AMALIY MASHG‘ULOT № 10,11

Elektr energetika sistemalarining matritsa ko‘rinishidagi holat tenglamalarini teskari matritsa usullari yordamida yechish.

1 vazifa asosida xosil qilingan $A^{*}I = F$ matritsa ko‘rinishidag elektr energetika tizimini turgun xolat teiglamasini noma’lumlari quyidagi usul yordamida xisoblanadi:

a) teskari matritsa usuli,
b) bo‘linish birlik sxemasi asosidagi Gauss usuli,
v) oddiy ketma - ket yaqinlashish usuli

bu erda

$$A = \begin{bmatrix} M \\ NZ \end{bmatrix} \qquad F = \begin{bmatrix} J \\ E \end{bmatrix}$$

I - tarmoq. toklari matritsasi.

J - tugunga berilaetgan yoki tugundan olinaetgan berilgan toklar matritsasi, (bu toklarnitsg kiymatlari 1 tablitsadan ochinadi),

M - birinchi insedensiya matritsasi (Tarmoqdarning tugunlarda ulanishlarini belgilovchi matritsa),

N ikkinchi insedensiya matritsasi (Tarmoqdarning mustaqil konturlarda ulanishlarini belgilovchi matritsa),

E_k= NE - kontur EYUK lari (har bir mustaqil konturga kiruvchi tarmoqlar EYUK lari yig’indisi - qiymatlari tablitsa 1 dan olinadi) R - berilgan parametr va kattaliklar ustun matritsasi

Ushbu uch noma’lumli chiziqli tenglamalar sistemasi berilgan bulsa:

$$\begin{cases} a_{11}x_1 + a_{12}x_2 + a_{13}x_3 = b_1, \\ a_{21}x_1 + a_{22}x_2 + a_{23}x_3 = b_2, \\ a_{31}x_1 + a_{32}x_2 + a_{33}x_3 = b_3 \end{cases}$$

Uni teskari matritsalar usuli erdamida yeching.

Tenglamalar sistemasida katnashaetgan $a_{ij}, b_i (i, j = 1,2,3)$ uzgarmas koeffitsientlar quyidagi jadvalda berilgan.

1- jadval

Variant	a_{11}	a_{12}	a_{13}	a_{21}	a_{22}	a_{23}	a_{31}	a_{32}	a_{33}	b_1	b_2	b_3
1	4	-3	1	5	-2	7	1	2	1	-8	9	3
2	1	0	3	2	1	4	-1	1	-2	7	9	-3
3	-2	2	1	4	-5	0	3	7	1	9	-13	4
4	-1	2	4	5	0	8	-7	1	3	16	14	24
5	3	2	1	-4	1	3	-2	0	2	-7	18	10
6	0	-1	3	5	0	4	-1	-3	7	8	22	20
7	1	-1	1	-2	0	-5	2	1	3	6	13	4
8	-1	1	3	-4	0	3	-2	1	4	12	17	17
9	1	1	-2	1	3	0	5	-1	2	-7	20	-5
10	2	-1	0	3	1	4	-5	4	-3	-5	7	5

11	-3	0	1	-1	4	2	3	2	-1	-3	12	-7
12	4	2	1	-3	0	5	6	-2	1	-4	9	-11
13	55	4	1	2	-1	0	-7	-3	1	-3	-5	14
14	-1	-5	2	4	-2	3	1	0	0	-1	-22	-5
15	-2	4	3	-12	5	-7	-4	3	3	17	19	25
16	3	-3	2	1	4	0	10	5	-6	-3	2	-33
17	4	1	-2	1	5	8	0	-7	1	-13	27	-4
18	5	0	1	1	-2	3	-2	3	-4	-7	5	-5
19	-1	3	-4	4	3	1	2	3	4	-7	-2	11
20	-5	1	3	3	2	8	7	5	3	20	20	0
21	-2	4	2	1	0	7	10	-9	-1	6	19	32
22	-4	2	1	5	-2	3	4	-3	-2	13	0	-17
23	-5	3	2	0	1	7	8	-3	-2	19	22	-25
24	1	-2	3	4	-1	3	7	5	-1	5	0	-12
25	3	2	1	-2	0	10	8	-7	3	1	34	14

Teskari matritsa. Quyidagi *n*x*n* o'lchamli matritsani kuraylik:

$$E = \begin{pmatrix} 1 & 0 & \cdots & 0 \\ 0 & 1 & \cdots & 0 \\ \cdots & \cdots & \cdots & \\ 0 & 0 & \cdots & 1 \end{pmatrix}$$

Ixtiyoriy *n*x*n* o'lchamli $A=||a_{ij}||$ matritsa uchun $A \cdot E = E \cdot A = A$ ekanligiga ishonch xosil kilish kiyin emas, ya'ni *E* matritsalar uchun birlik vazifasini bajaradi. SHuning uchun *E* ni **birlik matritsa** deb aytiladi.

