INSTITUTE NAME AND LOGO

MHT-CET 2017		
Time : 90 Min	**Maths : Matrices**	**Marks : 100**

Hints and Solutions

201) Ans: **B)** $\begin{bmatrix} \frac{1}{2} & -\frac{1}{2} & \frac{1}{2} \\ -4 & 3 & -1 \\ \frac{5}{2} & \frac{-3}{2} & \frac{1}{2} \end{bmatrix}$

Sol: $|A| = \begin{vmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{vmatrix} = -2 \neq 0 \quad \therefore A^{-1}$ exists.

Here, $C_{11} = -1$, $C_{12} = 8$, $C_{13} = -5$,
$C_{21} = 1$, $C_{22} = -6$, $C_{23} = 3$,
$C_{31} = -1$, $C_{32} = 2$, $C_{33} = -1$

$$\therefore \text{adj } A = \begin{bmatrix} -1 & 8 & -5 \\ 1 & -6 & 3 \\ -1 & 2 & -1 \end{bmatrix}^T = \begin{bmatrix} -1 & 1 & -1 \\ 8 & -6 & 2 \\ -5 & 3 & -1 \end{bmatrix}$$

$$\therefore A^{-1} = \frac{1}{-2}\begin{bmatrix} -1 & 1 & -1 \\ 8 & -6 & 2 \\ -5 & 3 & -1 \end{bmatrix} = \begin{bmatrix} \frac{1}{2} & \frac{-1}{2} & \frac{1}{2} \\ -4 & 3 & -1 \\ \frac{5}{2} & \frac{-3}{2} & \frac{1}{2} \end{bmatrix}$$

202) Ans: **D)** $\begin{bmatrix} \frac{4}{14} & \frac{2}{14} \\ \frac{-1}{14} & \frac{3}{14} \end{bmatrix}$

Sol: Suppose, $A = \begin{bmatrix} 3 & -2 \\ 1 & 4 \end{bmatrix} \Rightarrow |A| = 14$

and $\text{adj } A = \begin{bmatrix} 4 & 2 \\ -1 & 3 \end{bmatrix} \quad \therefore A^{-1} = \begin{bmatrix} \frac{4}{14} & \frac{2}{14} \\ \frac{-1}{14} & \frac{3}{14} \end{bmatrix}$

203) Ans: **C)** A

Sol: $A = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} \Rightarrow |A| = -1(1+0) = -1$

$$\text{adj}(A) = \begin{bmatrix} A_{11} & A_{21} & A_{31} \\ A_{12} & A_{22} & A_{32} \\ A_{13} & A_{23} & A_{33} \end{bmatrix}$$

$\Rightarrow A_{11} = 0, A_{12} = -1, A_{13} = 0$
$A_{21} = -1, A_{22} = 0, A_{23} = 0$
$A_{31} = 0\ , \ A_{32} = 0, A_{33} = -1$

$$\therefore A^{-1} = \frac{\text{adj}(A)}{|A|} = \begin{bmatrix} 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} = A$$

204) Ans: **D)** $\begin{bmatrix} -1 & 3 \\ 6 & -16 \end{bmatrix}$

Sol: If AB =C, then $B^{-1} A^{-1} = C^{-1}$
$\therefore A^{-1} = BC^{-1}$

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

$$= \begin{bmatrix} 0 & 1 \\ 2 & -4 \end{bmatrix}\begin{bmatrix} 1 & -2 \\ -1 & 3 \end{bmatrix} = \begin{bmatrix} -1 & 3 \\ 6 & -16 \end{bmatrix}$$

205) Ans: **B)** $\begin{bmatrix} -3 & -5 & -5 \\ 0 & 9 & 2 \\ 2 & 14 & 6 \end{bmatrix}$

Sol: $(BA)^{-1} = C \Rightarrow A^{-1} B^{-1} = C \Rightarrow A^{-1} = CB$

$$\therefore A^{-1} = \begin{bmatrix} -1 & 0 & 1 \\ 1 & 1 & 3 \\ 2 & 0 & 2 \end{bmatrix}\begin{bmatrix} 2 & 6 & 4 \\ 1 & 0 & 1 \\ -1 & 1 & -1 \end{bmatrix} = \begin{bmatrix} -3 & -5 & -5 \\ 0 & 9 & 2 \\ 2 & 14 & 6 \end{bmatrix}$$

