

Tema I

Vidrasc Maria 314CA,
Automatica si Calculatoare,
Universitatea Politehnica din Bucuresti

Cuprins

1 Rezolvarea temei 1

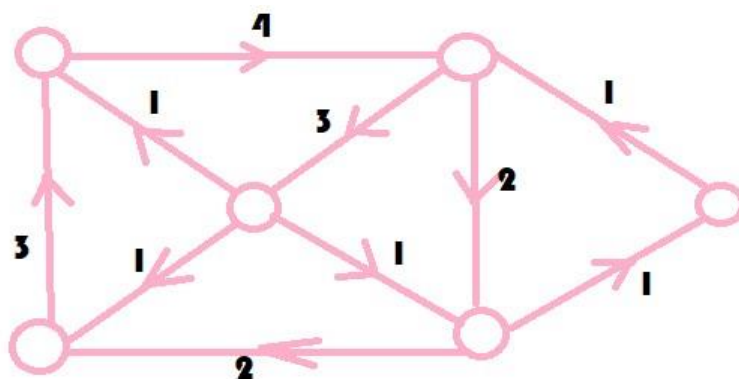
2 Referinte 14

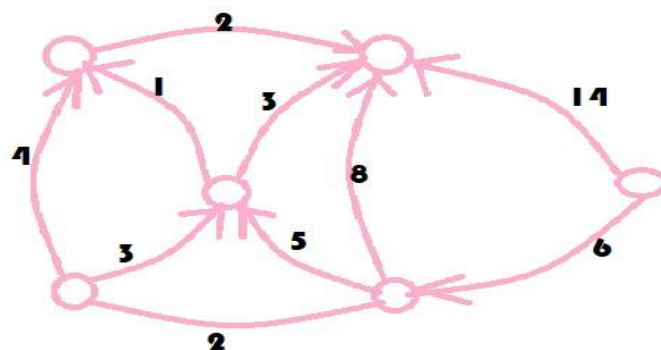
1 Rezolvarea temei

1. Generarea unui circuit

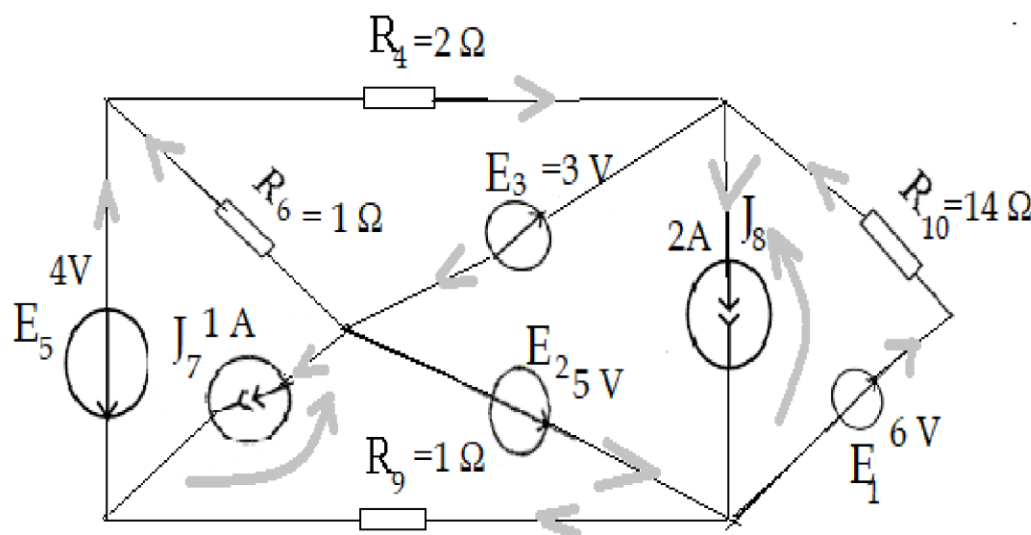
(a) Graful contine 6 noduri($N = 6$) si 10 laturi($L = 6$).

