β ,z= γ then the value of k satisfies the following quadratic equation **[AP EAMCET 07-07-2022_Shift-1]**

1. $x^2-5x+6=0$
2. $x^2+x-6=0$
3. $x^2-x-6=0$
4. $x^2+x-2=0$

143. If A= $\begin{bmatrix}x & 2 & 1\\ 2 & x & 1\\ 2 & 1 & 0\end{bmatrix}$ and $\det\left(A^3\right)=125$, then $x=$

[AP EAMCET 07-07-2022_Shift-1]

1. $\frac{1}{3}$
2. 3
3. $-\frac{1}{3}$
4. -3

144. Let $A=\begin{bmatrix}1 & 2\\ -2 & 1\end{bmatrix}$ and $B^{-1}=\begin{bmatrix}1 & 1\\ 0 & 2\end{bmatrix}$. If $\left(AB^{-1}\right)^{-1}=\begin{bmatrix}a & b\\ c & d\end{bmatrix}$ then 2b+5c+10d=

[AP EAMCET 07-07-2022_Shift-1]

1. 0
2. 1
3. -1
4. 2

145. Let $A=\begin{bmatrix}n & 0 & 0\\ 0 & n & 0\\ 0 & 0 & n\end{bmatrix}$ and $B=\begin{bmatrix}0 & 0 & n\\ 0 & n & 0\\ n & 0 & 0\end{bmatrix}$. Then $A^2+B^2+AB=$

[AP EAMCET 07-07-2022_Shift-1]

1. n(nI+nB+B)
2. n(2nI+B)
3. n^2(2I+B)
4. n(nI+nA+B)

146. Let $A=\begin{bmatrix}b^2+c^2 & a^2 & a^2\\ b^2 & c^2+a^2 & b^2\\ c^2 & c^2 & a^2+b^2\end{bmatrix}$. If $a=\sin\frac{\pi}{6}, b=\cos\frac{\pi}{4}\, and\, c=\cot\frac{\pi}{2}$ then A is

[AP EAMCET 07-07-2022_Shift-2]

1. Symmetric matrix
2. Skew-symmetric matrix
3. Singular matrix
4. Non-singular matrix

147. If a matrix A satisfies the equation $A^3-6A^2+11A-6I=0$, then A^{-1} can be

[AP EAMCET 07-07-2022_Shift-2]

1. $\frac{1}{4}I$
2. 4I
3. 3I
4. $\frac{1}{3}I$

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

[AP EAMCET 07-07-2022_Shift-2]

1. 0
2. 1
3. 2
4. 3

149. If $A=\begin{bmatrix}1 & -2 & 2\\ 2 & -6 & 5\\ 5 & 0 & 4\end{bmatrix}$ then Adj A=

[AP EAMCET 07-07-2022_Shift-2]

1. $\begin{bmatrix}-24 & 8 & 2\\ 17 & -6 & -1\\ 30 & -10 & 2\end{bmatrix}$
2. $\begin{bmatrix}-24 & 8 & 2\\ 17 & -6 & 1\\ -30 & 10 & -2\end{bmatrix}$
3. $\begin{bmatrix}-24 & 8 & 2\\ 17 & -6 & -1\\ 30 & -10 & -2\end{bmatrix}$
4. $\begin{bmatrix}24 & -8 & 2\\ -17 & -6 & 1\\ 30 & -10 & -2\end{bmatrix}$

150. If the system of simultaneous linear equations $x+y+z=\lambda, 5x-y+\mu z=10$ and $2x+3y-z=6$ has unique solution, then

[AP EAMCET 08-07-2022_Shift-1]

1. $\mu=23\ and\ \lambda\in R$
2. $\mu\in R\ and\ \lambda\neq 23$
3. $\mu\neq 23\ and\ \lambda\in R$
4. $\mu=23\ and\ \lambda=16$

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

[AP EAMCET 08-07-2022_Shift-1]

1. 21A
2. -42A
3. $7A^{-1}$
4. 14 (Adj A)

152. If $A=\begin{bmatrix}0 & 1 & 2 & 3 & 4\\ 0 & 2 & 4 & 8 & 12\\ 0 & 0 & 0 & 4 & 8\end{bmatrix}$, then the rank of A is

[AP EAMCET 08-07-2022_Shift-1]

1. 1
2. 2
3. 3
4. 4

153. The set of values of k for which the system of simultaneous equations x + y + kz = 1, 2x + 2y = 3 and x + 2y + 2kz = k has no real solution is

[AP EAMCET 08-07-2022_Shift-1]

1. {0}
2. R – {0}
3. {2}
4. {-1, 0, 1}

154. If A and B are $n\times n$ square matrices such that

$(2A+B)^2+(A-3B)^2=5A^2-2AB+10B^2$, then ABAB = **[AP EAMCET 08-07-2022_Shift-2]**

1. $\frac{1}{2}\left[(A-B)^2+(A+B)^2\right]$
2. 4AB
3. $\frac{1}{2}\left[(A+B)^2-(A-B)^2\right]$
4. A^2B^2

155. If $\begin{pmatrix}5 & a & -7\\ b & -7 & c\\ -7 & d & -1\end{pmatrix}$ is the adjoint of the matrix $\begin{pmatrix}1 & 2 & 3\\ 2 & 3 & 1\\ 3 & 1 & 2\end{pmatrix}$, then a + b + c + d =

[AP EAMCET 08-07-2022_Shift-2]

1. 8
2. 10
3. 0
4. 2

156. The rank of the matrix A=$\begin{bmatrix}1 & -1 & 0 & -2\\ -4 & 4 & 0 & 8\\ -2 & 1 & 2 & 4\end{bmatrix}$ is

[AP EAMCET 08-07-2022_Shift-2]

1. 1
2. 0
3. 3
4. 2

157. If $A=\begin{bmatrix}1 & 1 & a+1\\ 1 & a+1 & 1\\ a+1 & 1 & 1\end{bmatrix}$ is not an inevertible matrix, then the sum of all the value of a is

[AP EAMCET 08-07-2022_Shift-2]

1. -3
2. -1
3. 1
4. 0

158. Let $A=\begin{bmatrix}a & 3 & 5\\ 5 & -1 & 3\\ 2 & 3 & -4\end{bmatrix}$ and $B=\begin{bmatrix}b & 1 & 4\\ 4 & c & 1\\ -3 & 1 & d\end{bmatrix}$. If the trace of A is -4 and $AB=\begin{bmatrix}-1 & 0 & 17\\ -3 & 10 & 25\\ 28 & -8 & 3\end{bmatrix}$

then a + b + c + d =

[TS EAMCET 18-07-2022_Shift-1]

1. 7
2. -1
3. 3
4. 1

159. $\begin{vmatrix}1 & 1 & 1\\ a^2 & b^2 & c^2\\ a^3 & b^3 & c^3\end{vmatrix}=$

[TS EAMCET 18-07-2022_Shift-1]

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

160. Let α,β,γ be real numbers. If A = $\begin{pmatrix}7 & 3 & \alpha\\ \beta & 1 & -11\\ -5 & \gamma & 19\end{pmatrix}$ is a 3 x 3 matrix satisfying $A\begin{pmatrix}5\\ -13\\ 11\end{pmatrix}=\begin{pmatrix}-290\\ -119\\ 210\end{pmatrix}$, then $(adj\ A)^{-1}+adj\ A^{-1}=$

[TS EAMCET 18-07-2022_Shift-1]

1. A
2. -A
3. 2A
4. -2A

161. If $(\alpha\beta\gamma)\begin{pmatrix}1 & 2 & 3\\ 2 & 3 & -5\\ 1 & 2 & 5\end{pmatrix}=(3\ 5\ 2)$ then $\alpha^3+\beta^3+\gamma^3=$

[TS EAMCET 18-07-2022_Shift-1]

1. 8
2. -6
3. 6
4. -10

162. If $A+B=\begin{bmatrix}2 & 1 & 2\\ 1 & 2 & 0\\ 0 & 2 & 2\end{bmatrix}$, $AB=\begin{bmatrix}1 & 2 & 2\\ 1 & 1 & 0\\ 1 & 2 & 1\end{bmatrix}$ then $A^2+B(A+B)=$

[TS EAMCET 18-07-2022_Shift-2]

1. $\begin{bmatrix}4 & 6 & 6\\ 3 & 4 & 2\\ 1 & 6 & 3\end{bmatrix}$
2. $\begin{bmatrix}4 & 9 & 6\\ 3 & 3 & 2\\ 4 & 7 & 4\end{bmatrix}$
3. $\begin{bmatrix}6 & 10 & 8\\ 4 & 5 & 2\\ 4 & 9 & 6\end{bmatrix}$
4. $\begin{bmatrix}3 & 4 & 4\\ 2 & 3 & 2\\ 0 & 4 & 2\end{bmatrix}$

163. A, P, B are 3×3 matrices. If $|-B|=5, |BA^T|=15, |P^T AP|=-27$, then one of the values of $|P|$ is

[TS EAMCET 18-07-2022_Shift-2]

1. 3
2. -5
3. 9
4. 6

164. If A is a 3×3 matrix and $|A|=\frac{1}{2}$ then $\left|A^{-1}\left(Adj\left(AdjA\right)\right)\right|^{-1}=$

[TS EAMCET 18-07-2022_Shift-2]

1. 8
2. $\frac{1}{8}$
3. $\frac{1}{2}$
4. 2

165 Let $x=\alpha, y=\beta, z=\gamma$ be the unique solution of the system of simultaneous linear equations $2x+3y-2z+4=0, 3x-4y+3z+5=0$, $kx-2y+z+3=0$. If $\alpha=-2$ then k =

[TS EAMCET 18-07-2022_Shift-2]

1. $\begin{vmatrix}1 & 2\\3 & 5\end{vmatrix}$
2. $\begin{vmatrix}5 & 3\\1 & 2\end{vmatrix}$
3. $\begin{vmatrix}3 & 5\\1 & 2\end{vmatrix}$
4. $\begin{vmatrix}3 & 5\\2 & 1\end{vmatrix}$

166. If $\begin{bmatrix}0 & 2 & a\\b & 0 & 4\\-3 & c & 0\end{bmatrix}$ is a skew-symmetric matrix, then $\begin{bmatrix}a & b\\b & a\end{bmatrix}\begin{bmatrix}b & c\\c & b\end{bmatrix}=$

[TS EAMCET 19-07-2022_Shift-I]

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

167. If $\begin{bmatrix}-1 & 2 & b\\a & 5 & 6\\3 & c & 7\end{bmatrix}$ is a symmetric matrix then $\begin{vmatrix}a & b & c\\b & c & a\\c & a & b\end{vmatrix}=$

[TS EAMCET 19-07-2022_Shift-I]

1. 0
2. -121
3. 143
4. -143

168. If the matrix $A=\begin{bmatrix}1 & 2 & 2\\2 & 1 & 2\\2 & 2 & 1\end{bmatrix}$ satisfies the matrix equation $A^2-4A-5I=0$, then $A^{-1}=$

[TS EAMCET 19-07-2022_Shift-I]

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

169. Consider the simultaneous linear equations AX=B and AY=Q. If A is an invertible matrix and B is the unique solution of AY=Q, then the solution of AX=B is

[TS EAMCET 19-07-2022_Shift-I]

1. $A^{-1}(B+Q)$
2. $(A^{-1})^2 B$
3. $A^{-1}BQ$
4. $(A^{-1})^2 Q$

170. Let A=$\begin{pmatrix}0 & 1\\1 & k\end{pmatrix}, k\in R$ and A^3=$\begin{pmatrix}a & b\\c & d\end{pmatrix}$. If d=228, then b+c =

[TS EAMCET 19-07-2022_Shift-2]

1. 52
2. 74
3. 2
4. 100

171. Let A,B be two 3 x 3 matrices and C be a 3 x 3 unit matrix such that AB–C is a non–singular matrix. Let $D=(AB-C)^{-1}$. Then consider the following statements .

Statement–I: det (BA) =det(BA–C) det (BDA)

Statement–II: ABD =DAB

Which of the above statements is (are) true ?

[TS EAMCET 19-07-2022_Shift-2]

1. Statement I is true, but statement II is false
2. Statement II is true, but statement I is false
3. Both statement I and statement II are true
4. Both statement I and statement II are false

172. $Let\ A=\begin{bmatrix}0 & 0 & -1\\ 0 & -1 & 0\\ -1 & 0 & 0\end{bmatrix} B=\begin{bmatrix}0 & 1 & 0\\ 1 & 0 & 0\\ 0 & 0 & 1\end{bmatrix}$ then

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

[TS EAMCET 19-07-2022_Shift-2]

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

173. Let α,β,γ be real numbers. If

$\begin{pmatrix}7 & 5 & \alpha\\ \beta & 2 & 11\\ 3 & \gamma & 1\end{pmatrix}\begin{pmatrix}1\\ 3\\ 2\end{pmatrix}=\begin{pmatrix}\alpha+\beta\\ -2\alpha+\beta-2\gamma\\ \alpha+2\beta+3\gamma\end{pmatrix}$ then

$100+\dfrac{2\alpha+11\beta}{\gamma}=$

[TS EAMCET 19-07-2022_Shift-2]

1. 27
2. –25
3. 225
4. –227

174. If $A=\begin{bmatrix}1 & 2 & 3\\ 4 & 3 & 2\\ 3 & 4 & 5\end{bmatrix}$ then $\left(A+A^T\right)\left(A-A^T\right)=$

[TS EAMCET 20-07-2022_Shift-1]

1. $4\begin{bmatrix}3 & 2 & -3\\ 3 & 0 & -3\\ 3 & 2 & -3\end{bmatrix}$
2. $\begin{bmatrix}12 & 8 & 12\\ 12 & 0 & 12\\ 12 & 8 & 12\end{bmatrix}$
3. $4\begin{bmatrix}3 & -2 & -3\\ 3 & 0 & -3\\ 3 & -2 & -3\end{bmatrix}$
4. $\begin{bmatrix}-12 & 8 & 12\\ -12 & 0 & 12\\ -12 & 8 & 12\end{bmatrix}$

175. If $f(x)=\begin{vmatrix}x & x+1 & x+3\\ x+2 & x+4 & x+7\\ x+6 & x+9 & x+13\end{vmatrix}$, then f(5)=

[TS EAMCET 20-07-2022_Shift-1]

1. –15
2. 10
3. –2
4. 0

176. Let $A=\begin{pmatrix}2 & 1 & 1\\ 0 & 1 & 0\\ 1 & 1 & 2\end{pmatrix}$. If $A^{-1}=\alpha A^2+\beta A+\gamma I$,

where α,β,γ are real numbers and I is a 3×3 identity matrix, then $17\alpha+5\beta+\gamma=$

[TS EAMCET 20-07-2022_Shift-1]

1. –1
2. $\dfrac{-1}{3}$
3. $\dfrac{2}{3}$
4. 3

177. For a system of simultaneous linear equations,

if $AX=\begin{bmatrix}1\\ 1\\ 2\end{bmatrix}$, $Adj\ A=\begin{bmatrix}1 & -1 & -1\\ 1 & 1 & -1\\ 1 & 1 & 1\end{bmatrix}$ and det

A>0, then X=

[TS EAMCET 20-07-2022_Shift-1]

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

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

178. If A is a 2×2 matrix such that det A = –21 and trace of A^3 is 2024, then the trace of A is

[TS EAMCET 20-07-2022_Shift-2]

1. 6 2. 11
3. 12 4. 13

179. If $\begin{bmatrix}a & b & c\\ d & e & f\\ g & h & i\end{bmatrix}$ is skew symmetric matrix and b, c, f are non-zero real numbers then $\frac{b}{c} =$

[TS EAMCET 20-07-2022_Shift-2]

