c) $\left(n+\frac{(-1)^n}{6}\right)\pi$ d) $\frac{n\pi}{2}$

62) If $A=\begin{bmatrix}-2 & 0 & 1\\ 1 & 2 & 3\end{bmatrix}$ & $B=\begin{bmatrix}0 & 1\\ 2 & 3\\ 1 & -1\end{bmatrix}$ then AB is

a) singular matrix b) non – singular
c) $|AB| = 4$ d) scalar.

63) If $A=\begin{bmatrix}1 & 3 & 3\\ 3 & 1 & 3\\ 3 & 3 & 1\end{bmatrix}$ then $A^2 - 5A$ is

a) Zero matrix b) Unit matrix
c) Scalar matrix d) Skew – Symmetric

64) If $A=\begin{bmatrix}2 & 4\\ 1 & 1\end{bmatrix}$ then $A^{-1} =$

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

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

65) For equations $x + y + 7z = 2$, $x - y + 5z = 1$, $9x - 6y - 9z = 1$, values of x, z are…

a) $\frac{1}{2}, \frac{1}{3}$ b) $\frac{1}{2}, \frac{1}{6}$ c) 1, 3 d) 1, - 3

66) If $A=\begin{bmatrix}2 & 0 & -3\\ 4 & 3 & 1\\ -5 & 7 & 2\end{bmatrix}$ is expressed as the sum of a symmetric and skew–symmetric matrix, then the symmetric matrix is

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

c) $\begin{bmatrix}4 & 4 & -8\\ 4 & 6 & 8\\ -8 & 8 & 4\end{bmatrix}$ d) $\begin{bmatrix}1 & 0 & 0\\ 0 & 1 & 0\\ 0 & 0 & 1\end{bmatrix}$

67) The inverse of $\begin{bmatrix}1 & 2 & -2\\ -1 & 3 & 0\\ 0 & -2 & 1\end{bmatrix}$ is

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

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

68) If $A=\begin{bmatrix}\cos\theta & \sin\theta\\ -\sin\theta & \cos\theta\end{bmatrix}$, then $\lim_{n\to\infty}\frac{1}{n}A^n$ is

a) a null matrix b) an identity matrix

c) $\begin{bmatrix}0 & 1\\ -1 & 0\end{bmatrix}$ d) none

69) The inverse of $\begin{bmatrix}1 & 2 & 3\\ 0 & 5 & 0\\ 2 & 4 & 3\end{bmatrix}$ is

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

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

70) If $A^2 + mA + nI = 0$ and $n \neq 0$, $|A| \neq 0$ then $A^{-1} =$

a) $-\frac{1}{m}(A+nI)$ b) $-\frac{1}{n}(A+mI)$

c) $-\frac{1}{n}(I+mA)$ d) $(A + mnI)$

71) The inverse of $\begin{bmatrix}\cos\alpha & \sin\alpha & 0\\ \sin\alpha & \cos\alpha & 0\\ 0 & 0 & 1\end{bmatrix}$ is

a) $\begin{bmatrix}\cos\alpha & \sin\alpha & 0\\ -\sin\alpha & \cos\alpha & 0\\ 0 & 0 & 1\end{bmatrix}$ b) $\begin{bmatrix}0 & \sin\alpha & 0\\ \sin\alpha & \cos\alpha & 0\\ \cos\alpha & 0 & 1\end{bmatrix}$

c) $\begin{bmatrix}0 & \sin\alpha & 0\\ 0 & \cos\alpha & 0\\ \cos\alpha & 0 & 1\end{bmatrix}$ d) $\begin{bmatrix}0 & \sin\alpha & 0\\ 0 & \cos\alpha & 0\\ 0 & \sin\alpha & 1\end{bmatrix}$

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

a) $\begin{bmatrix}2 & -2\\ 0 & 3\end{bmatrix}$ b) $\frac{1}{10}\begin{bmatrix}2 & 2\\ -2 & 3\end{bmatrix}$ c) $\begin{bmatrix}3 & -2\\ 2 & 2\end{bmatrix}$ d) $\begin{bmatrix}5 & 2\\ 3 & 1\end{bmatrix}$