206) Ans: **C)** 1

Sol: We know that, $A(\text{adj } A) = |A|.I$

$$\Rightarrow \begin{bmatrix} k & 0 \\ 0 & k \end{bmatrix} = (\cos^2\alpha + \sin^2\alpha)\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} \Rightarrow k = 1$$

207) Ans: **A)** 2

Sol: Co-factor $A_{32} = (-1)^5 \begin{vmatrix} 2 & 3 \\ 4 & 5 \end{vmatrix} = 2$

208) Ans: **A)** $\begin{bmatrix} 4 & -1 \\ -7 & 2 \end{bmatrix}$

Sol: Multiplicative inverse of matrix

$(A^{-1}) = \begin{bmatrix} 2 & 1 \\ 7 & 4 \end{bmatrix}$

$$= \frac{1}{2\times4-7\times1}\begin{bmatrix} 4 & -1 \\ -7 & 2 \end{bmatrix} = \begin{bmatrix} 4 & -1 \\ -7 & 2 \end{bmatrix}$$

209) Ans: **D)** 5

Sol: From given, $\begin{pmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{pmatrix} = 10A^{-1}$

$$\Rightarrow \begin{pmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{pmatrix}\begin{pmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{pmatrix} = \begin{pmatrix} 10 & 0 & 0 \\ 0 & 10 & 0 \\ 0 & 0 & 10 \end{pmatrix}$$

By equating the element of 2nd row and first column,
$\Rightarrow -5 + \alpha = 0 \Rightarrow \alpha = 5$

210) Ans: **B)** 3, 2, 1
Sol: Consider option (B),

$$\begin{bmatrix}1 & 3 & 3\\1 & 4 & 4\\1 & 3 & 4\end{bmatrix}\begin{bmatrix}3\\2\\1\end{bmatrix}=\begin{bmatrix}12\\15\\13\end{bmatrix}$$

$\therefore$ Option (B) is the correct answer.

211) Ans: **D)** All real k
Sol: $|A| = k^2 + 1$, which can be never zero. Hence matrix A is invertible for all real k.

212) Ans: **D)** $\begin{bmatrix}3 & -16\\6 & -30\end{bmatrix}$

Sol: If AC = B, then $A = BC^{-1}$

$$\therefore A=\begin{bmatrix}3 & -1\\6 & 0\end{bmatrix}\begin{bmatrix}1 & 5\\0 & 1\end{bmatrix}^{-1}$$

$$=\begin{bmatrix}3 & -1\\6 & 0\end{bmatrix}\begin{bmatrix}1 & -5\\0 & 1\end{bmatrix}=\begin{bmatrix}3 & -16\\6 & -30\end{bmatrix}$$

213) Ans: **A)** -1
Sol: $M_{21} = -1$ ....(By leaving R_2 and C_1)

214) Ans: **D)** $\begin{bmatrix}\frac{1}{a} & 0\\0 & b\end{bmatrix}$

Sol: $A^{-1}=\frac{1}{|A|}(\text{adj } A)=\frac{1}{\frac{a}{b}}\begin{bmatrix}\frac{1}{b} & 0\\0 & a\end{bmatrix}=\begin{bmatrix}\frac{1}{a} & 0\\0 & b\end{bmatrix}$

215) Ans: **B)** $|A|$
Sol: $a_{11}A_{11} + a_{21}A_{21} + a_{31}A_{31}$
$= 1(4-3) + 3[-(4 - 1)] + 2(6 - 2) = 0$
and $|A| = 1(4 - 3) - 2(6 - 6) + 1(3 - 4) = 0$
$\therefore a_{11}A_{11} + a_{21}A_{21} + a_{31}A_{31} = |A|$

216) Ans: **B)** $|A|I$
Sol: $A(\text{adj } A) = A.A^{-1}|A| = |A|I$

217) Ans: **D)** $\frac{1}{11}\begin{bmatrix}1 & 2\\-3 & 5\end{bmatrix}$

Sol: Let, $A=\begin{bmatrix}5 & -2\\3 & 1\end{bmatrix}$

$|A| = 11, A_{11} = 1, A_{12} = -3, A_{21} = 2, A_{22} = 5$

$$\therefore A^{-1}=\frac{1}{11}\begin{bmatrix}1 & 2\\-3 & 5\end{bmatrix}$$

218) Ans: **D)** $\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$

Sol: $A.[\text{adj }(A)] = |A|I$

Here $|A| = \cos^2 x + \sin^2 x = 1$

$$\therefore A.(\text{adj }(A))=\begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$$