1. $\frac{dh}{fg}$ 2. $\frac{df}{gh}$

3. $\frac{-df}{gh}$ 4. $\frac{-dh}{fg}$

180. In the matrix $\begin{bmatrix}-1 & x & 3\\ -4 & -5 & -6\\ -7 & y & 9\end{bmatrix}$, if the cofactors of –6 and –7 respectively 22 and 27, then $5x+y=$

[TS EAMCET 20-07-2022_Shift-2]

1. 0 2. –1
3. –2 4. –4

181. If $S=\begin{bmatrix}0 & 1 & 1\\ 1 & 0 & 1\\ 1 & 1 & 0\end{bmatrix}$ and $A=\frac{1}{2}\begin{bmatrix}b+c & c-a & b-a\\ c-b & c+a & a-b\\ b-c & a-c & a+b\end{bmatrix}$, then $SAS^{-1}=$ **[15th May 2023 Shift 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. $\begin{bmatrix}a & b & c\\ b & c & a\\ c & a & b\end{bmatrix}$

182. 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

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 **[15th May 2023 Shift 1]**

1. $A^2+B^2+C^2=3A^2B^2C^2$
2. $A^2+B^2+C^2=3ABC$
3. $A^2+B^2+C^2=3I$
4. $A^2+B^2+C^2=2ABC$

183. If the cofactors of the elements 3,7 and 6 of the matrix $\begin{bmatrix}1 & 2 & 3\\ 4 & -1 & 7\\ 2 & 4 & 6\end{bmatrix}$ are a,b and c respectively, then $[a\,b\,c]\begin{bmatrix}1\\4\\2\end{bmatrix}+[a\,b\,c]\begin{bmatrix}3\\7\\6\end{bmatrix}=$

[15th May 2023 Shift 2]

1. -1 2. 1
3. 0 4. 3

184. Let $B=\begin{bmatrix}2 & 6 & 4\\ 1 & 0 & 1\\ -1 & 1 & -1\end{bmatrix}$ and $C=\begin{bmatrix}-1 & 0 & 1\\ 1 & 1 & 3\\ 2 & 0 & 2\end{bmatrix}$. If a matrix A is such that BAC=I. then $A^{-1}=$

[15th May 2023 Shift 2]

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

185. If det(AB) =(det A) (det B) and A is a non-singular matrix of order 3×3 , then det (adj A)=

[15th May 2023 Shift 2]

1. $\det(A)$
2. $(\det(A))^{-1}$
3. $(\det(A))^{2}$
4. $(\det(A))^{3}$

186. If A=$\left\{\begin{pmatrix} a & b \\ c & d \end{pmatrix}: a,b,c,d\in\{-1,1\}\right\}$, then the number of singular matrices in A is

[15th May 2023 Shift 2]

1. 9
2. 12
3. 10
4. 8

187. If there exists a kth order non-singular sub matrix in a matrix P of order m × n, then the rank(ρ) of P **[16th May 2023 Shift 1]**

1. Satisfies $k\le\rho\le m$
2. Satisfies $k<\rho<n$
3. $k\le\rho\le\min\{m,n\}$
4. Is equal to k +1

188. $If\ A=\begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \end{bmatrix} and\ B=\begin{bmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \end{bmatrix}$

then which one of the following is True?

[16th May 2023 Shift 1]

1. $A^TBB^TA=B^TAA^TB$
2. The order of $A^TBB^TA\ and B^TAA^T are equal$
3. The order of A + B,A^TB, BA^T are equal
4. Rank of A and B are equal

189. In a matrix A, if all the sub matrices of kth order are singular and there is one non-singular sub matrix of order r $(r<k)$, *then the rank* (ρ) of the matrix A

[16th May 2023 Shift 1]

1. Satisfies $r\le\rho<K$
2. Is equal to r
3. Is equal to $(k-1)$
4. Is equal to $(k+1)$

190. Let $A=\begin{pmatrix} -\cot\theta & \operatorname{cosec}\theta \\ \operatorname{cosec}\theta & -\cot\theta \end{pmatrix}$, If $A^{-1}+A=0$ at $\theta=\theta_2$, then which one of the following is True?

[16th May 2023 Shift 2]

1. $\theta_1=\frac{\pi}{2},\theta_2=\pi$
2. $\theta_1=\frac{\pi}{2}$, such θ_2 does not exist
3. $\theta_1=\frac{\pi}{4},\theta_2=\frac{\pi}{2}$
4. such θ_1 does not exist, $\theta_2=\pi$

191. A matrix whose elements a_{ij} are defined by

$a_{ij}=\frac{1}{3}|i-5j|, i,j=1,2,3$ is

[16th May 2023 Shift 2]

1. $\begin{bmatrix} 4 & 3 & \frac{14}{3} \\ 1 & \frac{-8}{3} & 13 \\ \frac{2}{3} & \frac{7}{3} & 4 \end{bmatrix}$
2. $\begin{bmatrix} 4 & 3 & \frac{14}{3} \\ 1 & \frac{8}{3} & 13 \\ \frac{2}{3} & \frac{7}{3} & 4 \end{bmatrix}$
3. $\begin{bmatrix} \frac{4}{3} & 3 & \frac{10}{3} \\ 1 & \frac{8}{3} & \frac{13}{3} \\ 2 & 7 & 4 \end{bmatrix}$
4. $\begin{bmatrix} 4 & 3 & 10 \\ 1 & 8 & 13 \\ 2 & 7 & 4 \end{bmatrix}$

192. If P,Q and R are 3x3 matrices such that

$$\begin{pmatrix} 3x^2+x+3 & 2x^2-x+4 & 7x^2+8x+5 \\ 5x^2+3x+2 & 4x^2-2x-1 & 7x^2+5x+8 \\ 3x^2+2x+5 & 4x^2-x-2 & 3x^2+8x+7 \end{pmatrix}=Px^2+Qx+R,$$

then det R=

[16th May 2023 Shift 2]

1. 0
2. 136
3. 48
4. −72

193. If A= $\begin{bmatrix} 1 & 1 & 3 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{bmatrix}$, then $A+A^3+A^4+A^5+3I=$

[17th May 2023 Shift 1]

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

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

194. If the solution for the system of equations $x+2y-z=3, 3x-y+2z=1$ and $2x-2y+3z=2$ is (α,β,γ), then $\alpha^2+\beta^2+\gamma^2=$

[17th May 2023 Shift 1]

1. 33 2. 5
3. 17 4. 14

195. If $[x\ \ 4\ \ -1]\begin{bmatrix} 2 & 1 & 0 \\ 1 & 0 & 2 \\ 0 & 2 & 4 \end{bmatrix}\begin{bmatrix} x \\ 4 \\ -1 \end{bmatrix}=0$, then $x=$

[17th May 2023 Shift 1]

1. $-1+\sqrt{6}$ 2. $8\pm\sqrt{5}$
3. $-2\pm\sqrt{10}$ 4. $3\pm\sqrt{6}$

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

[17th May 2023 Shift 2]

1. $A-2A^2$ 2. $2A-A^2$
3. $2A^2+A$ 4. $2A+A^2$

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

[17th May 2023 Shift 2]

1. 3 2. 2
3. 4 4. 1

198. If matrix D_1=diag(a,b,c), matrix D_2=diag(3,3,3) and A is a Skew symmetric matrix of 3rd order, then $Tr(D_1D_2A+D_1D_2+D_1A+D_2A)-Tr(D_1+D_2)=$

[17th May 2023 Shift 2]

1. 2a+2b+2c–9 2. 3a+3b+3c–9
3. 3a+3b+3c 4. $a^3+b^3+c^3$

199. If $\begin{pmatrix} \alpha \\ \beta \\ \gamma \end{pmatrix}=\begin{pmatrix} \cos\theta & -\sin\theta & 0 \\ \sin\theta & \cos\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}\begin{pmatrix} x \\ y \\ z \end{pmatrix}$, then $\frac{x^2+y^2+z^2}{\gamma}$

[18th May2023 shift -1]

1. $\frac{\alpha^2+\beta^2+\gamma^2}{z}$ 2. 0
3. $\alpha\beta+\beta\gamma+\gamma\alpha$ 4. $1+\alpha^2+\beta^2+\gamma^2$

200. If $A=\begin{pmatrix} 1 & 5 & 3 \\ 2 & 4 & 0 \\ 3 & -1 & -5 \end{pmatrix}, B=\begin{pmatrix} -1 \\ -2 \\ 4 \end{pmatrix}$ and $[x\ y\ z]A^T=B^T$, then x +y +z = **[18th May2023 shift -1]**

1. 4 2. - 2
3. 6 4. 3

201. If A and B are non-singular matrices and det (AB) = (det A)(det B), then ((det A) (det B)) $B^{-1}A^{-1}$ = **[18th May2023 shift -1]**

1. Adj (BA) 2. Adj(A)+Adj(B)
3. Adj (AB) 4. (Adj B)(Adj A)

202. If A = $\begin{bmatrix} 2 & 0 & -3 \\ 4 & 3 & 1 \\ -5 & 7 & 2 \end{bmatrix}$ is expressed as a sum of a symmetric matrix P and skew symmetric matrix Q, then $P^T-Q^T=$

[18th May 2023 Shift 2]

1. $\begin{bmatrix} 8 & -16 & -4 \\ 2 & 8 & 7 \\ 6 & 14 & -16 \end{bmatrix}$ 2. $\begin{bmatrix} 2 & 0 & -3 \\ 4 & 3 & 1 \\ -5 & 7 & 2 \end{bmatrix}$

3. $\begin{bmatrix} 2 & 4 & -5 \\ 0 & 3 & 7 \\ -3 & 1 & 2 \end{bmatrix}$ 4. $\begin{bmatrix} 1 & 0 & \frac{-3}{2} \\ 2 & \frac{3}{2} & \frac{1}{2} \\ \frac{-5}{2} & \frac{7}{2} & 1 \end{bmatrix}$

203. If A+2B = $\begin{bmatrix} 1 & 2 & 0 \\ 6 & -3 & 3 \\ -5 & 3 & 1 \end{bmatrix}$ and 2A-B= $\begin{bmatrix} 2 & -1 & 5 \\ 2 & -1 & 6 \\ 0 & 1 & 2 \end{bmatrix}$, then Tr[A]-Tr[B]=

[18th May 2023 Shift 2]

1. 1
2. 2
3. 3
4. 4

204. The sum of the distinct values of x for which the matrix A= $\begin{bmatrix} 1 & 1 & X \\ 1 & X & 1 \\ X & 1 & 1 \end{bmatrix}$ has no inverse, is

[18th May 2023 Shift 2]

1. 4
2. 3
3. 2
4. -1

205. The number of ordered pairs (x, y) for which $A = \begin{pmatrix} 1 & 2 & 1 \\ 2 & 2 & x \\ y & 1 & 2 \end{pmatrix}$ is a singular and symmetric matrix is

[19th May 2023 Shift 1]

1. 1
2. 0
3. 2
4. 3

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

[19th May 2023 Shift 1]

1. $\begin{bmatrix} 2 & 1 & 6/5 & 7/5 \\ 1 & 7/5 & 2 & 3/5 \end{bmatrix}$
2. $\begin{bmatrix} -2 & 1 & 6/5 & 7/5 \\ 1 & -7/5 & 2 & 3/5 \end{bmatrix}$
3. $\begin{bmatrix} -2 & 1 & 6/5 & 7/5 \\ 1 & 7/5 & 2 & 3/5 \end{bmatrix}$
4. $\begin{bmatrix} 2 & 1 & 6/5 & 7/5 \\ 1 & -7/5 & 2 & 3/5 \end{bmatrix}$

207. The rank of the matrix $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & -2 \\ 1 & -1 & 4 \\ 2 & 2 & 8 \end{bmatrix}$ is

[19th May 2023 Shift 1]

1. 2
2. 1
3. 3
4. 4

208. Let $A = \begin{pmatrix} 0 \\ -6 \\ 8 \end{pmatrix}, B = \begin{pmatrix} 3 & 5 & -7 \\ 0 & -1 & 8 \\ 6 & -1 & 0 \end{pmatrix}$ and $X = \begin{pmatrix} x \\ y \\ z \end{pmatrix}$.

If $D = [\alpha \ \beta \ \gamma]^T$ is the solution of $X^T B^T = A^T$, then $D^T A =$ **[15th May 2023 Shift 1]**

1. 0
2. 4
3. -2
4. 6

209. If P is a non-singular matrix such that I + P + P^2 +... + P^n = O(O denotes the null matrix), then P^{-1} = **[12TH MAY 2023 SHIFT-1]**

1. P^n
2. $-P^n$
3. $-\left(1 + P + ... + P^n\right)$
4. $-\left(1 + P + ... + P^{n-1}\right)$

210. P is a 3 x 3 square matrix and $Tr(P) \neq 0$. If

$Tr(P - P^T) + Tr(P + P^T) + \frac{Tr(P)}{Tr(P^T)} +$

$Tr(P) \times Tr(P^T) = 0 \, then \, Tr(P) =$

[12TH MAY 2023 SHIFT-1]

1. 0
2. -1
3. 4
4. 3

211. If the system of equation $x + ky + 3z = -2, 4x + 3y + kz = 14,\ 2x + y + 2z = 3$ can be solved matrix inversion method then

[12TH MAY 2023 SHIFT-1]

1. $k \neq 0 \, and \, \frac{9}{2}$
2. $k = 0 \, or \, \frac{9}{2}$
3. $k \neq \frac{1}{2} \, and \, 2$
4. $k = \frac{1}{2} \, or \, 2$

212. If A = $\begin{bmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{bmatrix}$ and $\det(A^2) = 25, then \, |\alpha| =$

[12TH MAY 2023 SHIFT-1]

1. 5
2. 5^2
3. 1
4. $\frac{1}{5}$

213. $\begin{vmatrix} \sqrt{3} & 2\sqrt{5} & \sqrt{5} \\ \sqrt{15} & 5 & \sqrt{10} \\ 3 & \sqrt{15} & 5 \end{vmatrix} =$

[12TH MAY 2023 SHIFT -2]

1. $5\sqrt{2} - 3\sqrt{3}$
2. $5\sqrt{3} - 3\sqrt{5}$
3. $10\sqrt{3} - 15\sqrt{2}$
4. $15\sqrt{2} - 25\sqrt{3}$

214. If A is a non-singular matrix such that $(A-2I)(A-3I)=0$, then $\frac{1}{5}A+\frac{6}{5}A^{-1}=$

[12TH MAY 2023 SHIFT -2]

1. 0
2. I
3. 2I
4. 3I

215. Let A be a matrix such that AB is scalar matrix where B= $\begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix}$ and det(3A)=27.