73) If $A=\begin{bmatrix}5 & 6 & -3\\ -4 & 3 & 2\\ -4 & -7 & 3\end{bmatrix}$ then co–factors of 2nd row are

a) –3, 3, –11. b) 3, 3, –11
c) 3, –3, 11 d) 3, 3, 11

74) If for matrix A, $A^5 = I$, then $A^{-1} =$

a) A b) A^2 c) A^3 d) A^4

a) diagonal b) skew–symmetric
c) singular d) non –singular

168) If A= $\begin{bmatrix} 1 & 0 & 2 \\ -1 & 1 & -2 \\ 0 & 2 & 1 \end{bmatrix}$ and adj. A= $\begin{bmatrix} 5 & x & -2 \\ 1 & 1 & 0 \\ -2 & -2 & y \end{bmatrix}$ then (x, y) =

a) (4, –1) b) (–4, 1) c) (–4, –10) d) (4,1)

169) If $n \in +I$, then $\begin{bmatrix} 1 & 1 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{bmatrix}^n$ =

a) $\begin{bmatrix} 1 & n & n(n-1) \\ 0 & 1 & n \\ 0 & 0 & 1 \end{bmatrix}$ b) $\begin{bmatrix} 1 & n & [n(n-1)]/2 \\ 0 & 1 & 1 \\ 0 & 0 & n \end{bmatrix}$

c) $\begin{bmatrix} 1 & n & [n(n-1)]/2 \\ 0 & 1 & n \\ 0 & 0 & 1 \end{bmatrix}$ d) none

170) If 'n' is a natural number then $\begin{bmatrix} 2 & -1 \\ 3 & -2 \end{bmatrix}^n$ is

a) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ if 'n' is even

c) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ if 'n' is odd

b) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ if 'n' is natural number

d) None

171) If A= $\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ and A^{-1} exists and ≠ 0, then $(A^2 - 4A)A^{-1} =$

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

c) $\begin{bmatrix} 5 & 2 & 0 \\ 2 & 5 & 0 \\ 0 & 2 & 5 \end{bmatrix}$ d) $\begin{bmatrix} 5 & 2 & 5 \\ 2 & 5 & 5 \\ 5 & 5 & 2 \end{bmatrix}$

172) If A= $\begin{bmatrix} 3 & 1 \\ 1 & 4 \end{bmatrix}$ and $A^2 - KA + 11I_2 = 0$, then K =

a) –2 b) 2 c) –1 d) 7

173) If A + 2B = $\begin{bmatrix} 2 & -4 \\ 1 & 6 \end{bmatrix}$, A'+ B' = $\begin{bmatrix} 1 & 2 \\ 0 & -1 \end{bmatrix}$, then A =

a) $\begin{bmatrix} 0 & 4 \\ 3 & -8 \end{bmatrix}$ b) $\begin{bmatrix} 1 & -4 \\ -1 & 7 \end{bmatrix}$ c) $\begin{bmatrix} 0 & -4 \\ 3 & 8 \end{bmatrix}$ d) none

174) If A = $\begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$ and $A^2 - 5A + 7I = O$ then I =

a) $\frac{1}{5}A + \frac{7}{5}A^{-1}$ b) $\frac{1}{7}A + \frac{5}{7}A^{-1}$

c) $\frac{1}{7}A - \frac{5}{7}A^{-1}$ d) $\frac{1}{5}A - \frac{7}{5}A^{-1}$

175) Let P : a non singular matrix,
$1 + P + P^2 + ... + P^n = 0$
(0 denotes the null matrix) then P^{-1} is :
a) P^n b) $-P^n$ c) $-(1 + P + ... + P^n)$ d) none

176) If A= $\begin{bmatrix} 1 & -1 & 1 \\ 0 & 2 & -3 \\ 2 & 1 & 0 \end{bmatrix}$, B=adj A and C = 10A, then $\frac{|adj B|}{|C|}$ is

a) 5 b) 25 c) –1 d) 1/8

177) If A is a non-singular matrix and B is a square matrix, then $|A^{-1} BA|$ is:
a) |A| b) |B| c) |AB| d) |BA|