219) Ans: **A)** $\begin{bmatrix}3 & -1 & 1\\-15 & 6 & -5\\5 & -2 & 2\end{bmatrix}$

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

$$\therefore |A|=\begin{vmatrix}2 & 0 & -1\\5 & 1 & 0\\0 & 1 & 3\end{vmatrix}=2(3-0)-0-1(5-0)=1$$

Now, adj $A=\begin{bmatrix}3 & -1 & 1\\-15 & 6 & -5\\5 & -2 & 2\end{bmatrix}$

$$\therefore A^{-1}=\frac{1}{|A|}(\text{Adj }(A))=\begin{bmatrix}3 & -1 & 1\\-15 & 6 & -5\\5 & -2 & 2\end{bmatrix}$$

220) Ans: **D)** $x=\frac{11}{24}, y=\frac{1}{24}$

Sol: The given system of equation can be written in the matrix form as AX = B, where

$A=\begin{bmatrix}5 & -7\\7 & -5\end{bmatrix}, X=\begin{bmatrix}x\\y\end{bmatrix}$ and $B=\begin{bmatrix}2\\3\end{bmatrix}$

Now, $|A|=\begin{vmatrix}5 & -7\\7 & -5\end{vmatrix}=24 \neq 0$

$\therefore$ The given system of equation has a unique solution which is given by $X = A^{-1}B$

$$\text{adj } A=\begin{bmatrix}-5 & -7\\7 & 5\end{bmatrix}^T=\begin{bmatrix}-5 & 7\\-7 & 5\end{bmatrix}$$

$$\therefore A^{-1}=\frac{1}{24}\begin{bmatrix}-5 & 7\\-7 & 5\end{bmatrix}$$

$$\therefore X=A^{-1}B=\frac{1}{24}\begin{bmatrix}-5 & 7\\-7 & 5\end{bmatrix}\begin{bmatrix}2\\3\end{bmatrix}=\frac{1}{24}\begin{bmatrix}11\\1\end{bmatrix}$$

$$\Rightarrow \begin{bmatrix}x\\y\end{bmatrix}=\begin{bmatrix}11/24\\1/24\end{bmatrix} \Rightarrow x = 11/24, y = 1/24$$

221) Ans: **D)** $\frac{1}{67}\begin{bmatrix}-6 & 17 & 13\\14 & 5 & -8\\-15 & 9 & -1\end{bmatrix}$

Sol: $A=\begin{bmatrix}1 & 2 & -3\\2 & 3 & 2\\3 & -3 & -4\end{bmatrix}$

$$\therefore |A|=\begin{vmatrix}1 & 2 & -3\\2 & 3 & 2\\3 & -3 & -4\end{vmatrix}=-6+28+45=67\neq 0$$

Now, adj $A=\begin{bmatrix}-6 & 14 & -15\\17 & 5 & 9\\13 & -8 & -1\end{bmatrix}^T=\begin{bmatrix}-6 & 17 & 13\\14 & 5 & -8\\-15 & 9 & -1\end{bmatrix}$

$$\therefore A^{-1}=\frac{1}{|A|}(\text{adj } A)=\frac{1}{67}\begin{bmatrix}-6 & 17 & 13\\14 & 5 & -8\\-15 & 9 & -1\end{bmatrix}$$

222) Ans: **A)** $\begin{bmatrix} 1 \\ 2 \\ -3 \end{bmatrix}$

Sol: $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -2 & -2 \\ 1 & 3 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 3 \\ 4 \end{bmatrix}$

i.e. $x + y + z = 0$ ......(i)

$x - 2y - 2z = 3$ ......(ii)

$x + 3y + z = 4$ .....(iii)

Solving the above equations,

$x = 1, y = 2, z = -3$ i.e. $\begin{bmatrix} 1 \\ 2 \\ -3 \end{bmatrix}$

223) Ans: **C)** $\begin{bmatrix} 1 \\ 2 \\ -3 \end{bmatrix}$

Sol: We have, $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -2 & -2 \\ 1 & 3 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 0 \\ 3 \\ 4 \end{bmatrix}$

$x + y + z = 0$

$x - 2y - 2z = 3$

$x + 3y + z = 4$

On solving, $x = 1$, $y = 2$, $z = -3$ i.e. $\begin{bmatrix} 1 \\ 2 \\ -3 \end{bmatrix}$