Then $3A^{-1}+A^2=$ **[12TH MAY 2023 SHIFT -2]**

1. $\begin{bmatrix} 4 & -6 \\ 0 & 2 \end{bmatrix}$
2. $\begin{bmatrix} 9 & -4 \\ 0 & 3 \end{bmatrix}$
3. $\begin{bmatrix} 10 & -6 \\ 0 & 2 \end{bmatrix}$
4. $\begin{bmatrix} 10 & -6 \\ 0 & 4 \end{bmatrix}$

216. If A is a symmetric matrix with real entries, then **[12TH MAY 2023 SHIFT -2]**

1. A^{-1} is symmetric, if it exist
2. A^{-1} always exists and is symmetric
3. A^{-1} is skew symmetric, if it exists
4. A^{-1} always exists and is skew-symmetric

217. If $A=\begin{bmatrix} 1 & 2 & -1 \\ -1 & 0 & 2 \\ 1 & 2 & 0 \end{bmatrix}$ and $B=\begin{bmatrix} -3 & -2 & 4 \\ 2 & 2 & -1 \\ -2 & 0 & 3 \end{bmatrix}$,

then $A^2=$ **[13TH MAY 2023 SHIFT-1]**

1. A-B
2. B-A
3. A+B
4. B^2

218. $\begin{vmatrix} 2 & 3 & 5 \\ 3 & 5 & 2 \\ 5 & 2 & 3 \end{vmatrix}+\begin{vmatrix} 1 & 1 & 1 \\ 7 & 11 & 13 \\ 49 & 121 & 169 \end{vmatrix}=$

[13TH MAY 2023 SHIFT-1]

1. 32
2. -67
3. 93
4. -22

219. $A=\begin{bmatrix} k & 5 & 2 \\ 2 & -k & 5 \\ 5 & 2 & -k \end{bmatrix}$ and $\det A=190$ then $AdjA=$

[13TH MAY 2023 SHIFT-1]

1. $\begin{bmatrix} -1 & 19 & 31 \\ 31 & -19 & -11 \\ 19 & 19 & -19 \end{bmatrix}$
2. $\begin{bmatrix} -1 & 31 & 19 \\ 19 & -19 & 19 \\ 31 & -11 & -19 \end{bmatrix}$
3. $\begin{bmatrix} -1 & 19 & 31 \\ -31 & -19 & -11 \\ 19 & 19 & -19 \end{bmatrix}$
4. $\begin{bmatrix} -1 & -31 & 19 \\ 19 & -19 & 19 \\ 31 & -11 & -19 \end{bmatrix}$

220. If the unique solution of the simultaneous linear equations

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

$x+4y+3z=k$ is $x=\alpha, y=\beta, z=3$

then $k=$

[13TH MAY 2023 SHIFT-1]

1. 1
2. 2
3. -1
4. -2

221. Let $X=\left\{\begin{bmatrix} a & b \\ c & d \end{bmatrix} / a,b,c,d\in R\right\}$. If $f:X\to R$ is defined by $f(A)=\det(A)\forall A\in X$, then f is

[EAPCET 14-05-23 SHIFT-1]

1. One-one but not onto
2. Onto but not one -one
3. One –one and onto
4. Neither one –one nor onto

222. If A is square matrix of order3, then $\left|Adj\left(Adj\ A^2\right)\right|=$

[EAPCET 14-05-23 SHIFT-1]

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

223. If A and B are two square matrices of the same order and $(AB+BA)^T+(AB-BA)^T=2BA$ then **[EAPCET 14-05-23 SHIFT-1]**

1. A and B are both symmetric matrices but not skew –symmetric matrices
2. A and B both skew-symmetric matrices but not symmetric matrices
3. A and B are neither symmetric nor skew-symmetric matrices
4. A and B are any two non zero matrices

224. If $adj\begin{bmatrix}1 & 0 & 2\\ -1 & 1 & -2\\ 0 & 2 & 1\end{bmatrix}=\begin{bmatrix}5 & m & -2\\ 1 & 1 & 0\\ -2 & -2 & n\end{bmatrix}$, then $m+n$

[EAPCET 14-05-23 SHIFT-1]

1. 2
2. -3
3. 5
4. -5

225. If $A=\begin{bmatrix}0 & 3\\ 0 & 0\end{bmatrix}$ and $f(x)=x+x^2+x^3+....+x^{2023}$,

then $f(A)+I=$

[EAPCET 14-05-23 SHIFT-1]

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

226. $if\ A=\begin{bmatrix}b & a & 0\\ c & 0 & b\\ a & a & b\end{bmatrix}$ $and\ B=\begin{bmatrix}0 & a & b\\ b & 0 & c\\ b & a & a\end{bmatrix}$ are two matrices such that AB = $\begin{bmatrix}2 & 2 & 7\\ 1 & 8 & 5\\ 3 & 6 & 10\end{bmatrix}$ then

$a^2+b^2+c^2=$

[EAPCET 13-05-23 SHIFT-2]

1. 14
2. 17
3. 22
4. 29

227. $If\ A=\begin{bmatrix}1 & a & 3\\ b & 2 & c\\ 3 & d & 4\end{bmatrix}$ is a symmetric matrix and

B = $\begin{bmatrix}0 & 5 & b\\ -5 & 0 & -7\\ 6 & c & 0\end{bmatrix}$ is a skew symmetric matrix,

then AB=

[EAPCET 13-05-23 SHIFT-2]

1. $\begin{bmatrix}48 & 27 & 48\\ 52 & 19 & 22\\ -59 & 43 & -67\end{bmatrix}$
2. $\begin{bmatrix}48 & 26 & 36\\ 32 & 19 & 22\\ -11 & 43 & -67\end{bmatrix}$
3. $\begin{bmatrix}12 & 26 & 36\\ 32 & 79 & 50\\ -11 & 43 & -67\end{bmatrix}$
4. $\begin{bmatrix}12 & 32 & 41\\ 32 & 19 & 22\\ -11 & 43 & -67\end{bmatrix}$

228. If the inverse of the matrix

$$A=\begin{bmatrix}-1 & -3 & -2\\ 0 & 1 & 2\\ 3 & 4 & 5\end{bmatrix}\ is\ A^{-1}=\begin{bmatrix}a_1 & a_2 & a_3\\ b_1 & b_2 & b_3\\ c_1 & c_2 & c_3\end{bmatrix},$$

$then\ a_1+c_2+b_3=$

[EAPCET 13-05-23 SHIFT-2]

1. -6
2. $\frac{-2}{3}$
3. 2/3
4. 6

229. If $x=\alpha,\ y=\beta,\ z=\gamma$ is the unique solution of the system of linear equations.

$2x-3y+5z=12, 5x+2y+3z=11$

$and\ x+2y-3z=-3\ then\ 2\alpha+5\beta+3\gamma=$

[EAPCET 13-05-23 SHIFT-2]

1. 10
2. 11
3. 3
4. 2

KEY

1)	3	2)	2	3)	4	4)	4	5)	1
6)	4	7)	1	8)	4	9)	2	10)	4
11)	3	12)	3	13)	1	14)	4	15)	4
16)	1	17)	3	18)	3	19)	4	20)	1
21)	4	22)	3	23)	2	24)	2	25)	3
26)	2	27)	3	28)	4	29)	1	30)	4
31)	1	32)	2	33)	1	34)	3	35)	3
36)	2	37)	4	38)	1	39)	3	40)	2
41)	1	42)	4	43)	2	44)	4	45)	3
46)	3	47)	2	48)	4	49)	3	50)	4
51)	4	52)	3	53)	3	54)	4	55)	4
56)	2	57)	3	58)	1	59)	4	60)	3
61)	4	62)	3	63)	3	64)	1	65)	2
66)	3	67)	3	68)	2	69)	3	70)	1
71)	1	72)	2	73)	2	74)	2	75)	3
76)	2	77)	3	78)	4	79)	3	80)	2
81)	4	82)	3	83)	2	84)	3	85)	2
86)	3	87)	1	88)	1	89)	2	90)	4
91)	2	92)	4	93)	2	94)	3	95)	1
96)	4	97)	3	98)	1	99)	4	100)	3
101)	4	102)	3	103)	4	104)	2	105)	2
106)	3	107)	4	108)	1	109)	4	110)	1
111)	4	112)	2	113)	2	114)	2	115)	2

116) 2	117) 3	118) 2	119) 2	120) 3
121) 1	122) 4	123) 1	124) 2	125) 3
126) 1	127) 3	128) 2	129) 3	130) 4
131) 1	132) 2	133) 1	134) 4	135) 3
136) 2	137) 3	138) 1	139) 2	140) 3
141) 3	142) 2	143) 1	144) 2	145) 2
146) 3	147) 4	148) 3	149) 3	150) 3
151) 2	152) 2	153) 1	154) 4	155) 1
156) 4	157) 1	158) 3	159) 2	160) 4
161) 1	162) 1	163) 1	164) 1	165) 3
166) 3	167) 4	168) 2	169) 4	170) 2
171) 3	172) 2	173) 1	174) 1	175) 3
176) 2	177) 1	178) 2	179) 4	180) 3
181)1	182)1	183)3	184)4	185)3
186)4	187)3	188)2	189)1	190)2
191)2	192)2	193)2	194)1	195)3
196)2	197)2	198)1	199)1	200)3
201)3	202)2	203)2	204)4	205)2
206)4	207)3	208)2	209)1	210)2
211)2	212)4	213)4	214)2	215)4
216)1	217)3	218)4	219)1	220)2
221)2	222)3	223)3	224)3	225)3
226)1	227)2	228)3	229)4	230)

SOLUTIONS

1. Given system of equations

$2x+5y+z=19; -4x+by+6z=-42;$

$-3y-bz=81$

Augmented matrix

$$[AD]=\begin{bmatrix}2 & 5 & 1 & 19\\ -4 & b & 6 & -42\\ 0 & -3 & -b & 81\end{bmatrix}$$

$R_2 : R_2+2R_1$

$$\sim\begin{bmatrix}2 & 5 & 1 & 19\\ 0 & 10+b & 8 & -4\\ 0 & -3 & -b & 81\end{bmatrix}$$

$R_2 : bR_2+8R_3$

$$\sim\begin{bmatrix}2 & 5 & 1 & 19\\ 0 & 10+b^2 & 8b & -4b\\ 0 & -24 & -8b & 648\end{bmatrix}$$

$R_3 : R_3+R_2$

$$\sim\begin{bmatrix}2 & 5 & 1 & 19\\ 0 & 10b+b^2 & 8b & -4b\\ 0 & b^2+10b-24 & 0 & 648-4b\end{bmatrix}$$

There is no solution

$\therefore$ Rank A $\neq$ Rank $[AD]$

$\Rightarrow b^2+10b-24=0$

$b=-12, b=2$

$product=(-12)2=-24$

2. Given

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

Find $M^{n+1}-M^n, for\ any\ n\in N$

For n=1,

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

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

3. Conceptual

4. $B^8=I$

$Then\ B^{2032}=I$

5. $$A=\begin{bmatrix}a+ib & c+id\\ -c+id & a-ib\end{bmatrix}$$

$$A^{-1}=\begin{bmatrix}a-ib & -c-id\\ c-id & a+ib\end{bmatrix}$$

$|A|=a^2+b^2+c^2+d^2$

$$A^{-1}=\frac{adjA}{|A|}=\frac{1}{a^2+b^2+c^2+d^2}\begin{bmatrix}a-ib & -c-id\\ c-id & a+ib\end{bmatrix}$$

$\therefore a^2+b^2+c^2+d^2=1$

6. $R_2\to R_2-R_1, R_3\to R_3-R_2$

$$\begin{vmatrix}k-2 & 2k-3 & 3k-4\\ -2 & -6 & -12\\ -6 & -24 & -60\end{vmatrix}=0$$

$$\Rightarrow\begin{vmatrix} k-2 & 2k-3 & 3k-4 \\ 1 & 3 & 6 \\ 1 & 4 & 10 \end{vmatrix}=0$$

$\Rightarrow k=4$

7. $NM^{10}N^{-1}=\frac{1}{2}\begin{bmatrix}1&0\\0&2\end{bmatrix}\begin{bmatrix}1&10\\0&1\end{bmatrix}\begin{bmatrix}2&0\\0&1\end{bmatrix}$

$=\begin{bmatrix}1&5\\0&1\end{bmatrix}$

8. $\left(A^{2n}\right)^T=A^{2n}$

$\Rightarrow A^{2n}$ *is symmetric*

and $\left(A^{2n+1}\right)^T=-A^{2n+1}$

$\Rightarrow A^{2n+1}$ *is skew-symmetric*

9. $|A|=0$ *and* $\begin{vmatrix}2&1\\0&3\end{vmatrix}\neq 0$

rank of A is 2

10. $Q=A^{-1}$

From given condition

$$\frac{10}{10}\begin{bmatrix}4&2&2\\-5&0&5\\1&-2&3\end{bmatrix}=\begin{bmatrix}4&2&2\\-5&0&x\\1&-2&3\end{bmatrix}$$

$\therefore x=5$

11. $C_1\to C_1-C_2$

$$=\begin{vmatrix}4 & (\sin\theta-\operatorname{cosec}\theta)^2 & 2020\\ 4 & (\cos\theta-\sec\theta)^2 & 2020\\ 4 & (\tan\theta-\cot\theta)^2 & 2020\end{vmatrix}$$

$$=4\times 2020\times\begin{vmatrix}1 & (\sin\theta-\operatorname{cosec}\theta)^2 & 1\\ 1 & (\cos\theta-\sec\theta)^2 & 1\\ 1 & (\tan\theta-\cot\theta)^2 & 1\end{vmatrix}=0$$

12. conceptual

13. conceptual

14. $\begin{vmatrix}6\log_5 3 & \log_3 5\\ 3\log_5 3 & \log_9 25\end{vmatrix}\times\begin{vmatrix}\log_3 5 & \frac{1}{3}\log_3 5\\ \log_5 9 & \log_5 9\end{vmatrix}$.

$=(\log_5 3\times\log_3 5)(6-3)\times\log_3 5\log_5 9\left(1-\frac{1}{3}\right)$

$(\because \log_9 25=\log_3 5)$

$=\log_3 5\times\log_5 81$

15. $\begin{vmatrix}1&-1&x\\1&x&1\\x&-1&1\end{vmatrix}=0$

$x^3+x-2=0$

by verification take $x=1$

$\therefore$ *the real value of* $x=1$

16. Let $A=\begin{bmatrix}0&-a&-b\\a&0&-c\\b&c&0\end{bmatrix}$ be a skew-symmetric matrix

Now $|A|=\begin{vmatrix}0&-a&-b\\a&0&-c\\b&c&0\end{vmatrix}$

$=abc-abc=0$

Therefore , Determinant of skew-symmetric matrix of order “3” is always 0

17. Given A$=\begin{bmatrix}3&0&0\\0&5&0\\0&0&4\end{bmatrix}$ and $B=A^3$

So $B=A^3=\begin{bmatrix}27&0&0\\0&125&0\\0&0&64\end{bmatrix}$

Now $B^{-1}=\begin{bmatrix}\frac{1}{27} & 0 & 0\\ 0 & \frac{1}{125} & 0\\ 0 & 0 & \frac{1}{64}\end{bmatrix}$

18. Given $\begin{vmatrix}bc & b+c & 1\\ ca & c+a & 1\\ ab & a+b & 1\end{vmatrix}$

$R_2\to R_2-R_1, R_3\to R_3-R_2$

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

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

$=(a-b)(b-c)\left[1(c-a)-0+0\right]$

$=(a-b)(b-c)(c-a)$

19. conceptual

20. conceptual

21. $f^{1}(x)=\begin{vmatrix}-\sin x & 1 & 0\\ 2\sin x & x^2 & 2x\\ \tan x & x & 1\end{vmatrix}+$

$\begin{vmatrix}\cos x & x & 1\\ 2\cos x & 2x & 2\\ \tan x & x & 1\end{vmatrix}+\begin{vmatrix}\cos x & x & 1\\ 2\sin x & x^2 & 2x\\ \sec^2 x & 1 & 0\end{vmatrix}$

$f^{1}(0)=0$

22. conceptual

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

By elementary transformation

by $R_2\to 2R_2-R_1$

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

$e(A)=e(AD)=3$

A unique solution.