178) If A $\begin{bmatrix} 3 & 2 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 5 & 3 \\ 2 & 2 \end{bmatrix}$ then A^{-1} is equal to:

a) $\begin{bmatrix} 2 & 1 \\ 2 & 2 \end{bmatrix}$ b $\begin{bmatrix} 2 & 1 \\ 0 & 2 \end{bmatrix}$ c) $\frac{1}{2}\begin{bmatrix} 2 & 1 \\ 0 & 2 \end{bmatrix}$ d) $\frac{1}{4}\begin{bmatrix} 2 & 1 \\ 0 & 2 \end{bmatrix}$

179) If, $A = \begin{bmatrix} 3 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 3 \end{bmatrix}$ then the value of | A | . |adj A| is equal to :

a) $(3)^3$ b) $(3)^6$ c) $(3)^9$ d) $(3)^{12}$

180) If $A = \begin{pmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{pmatrix}$ then A^{-1} equals to

a) A^2 b) A^4 c) A d) A^3

181) Let A be any 3 × 3 invertible matrix. Then which one of the following is not always true ?

5) The element in the third row and second column of the inverse of the matrix $\begin{bmatrix} 3 & 2 & 6 \\ 1 & 1 & 2 \\ 2 & 2 & 5 \end{bmatrix}$ is

a) 0 b) 1 c) –2 d) 2

6) If $A = \left[a_{ij}\right]_{3\times3} \begin{bmatrix} 1 & 2 & 3 \\ 1 & 1 & 5 \\ 2 & 4 & 7 \end{bmatrix}$ and A_{ij} is a cofactor of a_{ij}, then $a_{11}A_{21} + a_{12}A_{22} + a_{13}A_{23}$ is equal to

a) 1 b) 0 c) 2 d) –1

7) If $A = \begin{bmatrix} 1 & 3 & -2 \\ -3 & 0 & -5 \\ 2 & 5 & 0 \end{bmatrix}$ and A(adj A) = KI, then the value of K is, (where I is unit matrix of order 3)

a) –85 b) 85 c) –25 d) 25

8) If $A = \begin{bmatrix} 0 & 1+2i & i-2 \\ -1-2i & 0 & K \\ 2-i & 7 & 0 \end{bmatrix}$ and A^{-1} does not exists, then K =….. (where $i = \sqrt{-1}$)

a) 7 b) 1 – 2i c) 1 + 2i d) –7

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

a) $\frac{1}{4}\begin{bmatrix} -7 & 6 & -1 \\ 9 & -6 & -1 \\ -5 & 2 & 1 \end{bmatrix}$ b) $-\frac{1}{4}\begin{bmatrix} -7 & 6 & -1 \\ 9 & -6 & -1 \\ -5 & 2 & 1 \end{bmatrix}$

c) $-\frac{1}{4}\begin{bmatrix} -7 & 6 & 1 \\ 9 & -1 & 1 \\ -5 & 2 & 1 \end{bmatrix}$ d) $-\frac{1}{4}\begin{bmatrix} -7 & -6 & -1 \\ 9 & 6 & -1 \\ -5 & -2 & 1 \end{bmatrix}$

10) If $(BA)^{-1} = C$, where $B = \begin{bmatrix} 2 & 6 & 4 \\ 1 & 0 & 1 \\ -1 & 1 & -1 \end{bmatrix}$ and $C = \begin{bmatrix} -1 & 0 & 1 \\ 1 & 1 & 3 \\ 2 & 0 & 2 \end{bmatrix}$, then A^{-1} is given by

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

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

MCQ From AIEEE / JEE (Main).

1) If $P = \begin{bmatrix} \sqrt{3}/2 & -1/2 \\ 1/2 & \sqrt{3}/2 \end{bmatrix}$, $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and $Q = PAP^T$ then $P^TQ^{2005}P$ is **[I.I.T. – 2005]**

a) $\begin{bmatrix} 1 & 2005 \\ 0 & 1 \end{bmatrix}$ b) $\begin{bmatrix} 1 & 2005 \\ 2005 & 1 \end{bmatrix}$

c) $\begin{bmatrix} 1 & 0 \\ 2005 & 1 \end{bmatrix}$ d) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