Determinanti 0 ga teng bo'lgan quyidagi Har qanday *n*x*n* o'lchamli $A=||a_{ij}||$ matritsa **maxsus matritsa** deb ataladi:

$$\det A = \begin{vmatrix} a_{11} & a_{12} \cdots & a_{1n} \\ a_{21} & a_{22} \cdots & a_{2n} \\ \cdots & \cdots & \cdots \\ a_{n1} & a_{n2} \cdots & a_{nn} \end{vmatrix} = 0$$

Aks xolda, ya'ni det$A \neq 0$ bulsa, *A* matritsa maxsus bo'lmagan matritsa deyiladi.

Masalan, misolga kura

$$A=\begin{pmatrix} 2 & -1 & 1 & 0 \\ 0 & 1 & 2 & -1 \\ 3 & -1 & 2 & 3 \\ 3 & 1 & 6 & 1 \end{pmatrix}$$

matritsa maxsus matritsa, chunki

$$\det A=\begin{vmatrix} 2 & -1 & 1 & 0 \\ 0 & 1 & 2 & -1 \\ 3 & -1 & 2 & 3 \\ 3 & 1 & 6 & 1 \end{vmatrix}=0$$

Ta'rif. Agar $A\cdot V=V\cdot A=E$ munosabat urinli bulsa, nx*n* o'lchamli kvadrat $B=||b_{ij}||$ matritsani maxsus bo'lmagan *n*x*n* o'lchamli $A=||a_{ij}||$ matritsaga teskari matritsa deb ataladi.Teskari matritsa $V=A^{-1}$ kurinishda belgilanadi.

Endi teskari matritsani bevosita xisoblash usullarini kuramiz.

Faraz kilaylik, $A=||a_{ij}||$ maxsus bo'lmagan kvadrat matritsa bulsin. Agar A_{ij} – a_{ij} elementning det*A* dagi algebraik tuldiruvchisi bulsa, u xolda

$$A^{v}=\begin{pmatrix} A_{12} & A_{21} & \dots & A_{n1} \\ A_{12} & A_{22} & \dots & A_{n2} \\ \dots & \dots & & \dots \\ A_{1n} & A_{2n} & \dots & A_{nn} \end{pmatrix}$$

A ga **biriktirilgan matritsa** deb ataladi. Determinantning (3), (4) xossalariga asosan quyidagi kelib chikadi:

$A^{v}A=AA^{v}=\det A\cdot E$, bundan $A^{-1}=\dfrac{1}{\det A}A^{v}$

Teskari matritsani xisoblashning bu usuli biriktirilgan matritsalar usuli deb ataladi.

Misol . Biriktirilgan matritsalar usuli bilan

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

matritsaga teskari matritsani toping.

Echish: det*A*=-4. Demak, *A* maxsus bo'lmagan matritsa ekan. Uning barcha algebraik tuldiruvchilarini topamiz:

$$A_{11}=\begin{vmatrix}0 & 2\\ -2 & 5\end{vmatrix}=4,\quad A_{21}=\begin{vmatrix}2 & -1\\ -2 & 5\end{vmatrix}=-8,\quad A_{31}=\begin{vmatrix}2 & -1\\ 0 & 2\end{vmatrix}=4$$

$$A_{12}=-\begin{vmatrix}3 & 2\\ 4 & 5\end{vmatrix}=-7,\quad A_{22}=\begin{vmatrix}1 & -1\\ 4 & 5\end{vmatrix}=9,\quad A_{32}=-\begin{vmatrix}1 & -1\\ 3 & 2\end{vmatrix}=-5$$

$$A_{13}=\begin{vmatrix}3 & 0\\ 4 & -2\end{vmatrix}=-6,\quad A_{23}=-\begin{vmatrix}1 & 2\\ 4 & -2\end{vmatrix}=10,\quad A_{33}=\begin{vmatrix}1 & 2\\ 3 & 0\end{vmatrix}=-6.$$

SHuning uchun,

$$A^{v}=\begin{pmatrix}4 & -8 & 4\\ -7 & 9 & -5\\ -6 & 10 & -6\end{pmatrix}$$

va

$$A^{-1}=-\frac{1}{4}A^{v}=\begin{pmatrix}-1 & -2 & -1\\ -7/4 & 9/4 & -5/4\\ 3/2 & -5/2 & 3/2\end{pmatrix}.$$

Misol:

$A=\begin{vmatrix}3 & 0 & 5\\ 0 & 2 & 8\\ 0 & 3 & 7\end{vmatrix}$ Matritsa berilgan. A^{-1} matritsa va Ã matritsani toping.