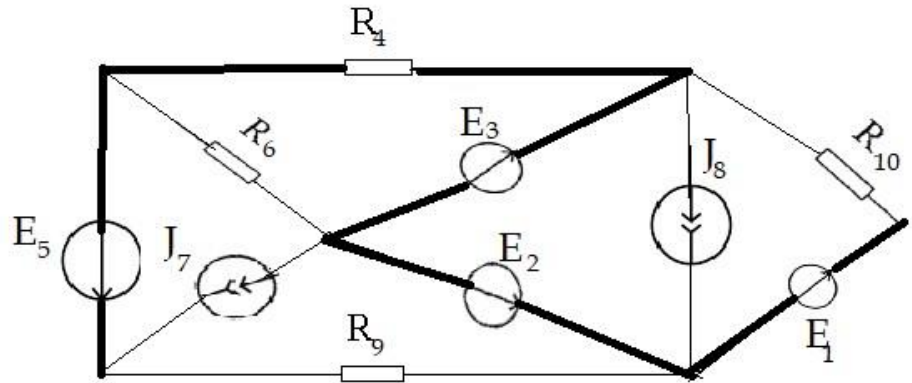
Am ales orientarile arbitrare, astfel incat graful contine laturi orientate in sensul regulii de la receptoare,cat si in sensul regulii de la generatoare.





(b) Inserarea elementelor pe laturi (R,SIT,SIC) si generarea unui arbore normal.





Teorema lui Tellegen

Se face produsul dintre intensitati si tensiuni
 .Pentru puterea consumata vom avea acelasi sens
 conform grafurilor ,iar pentru cea generata in sens
 contrar.

$$\sum_{k=1}^L u_k * i_k = 0$$

$P_c=39 \text{ W}$ $P_g=39 \text{ W}$	
$4 * 3=12$	$8 * 2=16$
$2 * 4=8$	$3 * 3=9$
$2 * 2=4$	$3 * 1=3$
$1 * 1=1$	$5 * 1=5$
$14 * 1=14$	$6 * 1=6$

Bilantul puterilor

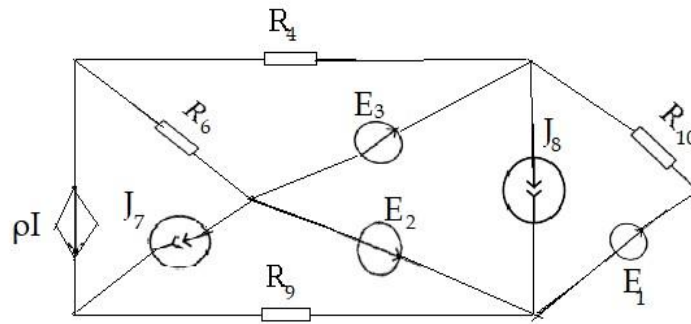
$$P_c = P_{Lk=1} r_k * i_{2k} P_c = 2 * 4^2 +$$

$$1 * 1^2 + 1 * 2^2 + 14 * 1^2$$

$$P_g = P_{Lk=1}(E_k * I_k + J_k * U_k)$$

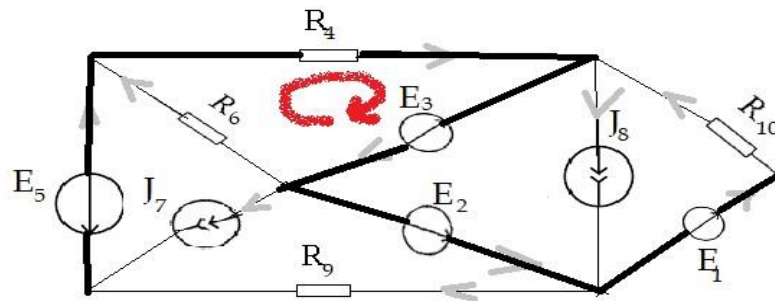
$$P_g = 4 * 3 + 3 * 3 + 5 * 1 + 6 * 1 + 1 * 3 + 2 * 8$$

$$E = \rho * I, E = 4V, I = 2A, \Rightarrow \text{Rezistenta de tranzitie} = 2\Omega$$