2) If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ and $A^2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$ then **[A.I.E.E.E. – 2003]**

a) $\alpha = 2ab, \beta = a^2 + b^2$

b) $\alpha = a^2 + b^2, \beta = ab$

c) $\alpha = a^2 + b^2, \beta = 2ab$

d) $\alpha = a^2 + b^2, \beta = a^2 - b^2$

3) If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$, $A^2 = B$ then value of α is **[I.I.T. (screening – 2003]**

a) 4 b) –1 c) 11 d) no real value of

4) If $\omega \neq 1$ is the complex cube root of unity and matrix $H = \begin{bmatrix} \omega & 0 \\ 0 & \omega \end{bmatrix}$, then H^{70} is equal to **[A.I.E.E.E. – 2011]**

a) 0 b) –H c) H^2 d) H

5) Let $A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$. If u_1 and u_2 are column

matrices such that $Au_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$ and $Au_2 = \begin{bmatrix} 0 \\ 1 \\ 0 \end{bmatrix}$,

then $u_1 + u_2$ is equal to : **[A.I.E.E.E. – 2012]**

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

6) Let P and Q be 3×3 matrices with $P \neq Q$ If $P^3 = Q^3$ and $P^2Q = Q^2P$, then determinant of $(P^2 + Q^2)$ is equal to :

[A.I.E.E.E. – 2012]

a) –2 b) 1 c) 0 d) –1

7) Let $P = [a_{ij}]$ be a 3 × 3 matrix and let $Q = [b_{ij}]$, where $b_{ij} = 2^{i+j}a_{ij}$ for $1 \le i, j \le 3$. If the determinant of P is 2, then the determinant of the matrix Q is : **[I.I.T. – 2012]**

a) 2^{10} b) 2^{11} c) 2^{12} d) 2^{13}

8) If P is 3×3 matrix such that $P^T = 2P + I$, where P^T is the transpose of P and I is the 3×3 identity matrix, then there exists a column matrix

$X = \begin{bmatrix} x \\ y \\ z \end{bmatrix} \neq \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$ such that : **[I.I.T. – 2012]**

a) $PX = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$ b) PX = X

c) PX = 2X d) PX = –X

9) If the adjoint of a matrix P is $\begin{bmatrix} 1 & 4 & 4 \\ 2 & 1 & 7 \\ 1 & 1 & 3 \end{bmatrix}$ then the possible value (s) of the determinant of P is :

[I.I.T. – 2012]

a) 4 b) –1 c) 1 d) ± 2

10) If $A = \begin{bmatrix} 5 & 5\alpha & \alpha \\ 0 & \alpha & 5\alpha \\ 0 & 0 & 5 \end{bmatrix}$, $|A^2| = 25$, then $|\alpha| =$

[A.I.E.E.E. – 2007]

a) $-\frac{1}{5}$ b) $\pm\frac{1}{5}$ c) $\frac{1}{5}$ d) 5

11) If $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$, $(10)B = \begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & k \\ 1 & -2 & 3 \end{bmatrix}$, B is inverse of A then k =

[A.I.E.E.E. – 2004]

a) –2 b) –1 c) 2 d) 5

12) Let $A = \begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$, the only statement about the matrix A is

[A.I.E.E.E. – 2004]

a) A is a zero matrix

b) A = (–1) = I, where I is a unit matrix

c) A^{-1} does not exists.

d) $A^2 = I$

13) If $A^2 – A + I$ then the inverse of A is

[A.I.E.E.E. – 2005]

a) A b) A + I **c)** I – A d) A – I

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

[A.I.E.E.E. – 2005]

a) $A^n = 2^{n-1}A - (n-1)I$ b) $A^n = nA - (n-1)I$

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

15) $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & -2 & 4 \end{bmatrix}$ and also $A^{-1} = \frac{1}{6}(A^2 + cA + dI)$, where I is a unit matrix, then the ordered pair (c, d) is **[I.I.T.– 2005]**

a) (–6,11) b) (–11,6) c) (11,6) d) (6,11)

16) If A and B are square matrices of size n × n such that $A^2 - B^2 = (A - B)(A + B)$, then which of the following will be always true?

[A.I.E.E.E.–2006]

a) A = B

b) AB = BA

c) either A or B is a zero matrix.

d) either A or B is an identity matrix.