224) Ans: **C)** $k^2 I$

Sol: $I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, then $kI = \begin{bmatrix} k & 0 & 0 \\ 0 & k & 0 \\ 0 & 0 & k \end{bmatrix}$

$\Rightarrow \text{adj}(kI) = \begin{bmatrix} k^2 & 0 & 0 \\ 0 & k^2 & 0 \\ 0 & 0 & k^2 \end{bmatrix} = k^2 I$

225) Ans: **A)** $A.\begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix} = 2I$

Sol: $A.\begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ 1 & 1 \end{bmatrix}\begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}$

$= \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix} = 2\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = 2I$

226) Ans: **B)** $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 7 \\ -2 & -4 & -5 \end{bmatrix}$

Sol: Let, $A = \begin{bmatrix} 3 & -2 & -1 \\ -4 & 1 & -1 \\ 2 & 0 & 1 \end{bmatrix}$

then $|A| = \begin{vmatrix} 3 & -2 & -1 \\ -4 & 1 & -1 \\ 2 & 0 & 1 \end{vmatrix} = 1$

The matrix of co-factors of A

$= \begin{bmatrix} c_{11} & c_{12} & c_{13} \\ c_{21} & c_{22} & c_{23} \\ c_{31} & c_{32} & c_{33} \end{bmatrix} = \begin{bmatrix} 1 & 2 & -2 \\ 2 & 5 & -4 \\ 3 & 7 & -5 \end{bmatrix}$

$\therefore \text{adj}(A) = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 7 \\ -2 & -4 & -5 \end{bmatrix}$

$\therefore A^{-1} = \frac{1}{|A|}.\text{adj}A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 7 \\ -2 & -4 & -5 \end{bmatrix}$, $(\because |A| = 1)$

227) Ans: **C)** 10

Sol: $A(\text{adj } A) = |A|\, I \Rightarrow \begin{vmatrix} 10 & 0 \\ 0 & 10 \end{vmatrix} = 10.\begin{vmatrix} 1 & 0 \\ 0 & 1 \end{vmatrix}$

228) Ans: **A)** 1

Sol: $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$

The matrix of co-factors of the elements of A,

$= \begin{bmatrix} \cos\alpha & -(-\sin\alpha) \\ -\sin\alpha & \cos\alpha \end{bmatrix}$

$\therefore$ adjA = The transpose of matrix of co-factors of A

$= \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$

$\therefore A\,\text{adj}A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$

$= \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} k & 0 \\ 0 & k \end{bmatrix}$ (Given) $\Rightarrow k = 1$

229) Ans: **C)** 10

Sol: A(Adj A) = $|A|.(I_n)$

$\therefore \begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix} = |A|\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$\Rightarrow |A| = 10$

230) Ans: **C)** -1

Sol: Let $A = \begin{bmatrix} 1 & 2 & 1 \\ 2 & 1 & 0 \\ -1 & 0 & 1 \end{bmatrix}$ $\therefore |A| = \begin{vmatrix} 1 & 2 & 1 \\ 2 & 1 & 0 \\ -1 & 0 & 1 \end{vmatrix} - 2 \neq 0$

$\therefore A^{-1}$ exists.

Here, $C_{11} = 1$, $C_{12} = -2$, $C_{13} = 1$

$C_{21} = -2$, $C_{22} = 2$, $C_{23} = -2$

$C_{31} = -1$, $C_{32} = 2$, $C_{33} = -3$

$\therefore \text{adj } A = \begin{bmatrix} 1 & -2 & 1 \\ -2 & 2 & -2 \\ -1 & 2 & -3 \end{bmatrix}^T = \begin{bmatrix} 1 & -2 & -1 \\ -2 & 2 & 2 \\ 1 & -2 & -3 \end{bmatrix}$

$\therefore A^{-1} = -\frac{1}{2}\begin{bmatrix} 1 & -2 & -1 \\ -2 & 2 & 2 \\ 1 & -2 & -3 \end{bmatrix} = \begin{bmatrix} -\frac{1}{2} & 1 & \frac{1}{2} \\ 1 & -1 & -1 \\ -\frac{1}{2} & 1 & \frac{3}{2} \end{bmatrix}$

The element in the second row and third column is -1.