24. conceptual

25. $a=2^n-1,\ b=\frac{3^n-1}{2},\ c=\frac{5^n-1}{4}$

$\Delta=\begin{vmatrix}2^n-1 & 3^n-1 & 5^n-1\\ 2 & 2 & 2\\ 2^n & 3^n & 5^n\end{vmatrix}$

$=\begin{vmatrix}2^n & 3^n & 5^n\\ 2 & 2 & 2\\ 2^n & 3^n & 5^n\end{vmatrix}+\begin{vmatrix}-1 & -1 & -1\\ 2 & 2 & 2\\ 2^n & 3^n & 5^n\end{vmatrix}=0$

26. $A^2+2I=\begin{bmatrix}3 & 0\\ 3 & 6\end{bmatrix}=3A$

27. Rank of given matrix is '3'

28. Given system of equations

$\left.\begin{aligned}2x+y-5=0\\ x-2y+1=0\\ 2x-14y-a=0\end{aligned}\right\}$ *consistent.*

So

$\begin{vmatrix}2 & 1 & -5\\ 1 & -2 & 1\\ 2 & -14 & -a\end{vmatrix}=0$

$\Rightarrow a=-16.$

29. $M=\begin{bmatrix}1 & 2 & 2\\ 2 & 1 & 2\\ 2 & 2 & 1\end{bmatrix}$

$M^2=\begin{bmatrix}9 & 8 & 8\\ 8 & 9 & 8\\ 8 & 8 & 9\end{bmatrix},\ 4M=\begin{bmatrix}4 & 8 & 8\\ 8 & 4 & 8\\ 8 & 8 & 4\end{bmatrix}$

$M^2-4M=5\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}=5I$

30. $A=\begin{bmatrix}\cos\theta & \sin\theta\\ -\sin\theta & \cos\theta\end{bmatrix}\Rightarrow A^n=\begin{bmatrix}\cos n\theta & \sin n\theta\\ -\sin n\theta & \cos n\theta\end{bmatrix}$

$\therefore A^3=\begin{bmatrix}\cos 3\theta & \sin 3\theta\\ -\sin 3\theta & \cos 3\theta\end{bmatrix}$

$\therefore m=\sin 3\theta,\ n=-\sin 3\theta$

31. $ax^4+bx^3+cx^2+50x+d$

$=\begin{vmatrix}x^3-14x^2 & -x & 3x+\lambda\\ 4x+1 & 3x & x-4\\ -3 & 4 & 0\end{vmatrix}$

Expand and compare co- efficient.
We get $50=25\lambda \Rightarrow \lambda=2$

32. A is a 3×3 matrix, determinant of cofactor of A and $|adjA|$ are same

Determinant of cofactor of A =

$\begin{vmatrix}1 & -2 & 1\\ 4 & -5 & -2\\ -2 & 4 & 1\end{vmatrix}=9$

$|adjA|=9$

$|A|^2=3^2\Rightarrow |A|=3$

33. $(A^2)^{-1}=(A^{-1})^2$

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

$\Rightarrow (A^{-1})^2=\begin{bmatrix}3 & -4 & 4\\ 0 & -1 & 0\\ -2 & 2 & -3\end{bmatrix}=A^2$

(By verification)

34. $[AD]=\begin{bmatrix}1 & 1 & 1 & 3\\ 1 & 2 & 2 & 6\\ 1 & a & 3 & b\end{bmatrix}$

$\sim\begin{bmatrix}1 & 1 & 1 & 3\\ 0 & 1 & 1 & 3\\ 0 & a-1 & 2 & b-3\end{bmatrix}$

$\sim\begin{bmatrix}0 & 1 & 1 & 3\\ 0 & 1 & 1 & 3\\ 0 & a-3 & 0 & b-9\end{bmatrix}$

Unique solution when $a\neq 3$, b is any value

35. A=B+C, BC=CB, $C^2=0$

$A^2=(B+C)(B+C)=B(B+2C)$

$A^3=A2.A=(B^2+2BC)(B+C)$

$=B^3+3B^2C=B^2(B+3C)$

An+1=Bn(B+(n+1)C)

$B^{2020}[B+2021C]=A^{2021}$

36. $\Delta=0$

$\begin{vmatrix}\alpha & -1 & -1\\ 1 & -\alpha & -1\\ 1 & -1 & -\alpha\end{vmatrix}=0$

$\alpha\left[\alpha^2-1\right]+1[-\alpha+1]-1[-1+\alpha]=0$

$\alpha^3-3\alpha+2=0$

$\alpha=1,1,-2$

$\alpha=1$, system is homogeneous linear equations

37. $\Delta=\begin{vmatrix}1 & 1 & 1\\ 2 & 2 & -1\\ 1 & 1 & \lambda\end{vmatrix}=0$

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

$\lambda=1$, inconsistent

38. $A)\left|\frac{1}{k}A^{-1}\right|=\frac{1}{k^3}\left|A^{-1}\right|$

B) $\left|Adj\left(A^{-1}\right)\right|=\left|A^{-1}\right|^2=\frac{1}{|A|^2}$

C) $BAB^{-1}=I$

$\left(BAB^{-1}\right)\left(BAB^{-1}\right)=I.I$

$BA\left(B^{-1}B\right)AB^{-1}=I$

$BA^2B^{-1}=I$

$\|^{ly}\ BA^kB^{-1}=I.....(1)$

$B\left(AdjB\right)=|B|I$

$\frac{B\left(AdjB\right)}{|B|}=I......(2)$

D) $A.AdjA=|A|I$

$AdjA^{-1}Adj\left(AdjA^{-1}\right)=\left|AdjA^{-1}\right|I$

$A^{-1}AdjA^{-1}=\left|A^{-1}\right|^2 I$

$AdjA^{-1}=\frac{A}{|A|}$

$A.\text{Adj}\left(AdjA^{-1}\right)=\frac{I}{|A|}$

$\text{Adj}\left(AdjA^{-1}\right)=\frac{A^{-1}}{|A|}$

---

39. $\Delta=\begin{vmatrix}2 & p & 6\\1 & 2 & q\\1 & 1 & 3\end{vmatrix}=(2-p)(3-q)$

$\Delta_x=\begin{vmatrix}8 & p & 6\\5 & 2 & q\\4 & 1 & 3\end{vmatrix}=(15-4q)(2-p)$

$\Delta_y=\begin{vmatrix}2 & 8 & 6\\1 & 5 & q\\1 & 4 & 3\end{vmatrix}=0$

$\Delta_z=\begin{vmatrix}2 & p & 8\\1 & 2 & 5\\1 & 1 & 4\end{vmatrix}=p-2$

$\therefore$clearly $p\neq 2, q=3$

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40. $\begin{vmatrix}\lambda-1 & 3\lambda+1 & 2\lambda\\\lambda-1 & 4\lambda-2 & \lambda+3\\2 & 3\lambda+1 & 3\lambda-3\end{vmatrix}=0$

$R_1\to R_1-R_2$

$\begin{vmatrix}0 & -\lambda+3 & \lambda-3\\\lambda-1 & 4\lambda-2 & \lambda+3\\2 & 3\lambda+1 & 3\lambda-3\end{vmatrix}=0$

$R_2\to R_2-R_1, R_3\to R_3-R_1$

$\begin{vmatrix}0 & -\lambda+3 & \lambda-3\\\lambda-1 & 5\lambda-5 & 6\\2 & 4\lambda-2 & 2\lambda\end{vmatrix}=0$

$C_2\to C_2+C_3$

$\begin{vmatrix}0 & 0 & \lambda-3\\\lambda-1 & 5\lambda+1 & 6\\2 & 6\lambda-2 & 2\lambda\end{vmatrix}=0$

$\lambda=3,0,3$

p=0,q=3

$p^2+q^2-pq=9$

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41. $\begin{bmatrix}1 & 4 & 2\\2 & -1 & 4\\-3 & 7 & -6\end{bmatrix}\begin{bmatrix}2 & 0 & -2\\b_{12} & b_{22} & b_{23}\\b_{31} & b_{32} & b_{33}\end{bmatrix}=\begin{bmatrix}2 & 14 & -4\\4 & 1 & -8\\-6 & 15 & 12\end{bmatrix}$

$b_{21}=0; b_{31}=0$

$b_{32}=1; b_{22}=3$

$b_{33}=-1; b_{23}=0$

$\because B=\begin{bmatrix}2 & 0 & -2\\0 & 3 & 0\\0 & 1 & -1\end{bmatrix}$

$|B|+Trace(B)=-2$

---

42. Rank of $A_{m\times n}$ is 4 $\Rightarrow 4=\min\{m,n\}$.

$A^TA_{7\times7}\Rightarrow A^T{}_{7\times p}.A_{p\times7}$

$\Rightarrow$p should be '4'.

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43. conceptual

44. $\begin{vmatrix} 1+\sin^2\theta & \cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & 1+\cos^2\theta & 4\sin 4\theta \\ \sin^2\theta & \cos^2\theta & 1+4\sin 4\theta \end{vmatrix} = 0$

$C_1 \to C_1 + C_2$

$\begin{vmatrix} 2 & \cos^2\theta & 4\sin 4\theta \\ 2 & 1+\cos^2\theta & 4\sin 4\theta \\ 1 & \cos^2\theta & 1+4\sin 4\theta \end{vmatrix} = 0$

$R_1 \to R_1 - R_2$

$R_2 \to R_2 - R_3$

$\begin{vmatrix} 0 & -1 & 0 \\ 1 & 1 & -1 \\ 1 & \cos^2\theta & 1+4\sin 4\theta \end{vmatrix} = 0$

$\Rightarrow 2+4\sin 4\theta = 0$

$\Rightarrow \sin 4\theta = \dfrac{-1}{2} \Rightarrow \sin 4\theta = \sin\dfrac{7\pi}{6}$

$4\theta = \dfrac{7\pi}{6}$

$\Rightarrow \theta = \dfrac{7\pi}{24}$

45. Given

$A^{-1} = \frac{1}{3}\left(A^2 - 5A + 7I\right)$

$\Rightarrow 3A^{-1} = A^2 - 5A + 7I$.....(1)

Multiply with '$17A^2$' on both sides

$\Rightarrow 51A = 17A^4 - 85A^3 + 119A^2$

$\Rightarrow 17A^4 - 85A^3 + 119A^2 - 51A = 0$.....(2)

Multiply (1) with '$19A^2$' on both sides

$\Rightarrow 57A = 19A^4 - 95A^3 + 133A^2$

$\Rightarrow -19A^4 + 95A^3 - 13A^2 + 57A = 0$....(3)

Now,

$17A^8 - 85A^7 + 119A^6 - 51A^5 - 19A^4$
$+ 95A^3 - 133A^2 + 57A + A + I = A + I$

($\because$ from 2 and 3)

46.

$[AB] \sim \begin{bmatrix} 2 & 1 & 1 & 1 \\ 0 & 3 & -1 & 1 \\ 1 & -1 & 1 & 0 \end{bmatrix}$

$R_3 \to 2R_3 - R_1$

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

$R_3 \to R_3 + R_2$

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

Let

$3y - z = 1$

$z = K \quad \Rightarrow 3y - K = 1$

$3z = 3K \quad \Rightarrow 3y = 1 + K$

$2x + y + z = 1$

$2x + \dfrac{1}{3} + \dfrac{K}{3} + K = 1$

$\Rightarrow 2x = 1 - \dfrac{1}{3} - \dfrac{4K}{3}$

$x = \dfrac{1}{3} - \dfrac{2K}{3}$

$\Rightarrow 3x = 1 - 2K$

$\begin{bmatrix} 3x \\ 3y \\ 3z \end{bmatrix} = \begin{bmatrix} 1-2k \\ 1+k \\ 0+3k \end{bmatrix}$

$3\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 0 \end{bmatrix} + k\begin{bmatrix} -2 \\ 1 \\ 3 \end{bmatrix}$

47. $A = \left[a_{ij}\right]_{6\times 6}, a_{ij} = \begin{cases} 1, & i+j=7 \\ 0, & i+j \neq 7 \end{cases}$

$$A=\begin{bmatrix}0&0&0&0&0&1\\0&0&0&0&1&0\\0&0&0&1&0&0\\0&0&1&0&0&0\\0&1&0&0&0&0\\1&0&0&0&0&0\end{bmatrix}$$

$$\Rightarrow|A|=1$$

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

$$(A(adjA)A^{-1})A^2=|A|IA^{-1}A^2$$

$$=|A|I(A^{-1}A)A$$

$$=1.I.IA=A$$

48. $x+ay+az=0, bx+y+bz=0$

$cx+cy+z=0$

Has a non-trivial solution

$$\Rightarrow\begin{vmatrix}1&a&a\\b&1&b\\c&c&1\end{vmatrix}=0$$

Given system of equations

$x+ay+az=a, bx+y+bz=b$

$cx+cy+z=c$

$\Delta=0$

$$\Delta_1=\begin{vmatrix}a&a&a\\b&1&b\\c&c&1\end{vmatrix}=a\begin{vmatrix}1&1&1\\b&1&b\\c&c&1\end{vmatrix}$$

$=a(1-b)(1-c)$

$\Delta_1\neq0, \Delta_2\neq0, \Delta_3\neq0$

49. $|A|=0$, A is 5th order matrix

$e(A)<5, e(A)=e(B)$

B has a non-zero minor of order '3'

$e(B)\geq3$

$\therefore e(A)=e(B)=3$

50. Conceptual

51. $|B-I|=|B-BB^T|=1.|-(B-I)^T|$

$2.|B-I|=0$

$\therefore|B-I|=0$

$|B^T|-1=1-1=0$

$\therefore|B-I|=|B^T|-1$

52. $|A|=0$

$\therefore$ Rank of A $\neq 3$

For $x=0$, $x=-1$ then determinant of any 2×2 sub matrix is zero

So, Rank of A=2 for $x\neq0$ and $x\neq-1$

53. Put

$a=b=1$

$weget\ the$ det $=128$

Which satisfies option 3

54. $A^2=A$

$$\Rightarrow\begin{bmatrix}2&-2&-16-4x\\-1&3&16+4x\\4+x&-8-2x&-12+x^2\end{bmatrix}=\begin{bmatrix}2&-2&-4\\-1&3&4\\1&-2&x\end{bmatrix}$$

$x=-3$

$|A|=0$

$$|Sub\ matrix\ of\ A|=\begin{vmatrix}2&-2\\-1&3\end{vmatrix}=-4\neq0$$

$rank\ of\ A=r=2$

$\therefore r+x=-1$

55. Option verification

(4) $x^2-2x+x-2=0$

$x=-1$ or $x=2$

56. $$AA^T=\begin{bmatrix}a&-b\\b&a\end{bmatrix}\begin{bmatrix}a&b\\-b&a\end{bmatrix}=\begin{bmatrix}20&0\\0&20\end{bmatrix}$$

$a^2+b^2=20$

$(a+b)^2-2ab=20$

$(a+b)^2=20+2\left(\frac{5}{2}\right)$

$a+b=\pm5$

$\therefore$ Equation is $x^2-(a+b)x+ab=0$

$\Rightarrow 2x^2 \pm 10x + 5 = 0$

57. $B = A^T \Rightarrow B^{-1} = A$

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

$5 + 0 + \alpha = 10$

$\alpha = 5$

58. $R_1 \to 3R_1 - 2R_3$

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

Since rank=1

$3(1-x) - 2(1+x) = 0$

$x = \frac{1}{5}$

$$\therefore \begin{vmatrix} 4 & 2 \\ 5 & k \end{vmatrix} = \begin{vmatrix} 2 & \left(1-\frac{1}{5}\right) \\ k & 1 \end{vmatrix}$$

$\Rightarrow k = \frac{5}{2}$

59. $a_1, a_2, \ldots\ldots a_9$ are in G.P

$a, ar, ar^2, ar^3 \ldots ar^8$

$$\begin{vmatrix} \log a & \log ar & \log ar^2 \\ \log ar^3 & \log ar^4 & \log ar^5 \\ \log ar^6 & \log ar^7 & \log ar^8 \end{vmatrix}$$

$$\begin{vmatrix} \log a & \log a + \log r & \log a + 2\log r \\ \log a + 3\log r & \log a + 4\log r & \log a + 5\log r \\ \log a + 6\log r & \log a + 7\log r & \log a + 8\log r \end{vmatrix}$$

