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Answers Key:

பகுதி - இ

அனைத்து வினாக்களுக்கும் விடையளிக்க.

1. $A=\begin{bmatrix}2&3\\1&2\end{bmatrix}$

A^2=A.A

$=\begin{bmatrix}2&3\\1&2\end{bmatrix}\begin{bmatrix}2&3\\1&2\end{bmatrix}$

$=\begin{bmatrix}7&12\\4&7\end{bmatrix}$

தரவு $A^2-kA+I_2=0$

$\Rightarrow\begin{bmatrix}7&12\\4&7\end{bmatrix}-k\begin{bmatrix}2&3\\1&2\end{bmatrix}+\begin{bmatrix}1&0\\0&1\end{bmatrix}=\begin{bmatrix}0&0\\0&0\end{bmatrix}$

$\Rightarrow\begin{bmatrix}7-2k+1&12-3k+0\\4-k+0&7-2k+1\end{bmatrix}=\begin{bmatrix}0&0\\0&0\end{bmatrix}$

$\Rightarrow\begin{bmatrix}8-2k&12-3k\\4-k&8-2k\end{bmatrix}=\begin{bmatrix}0&0\\0&0\end{bmatrix}$

$\Rightarrow 4-k=0$

$\Rightarrow k=4$

$|A|=\begin{vmatrix}2&3\\1&2\end{vmatrix}$

=4 − 3 = 1≠0

A^{-1} யைக் காணஇயலும்.

$adj\quad A=\begin{bmatrix}2&-3\\-1&2\end{bmatrix}$

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

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

2. $3x+5y-4z=6000$

$2x-3y+z=5000$

$-x+4y+6z=13000$

$\begin{pmatrix}3&5&-4\\2&-3&1\\-1&4&6\end{pmatrix}\begin{pmatrix}x\\y\\z\end{pmatrix}=\begin{pmatrix}6000\\5000\\13000\end{pmatrix}$

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

$\mathrm{A}=\begin{pmatrix}3&5&-4\\2&-3&1\\-1&4&6\end{pmatrix},X=\begin{pmatrix}x\\y\\z\end{pmatrix}$

$B=\begin{pmatrix}6000\\5000\\13000\end{pmatrix}$

$|A|=3(-18-4)-5(12+1)-4(8-3)$

$=-66-65-20=-151\neq 0$

$=\begin{pmatrix}-22&-13&5\\-46&14&-17\\-7&-11&-19\end{pmatrix}$

$A^{-1}=\frac{1}{|A|}\ \mathrm{adj}\ A=\frac{-1}{151}\begin{pmatrix}-22&-13&5\\-46&14&-17\\-7&-11&-19\end{pmatrix}^T$

$X=\mathrm{A}^{-1}\,\mathrm{B}$

$=\frac{-1}{151}\begin{pmatrix}-22&-46&-7\\-13&14&-11\\5&-17&-19\end{pmatrix}\begin{pmatrix}6000\\5000\\13000\end{pmatrix}$

$=\frac{-1}{151}\begin{pmatrix}-132000&-230000&-91000\\-78000&+70000&-143000\\30000&-85000&-247000\end{pmatrix}$

$\begin{pmatrix}x\\y\\z\end{pmatrix}=\frac{-1}{151}\begin{pmatrix}-453000\\-151000\\-302000\end{pmatrix}=\begin{pmatrix}3000\\1000\\2000\end{pmatrix}$

$x=Rs.3000,\mathrm{y}=Rs.1000,\mathrm{z}=Rs.2000$

3. $\mathrm{A}=\begin{bmatrix}3&7\\2&3\end{bmatrix}$ மற்றும் B = $\begin{bmatrix}6&8\\7&9\end{bmatrix}$

$=\begin{bmatrix}18+49&24+63\\12+35&16+45\end{bmatrix}=\begin{bmatrix}67&87\\47&61\end{bmatrix}$

$|AB|=\begin{bmatrix}61&87\\47&67\end{bmatrix}=4087-4089=-2\neq 0(AB)^{-1}$

$\Rightarrow\ (AB)^{-1}=\frac{1}{|AB|}adj(AB)=\frac{-1}{2}\begin{bmatrix}61&-87\\-47&67\end{bmatrix}$