231) Ans: **C)** non singular

Sol: Let $|A| = \begin{bmatrix} 3 & 1 & 2 \\ 0 & -2 & 4 \\ 5 & 6 & 3 \end{bmatrix}$

= 3(-6 - 24) -1(0 - 20) + 2(0 + 10)
= 3(-30) - 1(-20) + 2(10)
= -90 + 20 + 20 = -90 + 40 = 50 $\neq$ 0
Hence, A is non-singular.

232) Ans: **B)** 11

Sol: Given, $A^{-1} = \frac{1}{k} \text{adj } A$

$\therefore k = |A|$

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

= 3(2 + 1)-2(1- 0) + 4(1-0) = 9 - 2 + 4 = 11 $\Rightarrow$ k = 11

233) Ans: **C)** $\begin{bmatrix} 3 & 1 \\ -2 & 1 \end{bmatrix}$

Sol: adj (A) can be obtained by changing the diagonal element, also changing the sign of off diagonal elements.

$\therefore \text{adj}(A) = \begin{bmatrix} 3 & 1 \\ -2 & 1 \end{bmatrix}$

234) Ans: **A)** 11

Sol: From given, $K = |A|$

i.e. $|A| = \begin{vmatrix} 3 & 2 & 4 \\ 1 & 2 & -1 \\ 0 & 1 & 1 \end{vmatrix} = 11$

235) Ans: **D)** $\frac{1}{10}\begin{pmatrix} 4 & 2 \\ -3 & 1 \end{pmatrix}$

Sol: Let $A = \begin{bmatrix} 1 & -2 \\ 3 & 4 \end{bmatrix}$

$\therefore |A| = 4 + 6 = 10 \neq 0$

Now, $A_{11} = 4$, $A_{12} = -3$, $A_{21} = -(-2) = 2$, $A_{22} = 1$

$\therefore \text{adj}(A) = \begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$

Now, $A^{-1} = \frac{\text{adj}(A)}{|A|} = \frac{1}{10}\begin{bmatrix} 4 & 2 \\ -3 & 1 \end{bmatrix}$

236) Ans: **C)** $\lambda \neq -17$

Sol: $\begin{bmatrix} \lambda & -1 & 4 \\ -3 & 0 & 1 \\ -1 & 1 & 2 \end{bmatrix} \neq 0 \Rightarrow \lambda \neq -17$

237) Ans: **D)** A

Sol: $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$, $\quad \therefore \text{adj } A = \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

$\therefore \text{adj(adj } A) = \begin{bmatrix} a & b \\ c & d \end{bmatrix} = A$

238) Ans: **B)** Zero matrix
Sol: A is a singular matrix.
$\therefore$ |A| = 0 and A.(adj A) = |A|.I = 0.I = 0
$\therefore$ A(adj A) is a zero matrix.

239) Ans: **D)** $\frac{1}{(ad-bc)}\begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$

Sol: $|A| = (ad - bc)$

$\therefore A^{-1} = \frac{1}{(ad-bc)}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$

240) Ans: **C)** $\frac{1}{3}\begin{bmatrix} 5 \\ 7 \end{bmatrix}$

Sol: $A = \begin{bmatrix} -1 & 2 \\ 2 & -1 \end{bmatrix}$, $B = \begin{bmatrix} 3 \\ 1 \end{bmatrix}$

$AX = B \Rightarrow X = A^{-1}B$

Now, $A^{-1} = \frac{\text{adj } A}{|A|}$

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

and $X = A^{-1}B = \begin{bmatrix} \frac{1}{3} & \frac{2}{3} \\ \frac{2}{3} & \frac{1}{3} \end{bmatrix}\begin{bmatrix} 3 \\ 1 \end{bmatrix}$;

$X = \frac{1}{3}\begin{bmatrix} 5 \\ 7 \end{bmatrix}$

241) Ans: **C)** $\begin{bmatrix} \frac{4}{14} & \frac{2}{14} \\ \frac{-1}{14} & \frac{3}{14} \end{bmatrix}$

Sol: Let $A = \begin{bmatrix} 3 & -2 \\ 1 & 4 \end{bmatrix} \Rightarrow |A| = 14$

$\therefore \text{adj } A = \begin{bmatrix} 4 & 2 \\ -1 & 3 \end{bmatrix} \Rightarrow A^{-1} = \begin{bmatrix} \frac{4}{14} & \frac{2}{14} \\ \frac{-1}{14} & \frac{3}{14} \end{bmatrix}$

242) Ans: **C)** $A^2 + B^2$
Sol: Given, $B = -A^{-1}BA$
$\therefore AB = -AA^{-1}BA = -IBA = -BA$
$\therefore AB = -BA$
Now, $(A + B)^2 = (A + B)(A + B)$
$= A^2 + B^2 \quad [\because BA = -AB]$
Thus, $(A + B)^2 = A^2 + B^2$

243) Ans: **D)** Does not exist

Sol: Given, $A = \begin{bmatrix} 2 & 3 \\ 4 & 6 \end{bmatrix}$

Now, we know $A^{-1} = \frac{\text{adj.}A}{|A|}$.