$R_1 \to R_1 - \log a$, simplify

60. $a = 1,\ b = 2,\ c = 3$ verify

$$\begin{vmatrix} 5 & 1 & 1 \\ 2 & 4 & 2 \\ 3 & 3 & 3 \end{vmatrix} = 3\begin{vmatrix} 5 & 1 & 1 \\ 2 & 4 & 2 \\ 1 & 1 & 1 \end{vmatrix} = 24$$

Verify use: $4(2)3 = 24$

61. $(S^2)^T = ((ABCD)(ABCD))^T$

$= (ABCD)^T (ABCD)^T$

$= (D^T C^T B^T A^T)(D^T C^T B^T A^T)$

$= (S^T)^2$

62. $a^2 + b^2 + c^2 - 2a - 2b - 2c + 3 = 0$

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

$a = b = c = 1$

$ab + bc + ca = 3$

63. Substitute $|A| = |A|^T$ in first det

$\Rightarrow R_1 \leftrightarrow R_2,\ R_2 \leftrightarrow R_3$

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

If n=odd

64. $1 + 7 + 9 = 17$

65. $$\begin{vmatrix} -1 & \cos C & \cos B \\ \cos C & -1 & \cos A \\ \cos B & \cos A & -1 \end{vmatrix}$$

For any angles A, B, C of a triangle $\det \neq 0$

66. Consider as A, B

$$B^{-1} = \frac{1}{\sec^2\theta}\begin{bmatrix} 1 & -\tan\theta \\ \tan\theta & 1 \end{bmatrix}$$

$$A = \begin{bmatrix} 1 & -\tan\theta \\ \tan\theta & 1 \end{bmatrix}$$

$$AB^{-1} = \frac{1}{\sec^2\theta}\begin{bmatrix} \cos 2\theta & -\sin 2\theta \\ \sin 2\theta & \cos 2\theta \end{bmatrix}$$

67. $\text{LHS} = \begin{bmatrix} z_1\bar{z}_1 + z_2\bar{z}_2 & 0 \\ 0 & z_2\bar{z}_2 + z_1\bar{z}_1 \end{bmatrix}$

$$=\begin{bmatrix}|z_1|^2+|z_2|^2 & 0\\ 0 & |z_2|^2+|z_1|^2\end{bmatrix}=\begin{bmatrix}26 & 0\\ 0 & 26\end{bmatrix}=26I$$

68. $R_2\to R_2-R_1, R_3\to R_3+R_2, Expand$

69. $\det A=\begin{vmatrix}a_1 & b_1 & c_1\\ a_2 & b_2 & c_2\\ a_3 & b_3 & c_3\end{vmatrix}=k$

$R_2\to R_2+2R_1$, we get $\det B$ $\quad\therefore \det B=k$

70. $A=\begin{bmatrix}\sqrt{2020} & \sqrt{2021} & \sqrt{2022} & \sqrt{2023}\\ \sqrt{2}\sqrt{2020} & \sqrt{2}\sqrt{2021} & \sqrt{2}\sqrt{2022} & \sqrt{2}\sqrt{2023}\\ \sqrt{3}\sqrt{2020} & \sqrt{3}\sqrt{2021} & \sqrt{3}\sqrt{2022} & \sqrt{3}\sqrt{2023}\\ 2\sqrt{2020} & 2\sqrt{2021} & 2\sqrt{2022} & 2\sqrt{2023}\end{bmatrix}$

$=\sqrt{2}\sqrt{3}\,2A$

Rank $(A)=1$

71. IPE

72. Conceptual

73. $\begin{vmatrix}a & b & c\\ b & c & a\\ c & a & b\end{vmatrix}=0\Rightarrow a^3+b^3+c^3=3abc$

$\therefore a+b+c=0\Rightarrow |z_1|+|z_2|+|z_3|=0$

74. IPE

75. $\begin{vmatrix}2022 & 2024\\ 2021 & 2023\end{vmatrix}$

$R_1\to R_1-R_2$

$\begin{vmatrix}1 & 1\\ 2021 & 2023\end{vmatrix}=2\ \therefore \begin{bmatrix}1 & 2 & 3\\ -1 & 1 & 2\\ 3 & 0 & 2\end{bmatrix}^2$

76. $x^2+x+1=0$, ω,ω^2 are roots

Apply $1+\omega+\omega^2=0,\omega^3=1$ and simplify.

77. $f(A)=A^3-2A^2-5I$

78. $|2B^{-1}A^{-1}|=2^3|B^{-1}A^{-1}|=\dfrac{8}{|B||A|}$

79. $x=2,y=4,z=1,t=3\Rightarrow\begin{bmatrix}6 & 12\\ 3 & 9\end{bmatrix}$

80. $BB^T=\left(A^{-1}A^T\right)\left(A^{-1}A^T\right)^T$

$A^{-1}A^T\left(A^T\right)^T\left(A^{-1}\right)^T$

$A^{-1}\left(AA^T\right)\left(A^{-1}\right)^T$

$\left(A^{-1}A\right)\left(A^T\right)\left(A^{-1}\right)^T$

$I.I=I$

Option-2

81. $|A|=\begin{vmatrix}a & a & a-y\\ a & a+x & a\\ a & a & a\end{vmatrix}=16$

$R_1\to R_1-R_3,\ R_2\to R_2-R_3$

$=\begin{vmatrix}0 & 0 & -y\\ 0 & x & 0\\ a & a & a\end{vmatrix}=16$

$xy=\dfrac{16}{a}$

Rectangular hyperbola

82. $A^2=I$

$A^{-1}A^2=A^{-1}I$

$A=A^{-1}$

$|A|=|A^{-1}|$

$|A|=\dfrac{1}{|A|}$

$|A|=\pm1$

$\therefore |A|=-1$

83. Conceptual

84. Verify options

85. $A^{50}=\begin{bmatrix}\omega^{50} & 0\\ 0 & \omega^{50}\end{bmatrix}$

$$\omega^{50}=\left(\omega^{3}\right)^{16}.\omega^{2}=\omega^{2}$$

$$=\omega\begin{bmatrix}\omega & 0\\ 0 & \omega\end{bmatrix}=\omega A$$

86. $\left(A^{T}-\frac{1}{2}I\right)\left(A-\frac{1}{2}I\right)=I$

Apply transpose on both sides

$$\left(A-\frac{1}{2}I\right)^{T}\left(A^{T}-\frac{1}{2}I\right)^{T}=I^{T}$$

$$\left[\because (AB)^{T}=B^{T}A^{T}\right]$$

$$\left(A^{T}-\frac{1}{2}I\right)\left(A-\frac{1}{2}I\right)=I$$

If $A^{T}=-A$

$$\left(-A-\frac{1}{2}I\right)\left(-A^{T}-\frac{1}{2}I\right)=I$$

$$\left(A+\frac{1}{2}I\right)\left(A^{T}+\frac{1}{2}I\right)=I$$

$\therefore A$ is skew symmetric

87. $\begin{vmatrix}2 & 6 & 0 & 11\\ 6 & 20 & -6 & 3\\ 0 & 6 & -18 & 1\end{vmatrix}$

$R_2 \to R_2-3R_1$

$$\begin{vmatrix}2 & 6 & 0 & 11\\ 0 & 2 & -6 & -30\\ 0 & 6 & -18 & 1\end{vmatrix}$$

$R_3 \to R_3-3R_2$

$$\begin{vmatrix}2 & 6 & 0 & 11\\ 0 & 2 & -6 & -30\\ 0 & 0 & 0 & 91\end{vmatrix}$$

$\therefore$ Inconsistent

88. IPE

89. $|A|=5, |B^{T}A^{T}|=-15 \Rightarrow |B||A|=-15 \Rightarrow |B|=-3$

90. $\Delta_k=\begin{vmatrix}k & k-1\\ k-1 & k\end{vmatrix}=2k-1$

LHS

$$=\sum_{r=1}^{20}(2r-1)=2\sum_{r=1}^{20}r-\sum_{r=1}^{20}(1)$$

$$=2\left(\frac{20.21}{2}\right)-20=400$$

91. $\Delta \neq 0$

92. $\frac{1}{2}\left(2a^{2}+2b^{2}+2c^{2}-2ab-2bc-2ca\right)\leq 0$

$$(a-b)^{2}+(b-c)^{2}+(c-a)^{2}=0$$

$$a-b=0, b-c=0, c-a=0 \Rightarrow a=b=c$$

$$\begin{vmatrix}1 & 0 & 0\\ 0 & 8 & 0\\ 0 & 0 & 3\end{vmatrix}=24$$

93. $x-ay+az=0, bx+y-bz=0, -cx+cy+z=0$

$\Rightarrow \Delta=0 \Rightarrow ab+bc+ca+1=0$

$\Rightarrow ab+bc+ca=-1$

94. Verify options.

95. $\Delta=\begin{vmatrix}1 & -1 & 1\\ 1 & 2 & -1\\ 2 & 1 & 3\end{vmatrix}\neq 0$. Unique Solution

96. $\frac{a_1}{a_2}=\frac{b_1}{b_2}\neq\frac{c_1}{c_2}\Rightarrow\frac{1}{3}=\frac{2}{6}\neq\frac{3}{a-2}$

$\Rightarrow \frac{1}{3}\neq\frac{3}{a-2}\Rightarrow a\neq 11$

97. $|kA|=k^{n}|A|$

98. $R_1 \to R_1-R_3$ and expand $\sin^{2}x\left(\cos^{2}2x\right)$

99. Conceptual

100. $R_2 \to R_2-R_1, R_3 \to R_3-R_1$

R_2 *and* R_3 in same ratio $\Rightarrow \Delta=0$

101. $A_\alpha=\begin{bmatrix}\cos\alpha & \sin\alpha\\ -\sin\alpha & \cos\alpha\end{bmatrix}$

$$|A_\alpha|=\begin{vmatrix}\cos\alpha & \sin\alpha\\ -\sin\alpha & \cos\alpha\end{vmatrix}$$

$|A_\alpha| = 1$

$|A_{\pi/5}.A_{\pi/4}.A_{3\pi/10}| = |A_{\pi/5}||A_{\pi/4}||A_{3\pi/10}| = 1$

102. $\begin{vmatrix} 2 & 2k & 1 \\ 1 & k-1 & 1 \\ 2 & 1 & k+1 \end{vmatrix}$

$= 2(k^2-2) - 2k(k+1-2) + 1(1-2k+2)$

$= 2k^2 - 4 - 2k^2 + 2k + 3 - 2k = -1$

$-1 = Ak^2 + Bk^2 + C$

$A + B + C = -1$

103. $\begin{vmatrix} 3 & -2 & 1 \\ \lambda & -14 & 15 \\ 1 & 2 & -3 \end{vmatrix} = 0$

$3(42-30) + 2(-3\lambda - 15) + 1(2\lambda + 14) = 0$

$\lambda = 5$

104. $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$

$R_2 \to R_2 - R_1$

$R_3 \to R_3 - R_1$

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

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

$= (b-a)(c-a)\{c+a-(b+a)\}$

$= (b-a)(c-a)(c-b)$

$= (a-b)(b-c)(c-a)$

$\therefore k = 1$

105. $(1)\times 8 + 3\times(2)$

$40x - 56 + 24z = 0$

$\underline{21x + 30y - 24z = 9}$

$61x - 26y = 9 \ldots\ldots\ldots\ldots(4)$

$(2) - 2\times(3)$

$7x + 10y - 8z = 3$

$\underline{4x + 6y - 8z = -8}$

$3x + 4y = 11 \ldots\ldots\ldots\ldots(5)$

On solving $(4)\&(5)$

We get $y = 2$

$\therefore \beta = 2$

106. Given, $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix}_{3\times 3}$

w.k.t, $adj(adjA) = |A|^{n-2} \cdot A$

for $n = 3, adj(adjA) = (6)^{3-2} \cdot A = 6A$

107. Given,

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

Here, $|A| = 1$

$AdjA = \begin{vmatrix} -1 & 0 & -1 & -1 \\ 0 & 0 & 1 & 0 \\ 2 & 1 & 1 & 2 \\ -1 & 0 & -1 & -1 \end{vmatrix} = \begin{bmatrix} 0 & 0 & 1 \\ 0 & -1 & 2 \\ 1 & -1 & 1 \end{bmatrix}$

$A^{-1} = \frac{AdjA}{|A|} = \begin{bmatrix} 0 & 0 & 1 \\ 0 & -1 & 2 \\ 1 & -1 & 1 \end{bmatrix}$

Again,

$$A^2=\begin{bmatrix}1&-1&1\\2&-1&0\\1&0&0\end{bmatrix}\begin{bmatrix}1&-1&1\\2&-1&0\\1&0&0\end{bmatrix}=\begin{bmatrix}0&0&1\\0&-1&2\\1&-1&1\end{bmatrix}$$

Clearly,

$$\boxed{A^2=A^{-1}}\to(1)\Rightarrow\boxed{A^3=I}\to(2)$$

$$(1)\times(2)\Rightarrow A^5=A^{-1}\cdot I=A^{-1}$$

108. Given, $|A^TBA|=27\ and\ |AB^{-1}|=8$

$$\Rightarrow|A^T|\cdot|B|\cdot|A|=27$$

$$\Rightarrow|A|^2\cdot|B|=27=3^3\to(1)$$

$$|A|\cdot|B^{-1}|=8$$

$$\frac{|A|}{|B|}=8=2^3\to(2)$$

$$(1)\times(2)\Rightarrow|A|^3=3^3\cdot2^3=6^3$$

$$\therefore|A|=6$$

from $(2)\Rightarrow|B|=\frac{6}{8}=\frac{3}{4}$

now,

$$|B^T\cdot A^{-1}\cdot B|=|B^T|\cdot|A^{-1}|\cdot|B|=\frac{|B|^2}{|A|}=\frac{9}{16\times6}=\frac{3}{32}$$

109. Given $(A^T)^{-1}=A\Rightarrow AA^T=A^TA=I$

$$B=\begin{bmatrix}1&2\\0&1\end{bmatrix},B^2=\begin{bmatrix}1&2.2\\0&1\end{bmatrix},B^3=\begin{bmatrix}1&2.3\\0&1\end{bmatrix}$$

$$....B^{2021}=\begin{bmatrix}1&2\times2021\\0&1\end{bmatrix}=\begin{bmatrix}1&4042\\0&1\end{bmatrix}$$

$$X=ABA^T$$

$$A^T\times A=A^TABA^TA=IBI=B$$

$$A^TX^2A=B^2....A^TX^{2021}A=B^{2021}=\begin{bmatrix}1&4042\\0&1\end{bmatrix}$$

110. $|AdjA|=|KA^T|$

$$|A|^{3-1}=K^3|A^T|$$

$$|A|^2=K^3|A|$$

$$|A|=K^3$$

$$\Rightarrow K^3=27\Rightarrow k=3$$

$$K^2-3K+5=9-9+5=5$$

111. x,y,z values in given equations

We get $2a+9b+5c=0.......(1)$

$$2a+3b-c=0...........(2)$$

$$a-2c=0......(3)$$

Solving $(1),(2)\ and\ (3)$

We get $a=2,b=-1,c=1$

112. $adjA=|A|B\Rightarrow B=\frac{Adj\ A}{|A|}=A^{-1}$

$\therefore AB=I$ $\quad tr(C)=8$

$$\sum_{k=1}^{\infty}tr\left(\frac{1}{3^k}(AB)^kC\right)=tr\left(\frac{1}{3}C\right)+tr\left(\frac{1}{3^2}C\right)+...$$

$$=\frac{8}{3}\left[1+\frac{1}{3}+\frac{1}{3^2}+....\right]=\frac{8}{3}\times\frac{3}{2}=4$$

113. $|A|=0\ \therefore Rank(A)=2$

$$[AB]=\begin{bmatrix}1&-4&7&a\\0&3&-5&-b\\-2&5&-9&-c\end{bmatrix}$$

$$R_3\to R_3+2R_1$$

$$\sim\begin{bmatrix}1&-4&7&a\\0&3&-5&-b\\0&-3&5&2a-c\end{bmatrix}$$

$$R_3\to R_3+R_2$$

$$\sim\begin{bmatrix}1&-4&7&a\\0&3&-5&-b\\0&0&0&2a-b-c\end{bmatrix}$$

$Rank(A) = Rank([AB])$

$\therefore 2a - b - c = 0 \Rightarrow a = \dfrac{b+c}{2}$

114. $\begin{bmatrix} 1 & -1 & 2 & 5 \\ -1 & 1 & -2 & -5 \\ 2 & -2 & 4 & 10 \end{bmatrix}$

$R_1 \to R_2 + R_1, R_3 \to R_3 - 2R_1$

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

$\therefore x - y + 2z = 5$

It is a plane not parallel to any of the coordinate planes.