Echish: A matritsaning determinantini $\Delta(A) = -30$

Algebraik tuldiruvchilar $A_{11}= -10;\ A_{21}=15;\ A_{31}= -10;\ A_{12}=0;$

$A_{22}=21;\ A_{32}= -24;\ A_{13}=0;\ A_{23}= -9;\ A_{33}=6$

(X) ga binoan

teskari matritsa $A^{-1}=\begin{vmatrix}\frac{-10}{-30} & \frac{15}{-30} & \frac{-10}{-30}\\ \frac{0}{-30} & \frac{21}{-30} & \frac{-24}{-30}\\ \frac{0}{-30} & \frac{9}{-30} & \frac{6}{-30}\end{vmatrix}=\begin{vmatrix}\frac{1}{3} & \frac{-1}{2} & \frac{1}{3}\\ 0 & \frac{-7}{10} & \frac{4}{5}\\ 0 & \frac{-3}{10} & \frac{-1}{5}\end{vmatrix}$

(U) ga muvofik matritsa Ã

$$\tilde{A} = \begin{vmatrix} -10 & 15 & -10 \\ 0 & 21 & -27 \\ 0 & 9 & 6 \end{vmatrix}$$

Kuyida kuriladigan usulimiz elementar almashtirishlar usuli deb ataladi.

Agar A nxn o'lchamli maxsus bo'lmagan kvadrat matritsa bulsa, uning uchun ulchami nx$2n$ bo'lgan $G_A=(A|E)$ matritsa tuzib olamiz, ya'ni A matritsaga birlik E matritsani birlashtirib tuzamiz. Xosil bo'lgan G_A matritsani satrlari ustida elementar almashtirishlar bajarib, uni $(E|V)$ kurinishga keltiramiz. U xolda $V=A^{-1}$ bo'ladi.

Teskari matritsa quyidagi xossalarga ega:

1^0. $(\alpha A)^{-1}=A^{-1}/\alpha \quad (\alpha\neq 0)$
2^0. $(AV)^{-1}= V^{-1}A^{-1}$
3^0. $(A^{-1})^T=(A^T)^{-1}$

Elektr energetika tizimi turgun xolat tenglamasini teskari matritsa usuli bilan echishga misol**1-**

Misol.

$$\begin{cases} 2x - y + z = 3, \\ x + 2y - 2z = -1, \\ 3x + 2y - 3z = -2 \end{cases}$$

Sistema matritsa usulida echilsin.

Echish.

Bu misolda $A=\begin{pmatrix} 2 & -1 & 1 \\ 1 & 2 & -2 \\ 3 & 2 & -3 \end{pmatrix}$, $V=\begin{pmatrix} 3 \\ -1 \\ -2 \end{pmatrix}$, $X=\begin{pmatrix} x \\ y \\ z \end{pmatrix}$

Bo'lgani uchun berilgan sistemani $A\cdot X=V$ matritsali kurinishda va uning yechimini $X=A^{-1}V$ kurinishda ezish mumkin. A matritsaning determinanti 1- satr elementlarini 2 ga ko'paytirib 2- satrning mos elementlariga kushamiz va xosil bo'lgano'lgan determinantni ikkinchi satr elemenlari bo'yicha yoyib hisoblaymiz.

$$|A| = \begin{vmatrix} 2 & -1 & 1 \\ 1 & 2 & -2 \\ 3 & 2 & -3 \end{vmatrix} = \begin{vmatrix} 2 & -1 & 1 \\ 5 & 0 & 0 \\ 3 & 2 & -3 \end{vmatrix} = 5\cdot(-1)^{2+1}\begin{vmatrix} -1 & 1 \\ 2 & -3 \end{vmatrix} = -5 \neq 0$$

bo'lgani uchun A xosmas matritsa va unga teskari A^{-1} matritsa mavjud. A matritsaning barcha elementlarini algebraik to'ldiruvchilarini topamiz:

$A_{11}=(-1)^{1+1}\begin{vmatrix} 2 & -2 \\ 2 & -3 \end{vmatrix}=-2$, $A_{12}=(-1)^{1+2}\begin{vmatrix} 1 & -2 \\ 3 & -3 \end{vmatrix}=-3$, $A_{13}=(-1)^{1+3}\begin{vmatrix} 1 & 2 \\ 3 & 2 \end{vmatrix}=-4$,

$A_{21}=(-1)^{2+1}\begin{vmatrix}-1 & 1\\ 2 & -3\end{vmatrix}=-1,\quad A_{22}=(-1)^{2+2}\begin{vmatrix}2 & 1\\ 3 & -3\end{vmatrix}=-9,\quad A_{23}=(-1)^{2+3}\begin{vmatrix}2 & -1\\ 3 & 2\end{vmatrix}=-7,$

$A_{31}=(-1)^{3+1}\begin{vmatrix}-1 & 1\\ 2 & -2\end{vmatrix}=0,\quad A_{32}=(-1)^{3+2}\begin{vmatrix}2 & 1\\ 1 & -2\end{vmatrix}=5,\quad A_{33}=(-1)^{3+3}\begin{vmatrix}2 & -1\\ 1 & 2\end{vmatrix}=5.$

Algebraik to'ldiruvchilarning qiymatlarini 2 mavzudagi (2.2) formulaga qo'yib A^{-1} teskari matritsani topamiz:

$$A^{-1}=-\frac{1}{5}\begin{pmatrix}-2 & -1 & 0\\ -3 & -9 & 5\\ -4 & -7 & 5\end{pmatrix}.$$

X, A^{-1} va V matritsalarni $X=A^{-1}\cdot V$ tenglikga qo'yamiz. U holda

$$\begin{pmatrix}x\\ y\\ z\end{pmatrix}=-\frac{1}{5}\begin{pmatrix}-2 & -1 & 0\\ -3 & -9 & 5\\ -4 & -7 & 5\end{pmatrix}\begin{pmatrix}3\\ -1\\ -2\end{pmatrix}=-\frac{1}{5}\begin{pmatrix}-6+1+0\\ -9+9-10\\ -12+7-10\end{pmatrix}=-\frac{1}{5}\begin{pmatrix}-5\\ -10\\ -15\end{pmatrix}=\begin{pmatrix}1\\ 2\\ 3\end{pmatrix}.$$

hosil bo'ladi. Bundan $x=1$, $u=2$, $z=3$ yechimni hosil qilamiz.

Tenglamalar sistemasida katnashayotgan $a_{ij}, b_i (i, j=1,2,3)$ uzgarmas koeffitsientlar quyidagi jadvalda berilgan.

1- jadval

Variant	a_{11}	a_{12}	a_{13}	a_{21}	a_{22}	a_{23}	a_{31}	a_{32}	a_{33}	b_1	b_2	b_3
1	4	-3	1	5	-2	7	1	2	1	-8	9	3
2	1	0	3	2	1	4	-1	1	-2	7	9	-3
3	-2	2	1	4	-5	0	3	7	1	9	-13	4
4	-1	2	4	5	0	8	-7	1	3	16	14	24
5	3	2	1	-4	1	3	-2	0	2	-7	18	10
6	0	-1	3	5	0	4	-1	-3	7	8	22	20
7	1	-1	1	-2	0	-5	2	1	3	6	13	4
8	-1	1	3	-4	0	3	-2	1	4	12	17	17
9	1	1	-2	1	3	0	5	-1	2	-7	20	-5
10	2	-1	0	3	1	4	-5	4	-3	-5	7	5
11	-3	0	1	-1	4	2	3	2	-1	-3	12	-7
12	4	2	1	-3	0	5	6	-2	1	-4	9	-11
13	55	4	1	2	-1	0	-7	-3	1	-3	-5	14
14	-1	-5	2	4	-2	3	1	0	0	-1	-22	-5
15	-2	4	3	-12	5	-7	-4	3	3	17	19	25
16	3	-3	2	1	4	0	10	5	-6	-3	2	-33
17	4	1	-2	1	5	8	0	-7	1	-13	27	-4
18	5	0	1	1	-2	3	-2	3	-4	-7	5	-5

19	-1	3	-4	4	3	1	2	3	4	-7	-2	11
20	-5	1	3	3	2	8	7	5	3	20	20	0
21	-2	4	2	1	0	7	10	-9	-1	6	19	32
22	-4	2	1	5	-2	3	4	-3	-2	13	0	-17
23	-5	3	2	0	1	7	8	-3	-2	19	22	-25
24	1	-2	3	4	-1	3	7	5	-1	5	0	-12
25	3	2	1	-2	0	10	8	-7	3	1	34	14