Thus, $|A| = [12 - 12] = 0$. As $|A|$ is zero, so inverse of A does not exist.

244) Ans: **C)** $\begin{bmatrix} -i & 0 \\ 0 & -2i \end{bmatrix}$

Sol: For $A = \begin{bmatrix} i & 0 \\ 0 & i/2 \end{bmatrix}$, $\text{adj}(A) = \begin{bmatrix} i/2 & 0 \\ 0 & i \end{bmatrix}$ and

$|A| = -\frac{1}{2}$

$\therefore A^{-1} = \frac{1}{\Delta}(\text{adj } A) = \frac{1}{-1/2}\begin{bmatrix} i/2 & 0 \\ 0 & i \end{bmatrix} = \begin{bmatrix} -i & 0 \\ 0 & -2i \end{bmatrix}$

245) Ans: **A)** $\frac{1}{11}\begin{bmatrix} -1 & 1 & 2 \\ 8 & -19 & 6 \\ -3 & 14 & -5 \end{bmatrix}$

Sol: $A = \begin{bmatrix} 1 & 3 & 4 \\ 2 & 1 & 2 \\ 5 & 1 & 1 \end{bmatrix}$

$\therefore |A| = \begin{bmatrix} 1 & 3 & 4 \\ 2 & 1 & 2 \\ 5 & 1 & 1 \end{bmatrix}$

= 1(1 - 2)-3(2 -10) + 4(2 - 5) = -1 + 24 - 12 = 11≠0

$\text{adj } A = \begin{bmatrix} -1 & 8 & -3 \\ 1 & -19 & 14 \\ 2 & 6 & -5 \end{bmatrix}^T = \begin{bmatrix} -1 & 1 & 2 \\ 8 & -19 & 6 \\ -3 & 14 & -5 \end{bmatrix}$

$\Rightarrow A^{-1} = \frac{1}{|A|}(\text{adj } A) = \frac{1}{11}\begin{bmatrix} -1 & 1 & 2 \\ 8 & -19 & 6 \\ -3 & 14 & -5 \end{bmatrix}$

246) Ans: **D)** Every skew-symmetric matrix of odd order is non-singular.
Sol: Because, every skew symmetric matrix of odd order is singular.

247) Ans: **A)** (-1, 0, 2)

Sol: $\begin{bmatrix} 1 & 0 & 1 \\ -1 & 1 & 0 \\ 0 & -1 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 1 \\ 1 \\ 2 \end{bmatrix}$

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

x + z = 1
-x + y = 1
z - y = 2
⇒ (x, y, z) = (-1, 0, 2)

248) Ans: **A)** - 1

Sol: In A^{-1}, the element of 2nd row and 3rd column is the c_{32}, element of the matrix (c_{ij}) of co-factors of element of A, (because of transposition) divided by $\Delta = |A| = -2$.

$\therefore$ Required element $= \frac{(-1)^{3+2}M_{32}}{-2} = \frac{-(-2)}{-2} = -1$,

where M_{32} = minor of c_{32} in

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

249) Ans: **C)** 10

Sol: Given, $A(\text{adj } A) = \begin{bmatrix} 10 & 0 \\ 0 & 10 \end{bmatrix}$

$\Rightarrow A(\text{adj } A) = 10\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = 10I$ .....(i)

and $A^{-1} = \frac{1}{|A|}(\text{adj } A)$

$A(\text{adj } A) = |A| I$ .....(ii)

From equation (i) and (ii), $|A| = 10$.

250) Ans: **D)** $\begin{bmatrix} 2 & -7 \\ -1 & 4 \end{bmatrix}$

Sol: Here, $A^{-1} = \frac{\text{Adj}(A)}{|A|}$

$\therefore A^{-1} = \begin{bmatrix} 2 & -7 \\ -1 & 4 \end{bmatrix}$