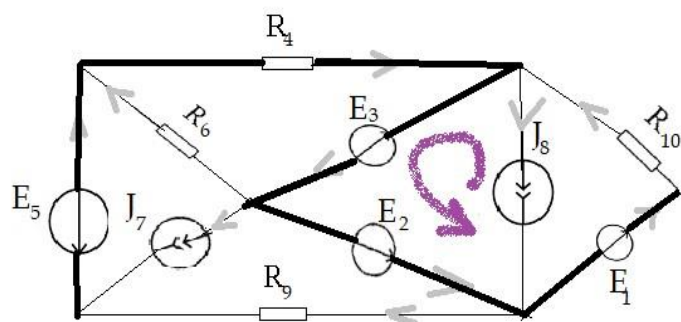
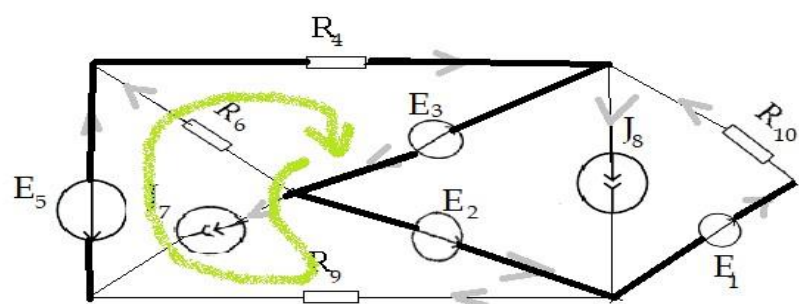
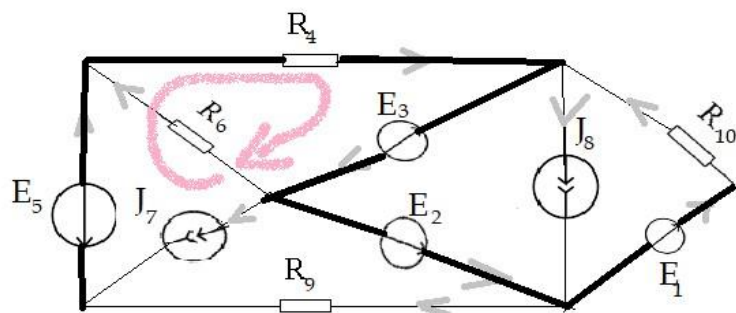


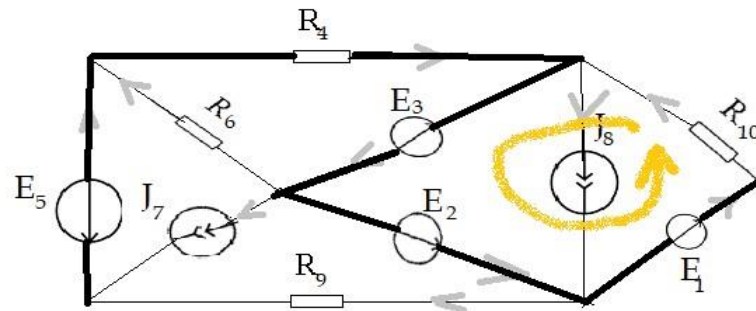
2. Metoda Kirchhoff

Pentru a realiza solutiile ecuatiei $A * x = B$ am ales mai intai bucelele



Bazele electrotehnicii – Tema 1





Am generat sistemul A ce contine ca si necunoscute intensitatile, cat si cele doua tensiuni pentru laturile in care deja stim intensitate (U7 si U8). Iar matricea B, este o matrice coloana ce contine termenii liberi.

Columns 1 through 9:

1.00000	-1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000
0.00000	0.00000	1.00000	-1.00000	0.00000	0.00000	0.00000	0.00000	0.00000
0.00000	1.00000	-1.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	1.00000	-1.00000	-1.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	-1.00000
0.00000	0.00000	0.00000	0.50000	0.00000	1.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.50000	0.00000	0.00000	-1.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.50000	0.00000	0.00000	0.00000	0.00000	1.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