17) Let $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} a & 0 \\ 0 & b \end{bmatrix}$, a, b ϵ N then

$(x, y) \equiv \left(\pm\sqrt{\frac{3}{8}}, \pm\frac{1}{\sqrt{2}}\right)$

8) If A is a symmetric matrix and B is a skew symmetric matrix such that $A + B = \begin{bmatrix} 2 & 3 \\ 5 & -1 \end{bmatrix}$, then AB is equal to

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

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

9) Let $A = \begin{pmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{pmatrix}, (\alpha \in R)$ such that $A^{32} = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}$. Then, the value of α is

a) $\frac{\pi}{32}$ b) 0 c) $\frac{\pi}{64}$ d) $\frac{\pi}{16}$

10) The total number of matrices $A = \begin{bmatrix} 0 & 2y & 1 \\ 2x & y & -1 \\ 2x & -y & 1 \end{bmatrix}$, $(x, y, \in R, x \neq y)$ for which $A^T A = 3I_3$ is

a) 2 b) 4 c) 3 d) 6

JEE Main 2020

1) Let α be a root of equation $x^2 + x + 1 = 0$ and matrix $A = \frac{1}{\sqrt{3}}\begin{bmatrix} 1 & 1 & 1 \\ 1 & \alpha & \alpha^2 \\ 1 & \alpha^2 & \alpha^4 \end{bmatrix}$, then the matrix A^{31} is equal to

1) A^3 2) A^2 3) I_3 4) A

2) Let A = $[a_{ij}]$ and B = $[b_{ij}]$ be two 3 × 3 real matrix such that $b_{ij} = (3)^{(i+j-2)} a_{ji}$, where i, j = 1, 2, 3. If the determinant of B is 81, then the determinant of A is

1) 1/9 2) 1/81 3) 3 4) 1/3

Ans : $|B| = \begin{vmatrix} b_{11} & b_{12} & b_{13} \\ b_{21} & b_{22} & b_{23} \\ b_{31} & b_{32} & b_{33} \end{vmatrix}$

$b_{ij} = (3)^{i+j-2} a_{ji}$

$81 = \begin{vmatrix} 3^0 & 3^1 a_{12} & 3^2 a_{13} \end{vmatrix}$

$81 = 3 \times 3^2 \begin{vmatrix} a_{11} & 3^1 a_{12} & 3^2 a_{13} \\ 3^1 a_{21} & 3^1 a_{22} & 3^1 a_{23} \\ 3^2 a_{31} & 3^2 a_{32} & 3^2 a_{33} \end{vmatrix}$

$81 = 3 \times 3^2 \times 3^3 |A| \quad \therefore |A| = \frac{1}{9}$

3) If $A = \begin{pmatrix} 2 & 2 \\ 9 & 4 \end{pmatrix}$ and $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$, then $10A^{-1}$ is equal to

1) A – 4I 2) A – 6I 3) 4I – A 4) 6I – A

4) If the matrices $A = \begin{bmatrix} 1 & 1 & 2 \\ 1 & 3 & 4 \\ 1 & -1 & 3 \end{bmatrix}$, B = adj A and C = 3A then $\frac{|adj B|}{|C|}$ is equal to

1) 72 2) 8 3) 16 4) 2

5) Let a, b, c, ∈ R be all non-zero and satisfy $a^3 + b^3 + c^3 = 2$. If the matrix $A = \begin{pmatrix} a & b & c \\ b & c & a \\ c & a & b \end{pmatrix}$ satisfies $A^T A = I$, then a value of abc can be

a) $-\frac{1}{3}$ b) $\frac{1}{3}$ c) 3 d) $\frac{2}{3}$

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

a) 10 b) 20 c) 15 d) 25

7) If $A = \begin{bmatrix} \cos\theta & i\sin\theta \\ i\sin\theta & \cos\theta \end{bmatrix}, \left(\theta = \frac{\pi}{24}\right)$ and $A^5 = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, where $i = \sqrt{-1}$, then which one of the following is not true?

a) $a^2 - d^2 = 0$ b) $a^2 - c^2 = 1$

c) $a^2 - b^2 = \frac{1}{2}$ d) $0 \le a^2 + b^2 \le 1$