$|B| = 54 - 56 = -2 \neq 0$

$\therefore B^{-1}$

$B^{-1} = \frac{1}{|B|} adj\ B = -\frac{1}{2}\begin{bmatrix} 9 & -8 \\ -7 & 6 \end{bmatrix}$

$|A| = 15 - 14 = 1 \neq 0$

$A^{-1} = \frac{1}{|A|} adj\ A = \frac{1}{1}\begin{bmatrix} 5 & -7 \\ -2 & 3 \end{bmatrix} = \begin{bmatrix} 5 & -7 \\ -2 & 3 \end{bmatrix}$

$B^{-1}A^{-1} = \frac{-1}{2}\begin{bmatrix} 9 & -8 \\ -7 & 6 \end{bmatrix}\begin{bmatrix} 5 & -7 \\ -2 & 3 \end{bmatrix}$

$= \frac{-1}{2}\begin{bmatrix} 45+16 & -63-24 \\ -35-12 & 49+18 \end{bmatrix}$

$= -\frac{1}{2}\begin{bmatrix} 61 & -87 \\ -47 & 67 \end{bmatrix}$

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

4. $X = \begin{pmatrix} 8 & -1 & -3 \\ -5 & 1 & 2 \\ 10 & -1 & -4 \end{pmatrix}$

$|X| = 8(-4+2) + 1(20-20) - 3(5-10)$

$= -16 + 15 = -1 \neq 0$

$A_{11} = 8 = -4 + 2 = -2$

$A_{12} = -1 = -(20-20) = 0$

$A_{13} = -3 = 5 - 10 = -5$

$A_{21} = -5 = -(4-3) = -1$

$A_{22} = 1 = -32 + 30 = -2$

$A_{23} = 2 = -(-8+10) = -2$

$A_{31} = 10 = -2 + 3 = 1$

$A_{32} = -1 = -(16-15) = -1$

$A_{33} = -4 = 8 - 5 = +3$

Co-factor matrix $= \begin{pmatrix} -2 & 0 & -5 \\ -1 & -2 & -2 \\ 1 & -1 & +3 \end{pmatrix}$

Adj $X = \begin{pmatrix} -2 & -1 & 1 \\ 0 & -2 & -1 \\ -5 & -2 & +3 \end{pmatrix}$

$X^{-1} = \frac{1}{|X|}\text{adj}\ X$

$= \frac{-1}{1}\begin{pmatrix} -2 & -1 & 1 \\ 0 & -2 & -1 \\ -5 & -2 & +3 \end{pmatrix}$

$Y = X^{-1}$

$\begin{pmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \\ 5 & p & q \end{pmatrix} = \begin{pmatrix} 2 & 1 & -1 \\ 0 & 2 & 1 \\ 5 & 2 & -3 \end{pmatrix}$

p=2,q=-3

பகுதி - ஆ

ஏதேனும் மூன்று வினாக்களுக்கு விடையளிக்க.

5. $\begin{vmatrix} 2 & x & 3 \\ 4 & 1 & 6 \\ 1 & 2 & 7 \end{vmatrix} = 0$

$\therefore 2\begin{vmatrix} 1 & 6 \\ 2 & 7 \end{vmatrix} - x\begin{vmatrix} 4 & 6 \\ 1 & 7 \end{vmatrix} + 3\begin{vmatrix} 4 & 1 \\ 1 & 2 \end{vmatrix} = 0$

$\Rightarrow$ 2 (7 -12) -x (28- 6) + 3 (8 - 1) = 0

$\Rightarrow$ -10 - 22x + 21 = 0

$\Rightarrow$ 11 = 22x

$\Rightarrow x = \frac{11}{22} = \frac{1}{2}$

6. 2x + 3y = 5

x - 2y = -1

$\begin{bmatrix} 2 & 3 \\ 1 & -2 \end{bmatrix}\begin{bmatrix} X \\ Y \end{bmatrix} = \begin{bmatrix} 5 \\ -1 \end{bmatrix}$

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

A = $\begin{bmatrix} 2 & 3 \\ 1 & -2 \end{bmatrix}$, $X = \begin{bmatrix} x \\ y \end{bmatrix}$,B= $\begin{bmatrix} 5 \\ -1 \end{bmatrix}$