1. **Elektr energetika tizimi turgun xolat tenglamasini teskari matritsa usuli bilan echishga misol**

Tenglamalar sistemasi

$$\begin{cases} I_1+I_3 = 3 \\ -I_1-I_2 = -3 \\ I_2-I_3-I_4 = -1 \\ 2I_1-2I_2-2I_3 = 0 \end{cases}$$

vazifani bajarish uchun ma’lumotlar yuqoridagi 1- jadvalda keltirilgan.

Matritsa ko’rinishidagi tenglama:

$$\begin{bmatrix} 1 & 0 & 1 & 0 \\ -1 & -1 & 0 & 0 \\ 0 & 1 & -1 & -1 \\ 2 & -2 & -2 & 0 \end{bmatrix} \times \begin{bmatrix} I_1 \\ I_2 \\ I_3 \\ I_4 \end{bmatrix} = \begin{bmatrix} 3 \\ -3 \\ -1 \\ 0 \end{bmatrix}$$ bu erdan

yoki

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

$$+1 \begin{vmatrix} -1 & -1 & 0 \\ 0 & 1 & -1 \\ 2 & -2 & 0 \end{vmatrix} = (-1)\ (-1)\ 0 +$$

+ 0 + O - O - (-1) (-2) (-1) -’ +(-1) 1O + O + +2(-1) (-1) _ o - 0 -- (-1)(-1)(-2) = 2+2 + 2 = 6 ^ 0 .

yani maxsus bo’lmagan matritsa

2. Transponirlangan matritsa A^t (berilgan A matritsaga nisbatan).

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

3. A' matritsaning x,ar bir elementini uning algebraik tuldiruvchnsi bilan almashgirib qo‘shma matritsa *A* ni xosil kilamiz

$$\tilde{A} = \begin{bmatrix} A_{11} & A_{12} & A_{13} & A_{14} \\ A_{21} & A_{22} & A_{23} & A_{24} \\ A_{31} & A_{32} & A_{33} & A_{34} \\ A_{41} & A_{42} & A_{43} & A_{44} \end{bmatrix} = \begin{bmatrix} 2 & -2 & 0 & 1 \\ -2 & -4 & 0 & 1 \\ 0 & 2 & 0 & -1 \\ -6 & -6 & -6 & 0 \end{bmatrix}$$

Bu erla

$$A_{11} = (-1)^{1+1} \begin{vmatrix} -1 & 1 & -2 \\ 0 & -1 & -2 \\ 0 & -1 & 0 \end{vmatrix} = (-1)(-1)0 + 0 + 0 - 0 - (-1)(-1)(-2) - 0 = 2$$

$$A_{12} = (-1)^{1+2} \begin{vmatrix} 0 & -1 & -2 \\ 1 & -1 & -2 \\ 0 & -1 & 0 \end{vmatrix} = -(0 + 0 - 1(-2)(-1) - 0 - 0 - 0) = -2$$

$$A_{13} = (-1)^{1+3} \begin{vmatrix} 0 & -1 & -2 \\ 1 & 0 & -2 \\ 0 & 0 & 0 \end{vmatrix} = 0$$

$$A_{14} = (-1)^{1+4}\begin{vmatrix} 0 & -1 & 1 \\ 1 & 0 & -1 \\ 0 & 0 & -1 \end{vmatrix} = -(0+0+0-0-1(-1)(-1)) = 1$$

$$A_{21} = (-1)^{2+1}\begin{vmatrix} -1 & 0 & 2 \\ 0 & -1 & -2 \\ 0 & -1 & 0 \end{vmatrix} = -(0+0+0-0-(-1)(-1)(-2)-0) = -2$$

$$A_{22} = (-1)^{2+2}\begin{vmatrix} 1 & 0 & 2 \\ 1 & -1 & -2 \\ 0 & -1 & 0 \end{vmatrix} = 0+0+1\ \ 2(-1)-0-0-1(-2) = -4$$

$$A_{23} = (-1)^{2+3}\begin{vmatrix} 1 & -1 & 2 \\ 1 & 0 & -2 \\ 0 & 0 & 0 \end{vmatrix} = 0$$

$$A_{24} = (-1)^{2+4}\begin{vmatrix} 1 & -1 & 0 \\ 1 & 0 & -1 \\ 0 & 0 & -1 \end{vmatrix} = 0+0+0-0-0-1(-1)(-1) = -1$$