115. $|A| = 4$, $|adj(A)| = |A|^{n-1} = 4^{3-1} = 16$

$|P| = 16 \Rightarrow \begin{vmatrix} 1 & \alpha & 3 \\ 1 & 3 & 3 \\ 2 & 4 & 4 \end{vmatrix} = 16$

$\Rightarrow \alpha = 11$

116. $\begin{vmatrix} \alpha & \beta & \gamma \\ a & b & c \\ l & m & n \end{vmatrix} = (-1)^k \begin{vmatrix} m & n & l \\ b & c & a \\ \beta & \gamma & \alpha \end{vmatrix}$

$\begin{vmatrix} m & n & l \\ b & c & a \\ \beta & \gamma & \alpha \end{vmatrix} = (-1) \begin{vmatrix} m & l & n \\ b & a & c \\ \beta & \alpha & \gamma \end{vmatrix}$

$C_2 \leftrightarrow C_3, \quad C_1 \leftrightarrow C_2$

$= (-1)^2 \begin{vmatrix} l & m & n \\ a & b & c \\ \alpha & \beta & \gamma \end{vmatrix}$

$R_1 \leftrightarrow R_3$

$= (-1)^3 \begin{vmatrix} \alpha & \beta & \gamma \\ a & b & c \\ l & m & n \end{vmatrix}$

$\therefore k = 3$

117. Matrix form is

$\begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & 4 \\ 1 & 4 & 10 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ k \\ k^2 \end{bmatrix}$

Augmented matrix

$= \begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & 2 & 4 & k \\ 1 & 4 & 10 & k^2 \end{bmatrix}$

$R_2 \to R_2 - R_1, R_3 \to R_3 - R_1$

$= \begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 1 & 3 & k-1 \\ 0 & 3 & 9 & k^2-1 \end{bmatrix}$

$R_3 \to R_3 - 3R_2$

$= \begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 1 & 3 & k-1 \\ 0 & 0 & 0 & k^2-1-3(k-1) \end{bmatrix}$

Given equations are consistent:

$k^2 - 1 - 3(k-1) = 0 \Rightarrow k = 1, 2$

118. $|AA^T|$

$|A||A^T|$

$= |A^T||A|$

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

Multiply

$\begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix} = 1$

119. $AA^T = \dfrac{1}{49} \begin{bmatrix} 3 & -2 & 6 \\ -6 & -3 & 2 \\ -2 & 6 & 3 \end{bmatrix} \begin{bmatrix} 3 & -6 & -2 \\ -2 & -3 & 6 \\ 6 & 2 & 3 \end{bmatrix}$

$= \dfrac{1}{49} \begin{bmatrix} 49 & 0 & 0 \\ 0 & 49 & 0 \\ 0 & 0 & 49 \end{bmatrix}$

$\therefore AA^T = I \Rightarrow \boxed{A^T = A^{-1}}$

120. $|A|^{10} = 1024$

$|A|^{10} = 2^{10} \Rightarrow |A| = 2$

$|A| = \begin{vmatrix} \alpha^2 & 5 \\ 5 & -\alpha \end{vmatrix}$

$2 = -\alpha^3 - 25$

$\alpha^3 = -27 \Rightarrow \alpha = -3$

121. $|A| = -130 + 5\sin^2\theta + \sin^2\theta\cos^2\theta - \cos^2\theta\sin^2\theta + 5\cos^2\theta$

$= -130 + 5 = -125$

122. $(A^T)^2 + 12A^T$

$A^T(A^T + 12I)$

$\begin{bmatrix} 2 & -4 \\ -3 & 1 \end{bmatrix}\left(\begin{bmatrix} 2 & -4 \\ -3 & 1 \end{bmatrix} + \begin{bmatrix} 12 & 0 \\ 0 & 12 \end{bmatrix}\right)$

$\begin{bmatrix} 2 & -4 \\ -3 & 1 \end{bmatrix}\begin{bmatrix} 14 & -4 \\ -3 & 13 \end{bmatrix} = \begin{bmatrix} 40 & -60 \\ -45 & 25 \end{bmatrix}$

123. $\begin{vmatrix} p+4d & 5 & 1 \\ p+7d & 8 & 1 \\ p+12d & 13 & 1 \end{vmatrix} = \begin{vmatrix} p & 5 & 1 \\ p & 8 & 1 \\ p & 13 & 1 \end{vmatrix} + d\begin{vmatrix} 4 & 5 & 1 \\ 7 & 8 & 1 \\ 12 & 13 & 1 \end{vmatrix}$

$C_1 \to C_1 - C_3 \quad C_2 \to C_2 - C_1$

$\begin{vmatrix} 0 & 5 & 1 \\ 0 & 8 & 1 \\ 0 & 13 & 1 \end{vmatrix} + d\begin{vmatrix} 4 & 1 & 1 \\ 7 & 1 & 1 \\ 12 & 1 & 1 \end{vmatrix}$

$= 0$

124. $A^2 = I$

$\begin{bmatrix} 1 & 0 & 0 \\ a & -1 & 0 \\ b & c & 1 \end{bmatrix}\begin{bmatrix} 1 & 0 & 0 \\ a & -1 & 0 \\ b & c & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 2b+ac & 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

$2b + ac = 0$

$\boxed{b = -\frac{ac}{2}}$

125. $|A| = 0 \Rightarrow \begin{vmatrix} -2 & x & 1 \\ x & 1 & 1 \\ 2 & 3 & -1 \end{vmatrix} = 0$

$-2(-1-3) - x(-x-2) + 1(3n-2) = 0$

$8 + x(x+2) + 3x - 2 = 0$

$x^2 + 5x + 6 = 0$

$x^2 + 3x + 2x + 6 = 0$

$x(x+3) + 2(x+3) = 0$

$x = -2, -3$

$l = -2 \;\; m = -3$

$(-2)^3 - (-3)^3$

$-8 + 27 = 19$

126. Conceptual

127. $A = \begin{bmatrix} 1 & 1 & 1 \\ 5 & -1 & 2 \\ 2 & 1 & -1 \end{bmatrix} D = \begin{bmatrix} 6 \\ 3 \\ -5 \end{bmatrix}$

AdjA $= \begin{bmatrix} -1 & 2 & 5 & -1 \\ 1 & -1 & 2 & 1 \\ 1 & 1 & 1 & 1 \\ -1 & 2 & 5 & -1 \end{bmatrix}^T$

$= \begin{bmatrix} 1-2 & 4+5 & 5+2 \\ 1+1 & -1-2 & 2-1 \\ 2+1 & 5-2 & -1-5 \end{bmatrix}^T$

$= \begin{bmatrix} -1 & 9 & 7 \\ 2 & -3 & 1 \\ 3 & 3 & -6 \end{bmatrix}^T$

$\begin{bmatrix} -1 & 2 & 3 \\ 9 & -3 & 3 \\ 7 & 1 & -6 \end{bmatrix}\begin{bmatrix} 6 \\ 3 \\ -5 \end{bmatrix}$

$$=\begin{bmatrix}-15\\40\\75\end{bmatrix}$$

128. $A^6=\begin{bmatrix}1&0\\12&11\end{bmatrix}$

$B^6=\begin{bmatrix}1&18\\0&1\end{bmatrix}$

$A^6+B^6=\begin{bmatrix}2&18\\12&2\end{bmatrix}$

det $(A^6+B^6)=4-216$

$=-212$

$=\frac{1}{2}\det\left(A^6+B^6\right)=\frac{-212}{2}=-106$

129. $G(x).G(y)$

$$=\begin{bmatrix}\cos(x+y)&-\sin(x+y)&0\\\sin(x+y)&\cos(x+y)&0\\0&0&1\end{bmatrix}\quad x+y=0$$

$$=\begin{bmatrix}1&0&0\\0&1&0\\0&0&1\end{bmatrix}=I$$

130. $A^3=B$

$$\begin{bmatrix}x^3&0\\x^2+x+1&1\end{bmatrix}=\begin{bmatrix}8&0\\7&1\end{bmatrix}$$

$x=2$ (or) -3

$\therefore \boxed{x=2}$

131. $A+B=\begin{bmatrix}1&2b&2c\\0&2&5\\0&1&4\end{bmatrix}$

$|A+B|=1\begin{vmatrix}2&5\\1&4\end{vmatrix}=8-5=3$

132. $\begin{bmatrix}1&2&1&-1\\-1&2&3&5\\0&1&k&k\end{bmatrix}$

$R_2\to R_2+R_1$

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

$R_3\to 4R_3-R_2$

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

$\therefore$ rank = 2

$4k-4=0$

$\boxed{k=1}$

133. $a+2b-3c=1$

$2a-4b+3c=1$

$3a+6b-6c=4$

$$\Delta=\begin{vmatrix}1&2&-3\\2&-4&3\\3&6&-6\end{vmatrix}$$

$=1(24-18)-2(-12-9)-3(12+2)$

$=6+42=72$

$=-24$

$$\Delta_1=\begin{vmatrix}1&2&-3\\1&-4&3\\4&6&-6\end{vmatrix}$$

$=1(24-18)-2(-6-12)+3(6+16)$

$=6+36-66=-24$

$\Delta_2=-12$

$\Delta_3=-8$

$a=\frac{\Delta_1}{\Delta}=1$

$b=\frac{\Delta_2}{\Delta}=\frac{1}{2}$

$c=\frac{\Delta_3}{\Delta}=\frac{1}{3}$

$x=1,\ y=2,\ z=3$

$\alpha=1\ \ \gamma=3$

$$\alpha^2+\gamma^2=1+9=10$$

$$=5(\beta)$$

134. Conceptual

135. $A^T=A$

$B^T=B$

$AB+BA=X$

$\Rightarrow X^T=X$

Symmetric matrix

$AB-BA=Y$

$Y^T=-Y$

Skew matrix

LHS =

$(XY)^T=Y^TX^T$

$=-YX$

136. Rank(A) = 3 = r_1

Rank (B) = 2 = r_2

$\therefore \quad r_1-r_2=1$

137. $A^2=A.A$

$$=\begin{bmatrix}1&1&3\\1&7&9\\2&3&7\end{bmatrix}\begin{bmatrix}1&1&3\\1&7&9\\2&3&7\end{bmatrix}$$

$$=\begin{bmatrix}8&17&33\\26&77&129\\19&44&82\end{bmatrix}$$

$Tr\left(A^2-A\right)=7+70+75$

$=152$

138. $\begin{vmatrix}x&1&2\\2&4&x\\-3&3&2\end{vmatrix}=0$

$x(8-3x)-1(4+3x)+2(6+12)=0$

$8x-3x^2-4-3x+36=0$

$3x^2-5x-32=0$

$$x=\frac{5\pm\sqrt{25+4(32)3}}{6}=\frac{5\pm\sqrt{409}}{6}$$

$$x_1=\frac{5-\sqrt{409}}{6};\ x_2=\frac{5+\sqrt{409}}{6}$$

$$x_1x_2=\frac{25-409}{36}=\frac{-384}{36}$$

$x_1+x_2+x_1x_2$

$$\frac{6\left(5-\sqrt{409}+5+\sqrt{409}\right)}{36}-\frac{384}{36}$$

$$\frac{60-384}{36}=\frac{-324}{6}=-9$$

139. $\begin{vmatrix}3&-4&k\\1&2&-1\\k&-1&3\end{vmatrix}\neq 0$

$3(6-1)+4(3+k)+k(-1-2k)\neq 0$

$15+12+4k-k-2k^2\neq 0$

$2k^2-3k-27\neq 0$

$2k^2-9k+6k-27=10$

$k(2k-9)+3(2k-9)\neq 0$

$k\neq -3, +\frac{9}{2}$ m = -3 or $m=\frac{9}{2}$

Equation 2 $\Rightarrow$

$\alpha+2\beta-\gamma-9=0$

$2\beta-\gamma=9-\alpha$

Equation $2\beta-\gamma=-8$

$\Rightarrow 9-\alpha=8$

$\boxed{\alpha=1}$

$\alpha+m=1-3=-2$

$\alpha+m=1+\frac{9}{2}=\frac{11}{2}$

140. $A+A^{-1}$

$A^{-1}=\frac{AdjA}{|A|}=\begin{bmatrix}\sin\alpha & \cos\alpha\\ -\cos\alpha & \sin\alpha\end{bmatrix}$

Where |A| = 1

$A+A^{-1}=I$

$\begin{bmatrix}2\sin\alpha & 0\\ 0 & 2\sin\alpha\end{bmatrix}=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

$\sin\alpha = \frac{1}{2} = \alpha = 30^0 = \frac{\pi}{6}$

For rank = 2

141. |A| = 0

$\begin{vmatrix}1 & 0 & -1\\ 0 & 1 & 1\\ 0 & 0 & k-1\end{vmatrix}=0$

$1(k-1)=0$

k = 1

$|AD|=\begin{vmatrix}1 & 0 & -3\\ 0 & 1 & k-1\\ 0 & 0 & 1\end{vmatrix}\neq 0$

but $|AD|\neq 0$

$\therefore$ Rank does not exists

142. $\begin{bmatrix}3 & 1 & -1 & 6\\ 3 & -1 & 1 & 2\\ 1 & k & 1 & -8\end{bmatrix}$

143. $|A|^3=5^3$

$|A|=5$

$\begin{vmatrix}x & 2 & 1\\ 2 & x & 1\\ 2 & 1 & 0\end{vmatrix}=5$

$x(-1)-2(-2)+1(2-2x)=5$

$-x+4+2-2x=5$

$-3x=-1$

$x=\frac{1}{3}$

144. $(AB^{-1})=\begin{bmatrix}1 & 2\\ -2 & 1\end{bmatrix}\begin{bmatrix}1 & 1\\ 0 & 2\end{bmatrix}$

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

$det(AB^{-1})=10$

$(AB^{-1})^{-1}=\frac{Adj(AB^{-1})}{|AB^{-1}|}$

$=\frac{1}{10}\begin{vmatrix}0 & -5\\ 2 & 1\end{vmatrix}$

$a=0 \quad b=\frac{-1}{2} \quad c=\frac{1}{5} \quad d=\frac{5}{10}$

$2b+5c+10d$

$-1+1+1=1$

145. $A^2=\begin{bmatrix}n^2 & 0 & 0\\ 0 & n^2 & 0\\ 0 & 0 & n^2\end{bmatrix}$

$B^2=\begin{bmatrix}n^2 & 0 & 0\\ 0 & n^2 & 0\\ 0 & 0 & n^2\end{bmatrix}$

$$AB=\begin{bmatrix}0&0&n^2\\0&n^2&0\\n^2&0&0\end{bmatrix}$$

$$A^2+B^2+AB=\begin{bmatrix}2n^2&0&n^2\\0&3n^2&0\\n^2&0&2n^2\end{bmatrix}$$

Verify options.