$|A| = -4 - 3 = -7 \neq 0$

$A^{-1} = \frac{1}{|A|}\text{adj}\ A = \frac{-1}{7}\begin{pmatrix} -2 & -3 \\ -1 & 2 \end{pmatrix}$

$X = A^{-1}B$

$= \frac{-1}{7}\begin{pmatrix} -2 & -3 \\ -1 & 2 \end{pmatrix}\begin{pmatrix} 5 \\ -1 \end{pmatrix}$

$= \frac{-1}{7}\begin{pmatrix} -10 & +3 \\ -5 & -2 \end{pmatrix} = \frac{-1}{7}\begin{pmatrix} -7 \\ -7 \end{pmatrix}$

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$\begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$

x=1, y=1

7. $A = \begin{pmatrix} -3 & -5 & 4 \\ -2 & 3 & -1 \\ 1 & -4 & -6 \end{pmatrix}$

$|A| = -3(-18-4) + 5(12+1) + 4(8-3)$

$= 66 + 65 + 20 = 151 \neq 0$

$A_{11} = -3 = -18 - 4 = -22$

$A_{12} = -5 = -(12+1) = -13$

$A_{13} = 4 = 8 - 3 = 5$

$A_{21} = -2 = -(30+16) = -46$

$A_{22} = 3 = 18 - 4 = 14$

$A_{23} = -1 = -(12+5) = -17$

$A_{31} = 1 = 5 - 12 = -7$

$A_{32} = -4 = -(3+8) = -11$

$A_{23} = -6 = -9 - 10 = -19$

Co-factor matrix $= \begin{pmatrix} -22 & -13 & 5 \\ -46 & 14 & -17 \\ -7 & -11 & -19 \end{pmatrix}$

$A^{-1} = \frac{1}{|A|}\text{adj } A = \frac{1}{151}\begin{pmatrix} -22 & -46 & -7 \\ -13 & 14 & -11 \\ 5 & -17 & -19 \end{pmatrix}$

$\frac{1}{151}\begin{bmatrix} -22 & -46 & -7 \\ -13 & 14 & -11 \\ 5 & -17 & -19 \end{bmatrix}$

8. $B = \begin{bmatrix} 0.6 & 0.9 \\ 0.20 & 0.80 \end{bmatrix}$

$I - B = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} - \begin{bmatrix} 0.6 & 0.9 \\ 0.20 & 0.80 \end{bmatrix} = \begin{bmatrix} 0.4 & -0.9 \\ -0.20 & 0.20 \end{bmatrix}$

$|I - B| = \begin{bmatrix} 0.4 & -0.9 \\ -0.20 & 0.20 \end{bmatrix}$

$= 0.08 - 0.18 = -0.1 < 0$

ஹாக்கின்ஸ் – சைமன் நிபந்தனைகளின்படி சாத்தியமானதல்ல.

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பகுதி - அ

ஏதேனும் மூன்று வினாக்களுக்கு விடையளிக்க.

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

$= x^2 - (x^2 - 1)$

$= x^2 - x^2 + 1 = 1$

10. $\begin{vmatrix} 1 & 3 & 4 \\ 102 & 18 & 36 \\ 17 & 3 & 6 \end{vmatrix} = 6\begin{vmatrix} 1 & 3 & 4 \\ 17 & 3 & 6 \\ 17 & 3 & 6 \end{vmatrix}$

$= 0 \ (\because R_2 \equiv R_3)$

11. $A = \begin{bmatrix} 8 & 2 \\ 4 & 3 \end{bmatrix}$

$|A| = \begin{vmatrix} 8 & 2 \\ 4 & 3 \end{vmatrix}$

$= 24 - 8 = 16$

$\neq 0$

∴ A என்ப து பூச்சியமற்ற கோவை அணி ஆகும்

12. $A = \begin{bmatrix} 2 & 3 \\ 1 & 4 \end{bmatrix}$

$[A_{ij}] = \begin{bmatrix} 4 & -1 \\ -3 & 2 \end{bmatrix}$

adj A = $[Aij]^T$

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