$$A_{31} = (-1)^{3+1}\begin{vmatrix} -1 & 0 & 2 \\ -1 & 1 & -2 \\ 0 & -1 & 0 \end{vmatrix} = 0+0+2(-1)(-1)-0-0-(-1)(-1)(-2) = 4$$

$$A_{32} = (-1)^{3+2}\begin{vmatrix} 1 & 0 & 2 \\ 0 & 1 & -2 \\ 0 & -1 & 0 \end{vmatrix} = -(0+0+0\ \ 0\ \ 0\ \ 1\ \ (-1)(-2)) = 2$$

$$A_{33} = (-1)^{3+3}\begin{vmatrix} & -1 & 2 \\ 0 & -1 & -2 \\ 0 & 0 & 0 \end{vmatrix} = 0$$

$$A_{34} = (-1)^{3+4}\begin{vmatrix} 1 & -1 & 0 \\ 0 & 1 & 1 \\ 0 & -1 & -1 \end{vmatrix} = -(1(-1)(-1) + 0 + 0 - 0 - 0 - 0) = -1$$

$$A_{41} = (-1)^{4+1}\begin{vmatrix} -1 & 0 & 2 \\ -1 & 1 & -2 \\ 0 & -1 & -2 \end{vmatrix} = -(1(-1)(-2)+0+2(-1)(-1)-0-0\ (-1)(-2)(-1))=-6$$

$$A_{42} = (-1)^{4+2}\begin{vmatrix} 1 & 0 & 2 \\ 0 & 1 & -2 \\ 1 & -2 & -2 \end{vmatrix} = (1\ 1(-2)+0+0-2\ (1)\ 1\ \ 0-1(-2)(-1))=-6$$

$$A_{43} = (-1)^{4+3}\begin{vmatrix} 1 & -1 & 2 \\ 0 & -1 & -2 \\ 1 & 0 & -2 \end{vmatrix} = -(1\ (-1)(-2)+1(-1)(-2)+0-1(-1)2-0-0))=-6$$

$$A_{44} = (-1)^{4+4}\begin{vmatrix} 1 & -1 & 0 \\ 0 & -1 & 1 \\ 1 & 0 & -1 \end{vmatrix} = 1(-1)(-1) + 1(-1)\ \ 1 + 0 - 0 - 0 = 0$$

Teskari matritsa A^{-1} ni hisoblaimiz

$$A^{-1} = \frac{1}{\Delta} \tilde{A} = \frac{1}{6} X$$

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

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

$$= \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix} \begin{bmatrix} I_1 \\ I_2 \\ I \\ I_4 \end{bmatrix} = \begin{bmatrix} \frac{1}{3} & -\frac{1}{3} & 0 & \frac{1}{6} \\ -\frac{1}{3} & -\frac{2}{3} & 0 & -\frac{1}{6} \\ \frac{2}{3} & \frac{1}{3} & 0 & -\frac{1}{6} \\ -1 & -1 & -1 & 0 \end{bmatrix} \begin{bmatrix} 3 \\ -3 \\ -1 \\ 0 \end{bmatrix} = \begin{bmatrix} 1\ 3+(-\frac{1}{3})\ (-3)+0+0 \\ -1\ 3+(-\frac{2}{3})\ (-3)+0+0 \\ \frac{2}{3}\ 3+\frac{1}{3}\ (-3)+0+0 \\ -3+3+1+0 \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \\ 1 \\ 1 \end{bmatrix}$$

Tenglama ildizlarini topamiz:

$I_1 = 2A$ $I_2 = 1A$

eki $I_3 = 1A$ $I_4 = 1A$

TOPSHIRIKLAR:

Tenglamalar sistemasini teskari matritsa yordamida echilsin

Nazorat savollari:

1. Biriktirilgan matritsa deyilganda nimani tushunasiz?
2. Matritsaga teskari matritsa deb qanday matritsaga?
3. Chiziqli algebraik tenglamalar sistemasini takribiy echish metodlarini keltiring.
4. Normal tenglamalar sistemasi xakida ma’lumot bering
5. Matritsaning teskari matritsasini xisoblash jarayonini ayting?
6. Chiziqli algebraik tenglamalar sistemasini takribiy echish metodlarini keltiring.
7. Normal tenglamalar sistemasi xakida ma’lumot bering
8. Matritsaning teskari matritsasini xisoblash jarayonini ayting?