146. $a=\frac{1}{2}\quad b=\frac{1}{\sqrt{2}}\quad c=0$

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

$$|A|=\frac{3}{4}\begin{vmatrix}\frac{1}{2}&\frac{1}{4}\\\frac{1}{2}&\frac{1}{4}\end{vmatrix}=0$$

Singular

147. $A^3-6A^2+11A-6I=0$

Let A $=x$

$x^3-6x^2+11x-6=0$

$x=1$ satisfies

$$\begin{array}{r|rrrr}1&1&-6&11&-6\\&0&1&-5&6\\\hline&1&-5&6&0\end{array}$$

$x^2-5x+6=0$

$x^2-3x-2x+6=0$

$x(x-3)-2(x-3)=0$

$x=2\qquad x=3$

$\therefore A=2I\qquad A=3I$

$A^{-1}A=2A^{-1}I\quad A^{-1}A=3A^{-1}I$

$I=2A^{-1}\qquad A^{-1}=\frac{I}{3}$

$A^{-1}=\frac{I}{2}$

148. $|A|=0$

149. $AdjA=(cofactor\ \ marix)^T$

150. $\begin{bmatrix}1&1&1&\lambda\\5&-1&\mu&10\\2&3&-1&6\end{bmatrix}$

$|A|\neq 0$

$$\begin{vmatrix}1&1&1\\5&-1&\mu\\2&3&-1\end{vmatrix}\neq 0$$

$\mu\neq 23,\quad \lambda\in R$

151. A. Adj A = |A| I

$|A|=1(-1-6)+3(2-9)+2(-4-3)$

$=-7-21-14$

$=-42$

$\therefore\quad A^2AdjA=A(A.AdjA)$

$=A(|A|I)$

$=A(-42I)$

$=-42$ A.

152. Rank A = Rank $A^T=\begin{bmatrix}0&0&0\\1&2&0\\2&4&0\\3&8&4\\4&12&8\end{bmatrix}$

$R_3\to\frac{R_3}{2},\quad R_5\to\frac{R_5}{4}$ and $R_1\leftrightarrow R_2$

$$\sim\begin{bmatrix}1&2&0\\0&0&0\\1&2&0\\3&8&4\\1&3&2\end{bmatrix}$$

$$R_2 \leftrightarrow R_5 \sim\begin{bmatrix}1&2&0\\1&3&2\\1&2&0\\3&8&4\\0&0&0\end{bmatrix}$$

$R_2 \to R_2 - R_1,\ R_3 \to R_3 - R,\ R_4 \to R_4 - 3R_1,$

$$\sim\begin{bmatrix}1&2&0\\0&1&2\\0&0&0\\0&2&4\\0&0&0\end{bmatrix} \Rightarrow R_3 \leftrightarrow R_4 \quad \text{Then} \sim\begin{bmatrix}1&2&0\\0&1&2\\0&2&4\\0&0&0\\0&0&0\end{bmatrix}$$

$R_3 \to R_3 - 2R_2$

$$\sim\begin{bmatrix}1&2&0\\0&1&2\\0&0&0\\0&0&0\\0&0&0\end{bmatrix} \Rightarrow \text{rank A} = 2$$

153.

$$[AD]=\begin{bmatrix}1&1&k&1\\2&2&0&3\\1&2&2k&k\end{bmatrix}$$

$R_2 \to R_2 - 2R_1,\ R_3 \to R_3 - R_1$

$$[AD]=\begin{bmatrix}1&1&k&1\\0&0&-2k&1\\0&1&k&k-1\end{bmatrix}$$

$R_2 \leftrightarrow R_3$

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

No solution of rank(A) $\neq$ rank (AD)

$\Rightarrow -2k = 0 \Rightarrow \boxed{k=0}$

154. $(2A+B)(2A+B)+(A-3B)^2 = 5A^2 + 10B^2 + 2AB$

$+ 2BA - 6AB$

$\Rightarrow AB = BA$

$AB.AB = AABB = A^2B^2$

155. $A=\begin{bmatrix}1&2&3\\2&3&1\\3&1&2\end{bmatrix}$ $\text{Adj}A = \begin{bmatrix}5&a&-1\\b&-7&c\\-7&d&-1\end{bmatrix}$

$\boxed{|A| = -7}$ A. adjA = |A|.I

A.adjA = -7I

$$\begin{bmatrix}1&2&3\\2&3&1\\3&1&2\end{bmatrix}\begin{bmatrix}5&a&-7\\6&-7&c\\-7&d&-1\end{bmatrix}=\begin{bmatrix}-7&0&0\\0&-7&0\\0&0&-7\end{bmatrix}$$

Multiply and compare were

a = -1, b = -1, c = 5, d = 5

a + b + c + d = 8

156. $R_2 \to R_2 + 412,\ R_3 \to R_3 + 2R$

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

$$\sim\begin{bmatrix}1&-1&0&-2\\0&0&0&0\\0&-1&2&0\end{bmatrix} R_2 \leftrightarrow R_3$$

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

Rank (A) = 2

157. By verification

158. Trace A = -4 $\Rightarrow$ a – 1 – 4 = - 4 $\Rightarrow$ 1 $\boxed{a=1}$

$$\begin{bmatrix}1&3&5\\5&-1&3\\2&3&-4\end{bmatrix}\begin{bmatrix}b&1&4\\4&c&1\\-3&1&d\end{bmatrix}=\begin{bmatrix}-1&0&17\\-3&10&25\\28&-8&3\end{bmatrix}$$

$\boxed{b=2}$ $\boxed{c=-2}$ $\boxed{d=2}$

$\boxed{a+b+c+d=3}$

159. Expending the determinent by using second row.

160. conceptual

161. After multiplication $\alpha+2\beta+\gamma=3$

$$2\alpha+3\beta+2\gamma=5$$
$$3\alpha-5\beta+5r=2$$

Solving $\boxed{\alpha=-1}$ $\boxed{\beta=1}$ $\boxed{\gamma=2}$

$\alpha^3+\beta^3+\gamma^3=8$

162. $(A+B)^2-AB=(A+B)(A+B)-AB$

$=A^2+AB+BA+B^2-AB$

$=A^2+B(A+B)=\begin{bmatrix}5&8&8\\4&5&2\\2&8&4\end{bmatrix}-\begin{bmatrix}1&2&2\\1&1&0\\1&2&1\end{bmatrix}$

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

163. $|-B|=5$

$-|B|=5$

$\boxed{|B|=-5}$

$|p^T||A||p|=-27$

$|p|^2(-3)=-27$

$|p|=9$

$\boxed{|p|=\pm3}$

$|KA|=K^n|A|$

$|BA^T|=15$

$|B||A^T|=15$

$-5|A^T|=15$

$\boxed{|A^T|=3}$ $\boxed{|A|=3}$

164. $\left(\frac{1}{|A|}\right)^{-1}\cdot\left(|A|^4\right)^{-1}=|A|\cdot\frac{1}{|A|^4}=\frac{1}{|A|^3}$

$=\frac{1}{1/8}=8$

165. $x=\alpha=-2$. Then

$-4+3y-2z=0$

$y=\frac{2z}{3}+4$

$-6-4\left(\frac{2z}{3}\right)+3z+5=0$

$\boxed{z=3}$

$\boxed{y=2}$

Substitute x = - 2, y = 2, z = 3 in

$kx-2y+z+3=0$. Then k = 1 = $\begin{vmatrix}3&5\\1&2\end{vmatrix}$

166. $\begin{bmatrix}a&2&a\\b&0&4\\-3&c&0\end{bmatrix}$ is a skew symmetric Matrix

Then b = - 2 a = 3 c = - 4

$\begin{bmatrix}a&b\\b&a\end{bmatrix}\begin{bmatrix}b&c\\c&b\end{bmatrix}=\begin{bmatrix}3&-2\\-2&3\end{bmatrix}\begin{bmatrix}-2&-4\\-4&-2\end{bmatrix}$

$=\begin{bmatrix}2&-8\\-8&2\end{bmatrix}$

167. $\begin{bmatrix}-1&2&b\\a&5&6\\3&c&7\end{bmatrix}$ is a symmetric matrix

a = 2, b = 3, c = 6.

$\begin{vmatrix}a&b&c\\b&c&a\\c&a&b\end{vmatrix}=3abc-c^3-b^3-a^3=-143$

168. $A^2-4A-5I=0$

$A^2A^{-1}-4AA^{-1}-5IA^{-1}=0$

$A-4I=5A^{-1}$

$=A^{-1}=\frac{1}{5}(A-4I)$

169. conceptual

170. $A^3=\begin{bmatrix}a&b\\c&d\end{bmatrix}=\begin{bmatrix}k&1+k^2\\1+k^2&2k+k^3\end{bmatrix}$

$2k+k^3=d=228\Rightarrow\boxed{k=6}$

$b+c=2\left(1+k^2\right)=2(1+36)=74$

171. conceptual

172. $\left(A^{-1}B\right)^{-1}+\left(AB^{-1}\right)^{-1}=B^{-1}A+BA^{-1}$

173. Multiply and compare $\alpha-\beta=-22\rightarrow(1)$

$\alpha+\gamma=-14\rightarrow(2)$

$\alpha+2\beta=5\rightarrow(3)$

Solving $\alpha=-13,\ \beta=9,\ \gamma=-1$

$100+\dfrac{2\alpha+11\beta}{\gamma}=27$.

174. $A+A^T=2\begin{bmatrix}1&3&3\\3&3&3\\3&3&5\end{bmatrix}$

$A-A^T=2\begin{bmatrix}0&-1&0\\1&0&-1\\0&1&0\end{bmatrix}$

175. $R_2\rightarrow R_2-R_1,\ R_3\rightarrow R_3-R_2$

$f(x)=\begin{vmatrix}x&x+1&x+3\\2&3&4\\4&5&6\end{vmatrix}$

$C_2\rightarrow C_2-C_1,\ C_3\rightarrow C_3-C_2$

$f(x)=\begin{vmatrix}x&1&2\\2&1&1\\4&1&1\end{vmatrix}=-2$

$f(5)=-2$ $\therefore$ f is constant function

176. A^3 - (sum of trace of A) A^2 + (sum of minors of principal digital elements)

A - |A| I = 0

$A^3-5A^2+7A-3I=0$

$A^2-5A+7I-3A^{-1}=0$

$A^{-1}=\frac{1}{3}A^2-\frac{5}{3}A+\frac{7}{3}$

$\alpha=\frac{1}{3}\ \beta=-\frac{5}{3}\ \gamma=\frac{7}{3}$

$17\alpha+5\beta+\gamma=\frac{-1}{3}$

177. $X=A^{-1}B=\dfrac{adA}{|A|}\begin{bmatrix}1\\1\\2\end{bmatrix}$, $|adjA|=|A^2|, 4=|A|^2$

$=\frac{1}{2}\begin{bmatrix}1&-1&-1\\1&1&-1\\1&1&1\end{bmatrix}\begin{bmatrix}1\\1\\2\end{bmatrix}$ $\boxed{|A|=2}$

$=\begin{bmatrix}-1\\0\\2\end{bmatrix}$

178. Conceptual

179. $b=-d$ $\quad\frac{b}{c}=\frac{d}{g}$

$c=-g$ $\quad=\frac{d}{g}\times1$

$f=-h$ $\quad=\frac{-dh}{fg}$

$\Rightarrow\boxed{-\frac{f}{h}=1}$

(or) $\boxed{\frac{y}{f}=-1}$

180. $x=-2,\quad y=8$

$5x+y=-2$

181. $S^{-1}=\frac{1}{2}\begin{bmatrix}-1&1&1\\1&-1&1\\1&1&-1\end{bmatrix}$

$SAS^{-1}=\begin{bmatrix}a&0&0\\0&b&0\\0&0&c\end{bmatrix}$

182. Verify

183. $a=(-1)^{1+3}\begin{vmatrix}4 & -1\\ 2 & 4\end{vmatrix}=18$

$b=(-1)^{2+3}\begin{vmatrix}1 & 2\\ 2 & 4\end{vmatrix}=0$

$c=(-1)^{3+3}\begin{vmatrix}1 & 2\\ 4 & -1\end{vmatrix}=-9$

$[a\ b\ c]\begin{bmatrix}1\\4\\2\end{bmatrix}+[a\ b\ c]\begin{bmatrix}3\\7\\6\end{bmatrix}$

$=[18\ \ 0\ \ -9]\begin{bmatrix}1\\4\\2\end{bmatrix}+[18\ \ 0\ \ -9]\begin{bmatrix}3\\7\\6\end{bmatrix}$

$=(18+0-18)+(54+0-54)$

=0

184. BAC=I

B^{-1}.BAC=B^{-1}.I

AC=B^{-1}

ACB=B^{-1}.B

ACB=I

A^{-1}.ACB $=A^{-1}$.I

CB=A^{-1}

$A^{-1}=$

$$\begin{bmatrix}-1 & 0 & 1\\ 1 & 1 & 3\\ 2 & 0 & 2\end{bmatrix}\begin{bmatrix}2 & 6 & 4\\ 1 & 0 & 1\\ -1 & 1 & -1\end{bmatrix}=\begin{bmatrix}-3 & -5 & -5\\ 0 & 9 & 2\\ 2 & 14 & 6\end{bmatrix}$$

185. Conceptual

186. $A=\left\{\begin{bmatrix}a & b\\ c & d\end{bmatrix}: a,b,c,d\in\{-1,1\}\right\}$

Singular Matrix → ad- bc=0

ad= bc

No. of singular Matrices

ad		bc
-1× 1		-1× 1 1× -1
1× - 1		-1× 1 1× -1
1× 1		1× 1 -1× -1
-1× -1		1× 1 -1× -1

187. Definition of rank (conceptual question)

K $\le p\le \min\{m,n\}$ *satisfies*

188. Given $A=\begin{bmatrix}a_{11} & a_{12} & a_{13}\\ a_{21} & a_{22} & a_{23}\end{bmatrix}$ and $B=\begin{bmatrix}b_{11} & b_{12} & b_{13}\\ b_{21} & b_{22} & b_{23}\end{bmatrix}$

The orders of

AT BBTA and BTAATB are equal

Ie, $\boxed{A^TBB^TA=B^TAA^TB=3X3order}$

189. Definition of rank (conceptual question)

$\boxed{r\le p<K satisfies}$

190. $A=\begin{bmatrix}-\cot\theta & \operatorname{cosec}\theta\\ \operatorname{cosec}\theta & -\cot\theta\end{bmatrix}$

$|A|=-1$

$AdjA=\begin{bmatrix}-\cot\theta & \operatorname{cosec}\theta\\ \operatorname{cosec}\theta & -\cot\theta\end{bmatrix}$

$A^{-1}=\begin{bmatrix}\cot\theta & \operatorname{cosec}\theta\\ \operatorname{cosec}\theta & \cot\theta\end{bmatrix}$

$\because A^{-1}+A=0$

$\Rightarrow \operatorname{cosec}\theta=0$

$\because \operatorname{cosec}\theta\in(-\infty,-1]\cup[1,\infty)$

$\Rightarrow \theta_2$ doesn'exist

for $A^{-1}=A$

$\cot\theta=0\Rightarrow\cos\theta=0,\sin\theta\neq0$

$$\theta_1=\frac{\pi}{2}$$

191. $a_{ij}=\frac{1}{3}|i-5j|$

$A_{3\times3}=\begin{bmatrix}a_{11} & a_{12} & a_{13}\\ a_{21} & a_{22} & a_{23}\\ a_{31} & a_{32} & a_{33}\end{bmatrix}$

$=\begin{bmatrix}\frac{4}{3} & 3 & \frac{14}{3}\\ 1 & \frac{8}{3} & \frac{13}{3}\\ \frac{2}{3} & \frac{7}{3} & 4\end{bmatrix}$

192. $\begin{bmatrix}3x^3+x+3 & 2x^2-x+4 & 7x^2+8x+5\\ 5x^2+3x+2 & 4x^2-2x-1 & 7x^2+5x+8\\ 3x^2+2x & 4x^2-x-2 & 3x^2+8x+7\end{bmatrix}=Px^2+Qx+R$

put $x=0$

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

$|R|=3(-7+16)-4(14-40)+5(-4+5)$

$=27+104+5$

$=136$

193. $A=\begin{bmatrix}1 & 1 & 3\\ 5 & 2 & 6\\ -2 & -1 & -3\end{bmatrix}$

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

$A^3=\begin{bmatrix}0 & 0 & 0\\ 0 & 0 & 0\\ 0 & 0 & 0\end{bmatrix}$

$A^5+A^4+A^3+A+3I=\begin{bmatrix}4 & 1 & 3\\ 5 & 5 & 6\\ -2 & -1 & 0\end{bmatrix}$

194. $x+2y-z=3$

$3x-y+2z=1$

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

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

By solving , x = −1, y = 4, z =4

$\alpha^2+\beta^2+\gamma^2=1+16+16=33$

195.
$\begin{bmatrix}x & 4 & -1\end{bmatrix}\begin{bmatrix}2 & 1 & 0\\ 1 & 0 & 2\\ 0 & 2 & 4\end{bmatrix}\begin{bmatrix}x\\ 4\\ -1\end{bmatrix}=0$

$\begin{bmatrix}2x+4 & x-2 & 4\end{bmatrix}\begin{bmatrix}x\\ 4\\ -1\end{bmatrix}=0$

$\Rightarrow 2x^2+4x+4x-8-4=0$

$\Rightarrow x^2+4x-6=0$

$\Rightarrow x=-2\pm\sqrt{10}$

196. $|A-\lambda I|=0$

$\lambda^3-2\lambda^2+I=0$

$A^3-2A^2+I=0$

$A^{-1}=2A-A^2$

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

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

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

Rank is 2

198. A is skew symmeetric then $A^T = -A$

$$Tr\ (D_1 D_2 A) = Tr(D_1 A) = Tr(D_2 A) = 0$$
$$Tr(D_1 D_2) = 3(a+b+c)$$
$$Tr(D_1 + D_2) = a+b+c+9$$
$$Tr(D_1 D_2) - Tr(D_1 + D_2) = 2a+2b+2c-9$$

199. put $\theta = \frac{\Pi}{2}$

$$\begin{pmatrix}\alpha\\ \beta\\ \gamma\end{pmatrix} = \begin{pmatrix}0 & -1 & 0\\ 1 & 0 & 0\\ 0 & 0 & 1\end{pmatrix}\begin{pmatrix}x\\ y\\ z\end{pmatrix}$$

$$\begin{pmatrix}\alpha\\ \beta\\ \gamma\end{pmatrix} = \begin{pmatrix}-y\\ x\\ z\end{pmatrix}$$

$$\frac{x^2+y^2+z^2}{\gamma} = \frac{\alpha^2+\beta^2+\gamma^2}{z}$$

200. $$[x\,y\,z]\begin{bmatrix}1 & 2 & 3\\ 5 & 4 & -1\\ 3 & 0 & -5\end{bmatrix} = [-1 \quad -2 \quad 4]$$

$$[x+5y+3z \quad 2x+4y \quad 3x-y-5z] = [-1 \quad -2 \quad 4]$$

$$\therefore x+5y+3z = -1 \rightarrow 1$$

$$2x+4y = -2$$

$$x+2y = -1 \rightarrow 2$$

$$3x-y-5z = 4 \rightarrow 3$$

Solving 1, 2, 3

201. $(\det A \det B) B^{-1}A^{-1}$

$$|AB|, (AB)^{-1}$$

$$\cancel{|AB|}, \frac{Adj(AB)}{\cancel{|AB|}}$$

$$= Adj(AB)$$

202. $P = \frac{A+A^T}{2}, Q = \frac{A-A^T}{2}$

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

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

$$P^T - Q^T = \begin{bmatrix}2 & 2 & -4\\ 2 & 3 & 4\\ -4 & 4 & 2\end{bmatrix} - \begin{bmatrix}0 & +2 & -1\\ -2 & 0 & +3\\ +1 & -3 & 0\end{bmatrix}$$

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

203. Given, $A + 2B = \begin{bmatrix}1 & 2 & 0\\ 6 & -3 & 3\\ -5 & 3 & 1\end{bmatrix}$

$$2A - B = \begin{bmatrix}2 & -1 & 5\\ 2 & -1 & 6\\ 0 & 1 & 2\end{bmatrix}$$

$$A\begin{bmatrix}1 & 0 & 2\\ 2 & -1 & 3\\ -1 & 1 & 1\end{bmatrix} \qquad B = \begin{bmatrix}0 & 1 & -1\\ 2 & -1 & 0\\ -2 & 1 & 0\end{bmatrix}$$

$$Tr(A) = \cancel{1} - \cancel{1} + 1 = 1$$
$$Tr(B) = 0 - 1 + 0 = -1$$
$$Tr(A) - Tr(B) = 1 - (-1) = 2$$

204. CONCEPTUAL

205. CONCEPTUAL

206. $$5c = \begin{bmatrix}4 & 2 & 6 & -2\\ 2 & -4 & 4 & -6\end{bmatrix} + \begin{bmatrix}6 & 3 & 0 & 9\\ 3 & -3 & 6 & 9\end{bmatrix}$$

$$= \begin{bmatrix}10 & 5 & 6 & 7\\ 5 & -7 & 10 & 3\end{bmatrix}$$

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

207. $R_3 \to R_3 - R_1$

$R_4 \to R_4 - 2R_1$

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

$$R_3 \to R_3 + R_2, \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & -2 \\ 0 & 0 & 0 \\ 0 & 2 & 4 \end{bmatrix}$$

$$R_3 \to R_4, \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & -2 \\ 0 & 2 & 4 \\ 0 & 0 & 0 \end{bmatrix}$$

$$R_3 \to R_3 - R_2, \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & -2 \\ 0 & 0 & -4 \\ 0 & 0 & 0 \end{bmatrix}$$

$Rank \ = 3$

208. $\left(X^T B^T\right)^T = \left(A^T\right)^T$

BX=A

$$\begin{bmatrix} 3 & 5 & -7 \\ 0 & -1 & 8 \\ 6 & -1 & 0 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{pmatrix} 0 \\ -6 \\ 8 \end{pmatrix}$$

After solving

x=1, y=-2, z=-1

209. $I + p + p^2 + ... + + p^n = 0$

$$I + \frac{p(p^n - 1)}{p - 1} = 0$$

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

$$p^{n+1} - \cancel{p} = \cancel{-p} + I$$

$$p^n . p = I$$

$$p^{-1} = p^n$$

210. *Given* p *is a* 3×3 *square matrix &*

$Tr(p) \neq 0$

$$Now\ Tr\left(P - P^T\right) + \frac{Tr(P)}{Tr\left(P^T\right)}$$

$$+ \frac{Tr(P)}{Tr\left(P^T\right)} + Tr(P) \times Tr\left(P^T\right) = 0$$

$$\left(Tr\left(P^T\right)\right)^2 + 2.Tr\left(P^T\right) + 1 = 0 \to (1)$$

$Let\ Tr\left(P^T\right) = t$

$from\ eq\,(1) \Rightarrow t^2 + 2t + 1 = 0 \ \Rightarrow (t+1)^2 = 0 \Rightarrow t = -1$

$\therefore Tr\left(P^T\right) = Tr(P) = -1$

211. Given linear equation's are

$$\begin{vmatrix} 1 & k & 3 \\ 4 & 3 & k \\ 2 & 1 & 2 \end{vmatrix} = 0 \quad \begin{pmatrix} matrix\ inversion \\ method\ solution \end{pmatrix}$$

$$1(6-k) - k(8-2k) + 3(4-6) = 0$$

$$2k^2 - 9k = 0$$

$$k(2k-9) = 0$$

$$k = 0 \quad (or) \quad k = 9/2$$

212. $|A| = 25\alpha$

$$\left|A^2\right| = 25$$

$$(25\alpha)^2 = 25$$

$$625\alpha^2 = 25$$

$$\alpha^2 = \frac{1}{25}$$

$$\therefore |\alpha| = \frac{1}{5}$$

213.

$$\begin{vmatrix} \sqrt{3} & 2\sqrt{5} & \sqrt{5} \\ \sqrt{15} & 5 & \sqrt{10} \\ 3 & \sqrt{15} & 5 \end{vmatrix} = \begin{vmatrix} \sqrt{3} & 2\sqrt{5} & \sqrt{5} \\ \sqrt{3} \times \sqrt{5} & \sqrt{5}\sqrt{5} & \sqrt{5}\sqrt{2} \\ \sqrt{3}\sqrt{3} & \sqrt{3}\sqrt{5} & \sqrt{5}\sqrt{5} \end{vmatrix}$$

$$= \sqrt{3} \times \sqrt{5} \times \sqrt{5} \begin{vmatrix} 1 & 2 & 1 \\ \sqrt{5} & \sqrt{5} & \sqrt{2} \\ \sqrt{3} & \sqrt{3} & \sqrt{5} \end{vmatrix} = 15\sqrt{2} - 25\sqrt{3}$$

214. $(A - 2I)(A - 3I) = 0$

$$A^2 - (5I)A + 6I^2 = 0$$

$$A^2 - 5A + 6 = 0$$

$$A^2 + 6 = 5A$$

$$\frac{A^2}{5} + \frac{6}{5} = A$$

$$\frac{1}{5}A + \frac{6}{5}A^{-1} = A A^{-1} = I$$

215. $B=\begin{bmatrix}1 & 2\\ 0 & 3\end{bmatrix}$ $|3A|=27 \Rightarrow 3^2|A|=27 \Rightarrow |A|=3$

$$A\begin{bmatrix}1 & 2\\ 0 & 3\end{bmatrix}=\begin{bmatrix}k & 0\\ 0 & k\end{bmatrix} \quad \Rightarrow A=\begin{bmatrix}k & -2k/3\\ 0 & \frac{k}{3}\end{bmatrix}$$

$$|A|=3=\frac{k^2}{3}\Rightarrow k=\pm 3$$

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

$$3A^{-1}+A^2=\begin{bmatrix}10 & -6\\ 0 & 4\end{bmatrix}$$

216. $|A|\neq 0$ $\left(A^{-1}\right)^T=\left(A^T\right)^{-1}$ $\boxed{A^T=A}$

$$=A^{-1}$$

$\therefore A^{-1}$ is symmetric

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

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

Verify from option-3 we get

218. $$\begin{vmatrix}2 & 3 & 5\\ 3 & 5 & 2\\ 5 & 2 & 3\end{vmatrix}=-70$$

$$\begin{vmatrix}1 & 1 & 1\\ 7 & 11 & 13\\ 49 & 121 & 169\end{vmatrix}=+48$$

$\Rightarrow -70+48=-22$

219. Given det A=190

$$\begin{vmatrix}k & 5 & 2\\ 2 & -k & 5\\ 5 & 2 & -k\end{vmatrix}=190$$

By solving k=3 satisfies.

$$\therefore A=\begin{bmatrix}3 & 5 & 2\\ 2 & -3 & 5\\ 5 & 2 & -3\end{bmatrix}$$

$$AdjA=\begin{bmatrix}-1 & 19 & 31\\ 31 & -19 & -11\\ 19 & 19 & -19\end{bmatrix}$$

220. $3x-2y+3-5k=0$...........(1)

$2x+3y-6+5k=0$...........(2)

$x+4y+9-k=$

$5x+20y+45-5k=0$...........(3)

$(1)+(2)\Rightarrow 5x+y-3=0$........(4)

$(2)+(3)\Rightarrow 7x+23y+39=0$........(5)

Solve (4) and (5) to get $x=1, y=-2$

(x,y) Values in (1) to get $\boxed{k=2}$

221. $$x=\left\{\begin{bmatrix}a & b\\ c & d\end{bmatrix}\right\}$$

Given f(A) = det (A) = ad –bc

For every $a,b,c,d\in A$ then some elements are same images

Not a one- one

→ co domain – Range

This is on to function

222. $|Adj(\text{Adj } A^2|$

$=|A^2|^{(3-1)^2}=|A^2|^4$

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

$=|A|^8$

223. Given

$$(AB+BA)^T+(AB-BA)^T=2BA$$

$$L.H.S=(AB+BA)^T+(AB-BA)^T$$

$$=(AB)^T+(BA)^T+(AB)^T-(BA)^T$$

$$=2(AB)^T$$

$$= 2\left(B^T.A^T\right)$$

R.H.S $= 2BA$

$= $ L.H.S =R.H.S then

$\Rightarrow \quad 2B^T.A^T = 2BA$

$$B^T.A^T = BA$$

$$(AB)^T = BA$$

$\therefore$ A, B are neither symmetric nor skew - symmetric

224. Given adj $\begin{bmatrix} 1 & 0 & 2 \\ -1 & 1 & -2 \\ 0 & 2 & 1 \end{bmatrix} = \begin{bmatrix} 5 & m & -2 \\ 1 & 1 & 0 \\ -2 & -2 & n \end{bmatrix}$

$$\begin{bmatrix} 5 & 1 & -2 \\ 4 & 1 & -2 \\ -2 & 0 & 1 \end{bmatrix}^T = \begin{bmatrix} 5 & m & -2 \\ 1 & 1 & 0 \\ -2 & -2 & n \end{bmatrix}$$

$$\Rightarrow \begin{bmatrix} 5 & 4 & -2 \\ 1 & 1 & 0 \\ -2 & -2 & 1 \end{bmatrix} = \begin{bmatrix} 5 & m & -2 \\ 1 & 1 & 0 \\ -2 & -2 & n \end{bmatrix}$$

$\therefore$ m=4 , n=1

m +n=5

225. Given A = $\begin{bmatrix} 0 & 3 \\ 0 & 0 \end{bmatrix}$

Given $f(x) = x + x^2 + x^3 + .. + x^{2023} \rightarrow 1$

$$A^2 = \begin{bmatrix} 0 & 3 \\ 0 & 0 \end{bmatrix} \begin{bmatrix} 0 & -3 \\ 0 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$$

Similarly A3, A4, ……A2023 are null Matrices

From equation 1, f(A) = A+0+0

$$f(A) = A = \begin{bmatrix} 0 & 3 \\ 0 & 0 \end{bmatrix}$$

$$\therefore f(A) + I = \begin{bmatrix} 0 & 3 \\ 0 & 0 \end{bmatrix} + \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}$$

226. $AB = \begin{bmatrix} 2 & 2 & 7 \\ 1 & 8 & 5 \\ 3 & 6 & 10 \end{bmatrix}$

Multiply A with B and comparing the corresponding terms

We get a2=4 $\Rightarrow$ a=2

b2=1 $\Rightarrow$ c=3

Now a2+ b2+c2=4+1+9=14

227. A^T=A and $B^T = -B$

a=b=-6	b=-6
c=d=7	c=7

Now

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

$$= \begin{bmatrix} 48 & 26 & 36 \\ 32 & 19 & 22 \\ -11 & 43 & -67 \end{bmatrix}$$

228.

$$A^{-1} = \frac{1}{-9} \begin{bmatrix} -3 & 7 & -4 \\ 6 & 1 & 2 \\ -3 & -5 & -1 \end{bmatrix}$$

Now $a_1 + c_2 + b_3 = \frac{3}{9} + \frac{5}{9} - \frac{2}{9} = \frac{6}{9} = \frac{2}{3}$

229. $\left.\begin{aligned} 2x - 3y + 5z &= 12 \\ 5x + 2y + 3z &= 11 \\ x + 2y - 3z &= -3 \end{aligned}\right\}$ solve these equations

We get x=2, y=-1, z=1

Now

$$2\alpha + 5\beta + 3\gamma = 4 - 5 + 3$$

$$= 7 - 5 = 2$$