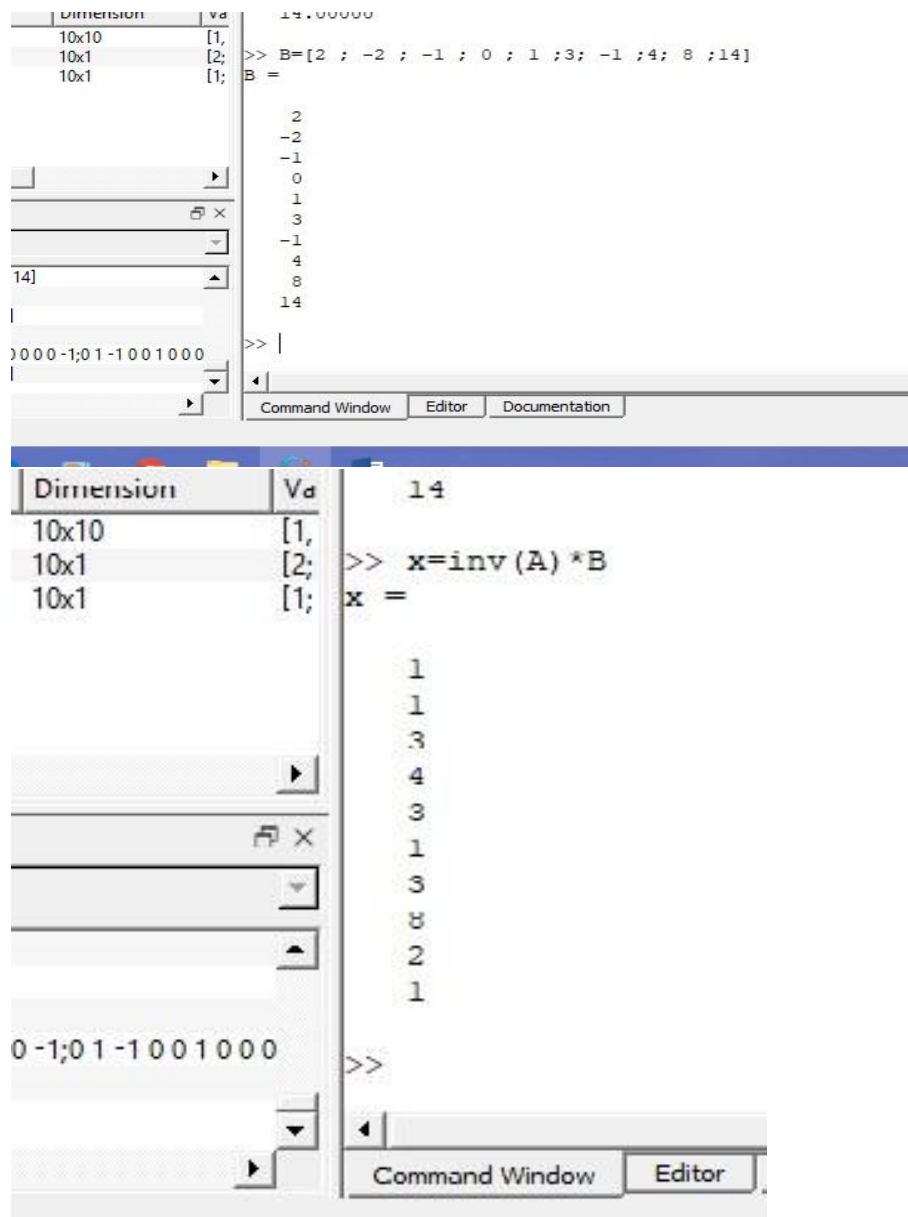
Column 10:

0.00000
-1.00000
0.00000
0.00000
0.00000
0.00000
0.00000
0.00000
0.00000
0.00000
14.00000

>> |

Command Window Editor Documentation

Bazele electrotehnicii – Tema 1



Pentru sursa comandata.Noul sistem va deveni :

Bazele electrotehnicii – Tema 1

A =

1.00000	-1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000
0.00000	0.00000	1.00000	-1.00000	0.00000	0.00000	0.00000	0.00000	0.00000	-1.00000
0.00000	1.00000	-1.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	1.00000	-1.00000	-1.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000	0.00000	-1.00000	0.00000
0.00000	0.00000	0.00000	0.50000	0.00000	1.00000	0.00000	0.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.50000	0.00000	0.00000	-1.00000	2.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.50000	0.00000	0.00000	0.00000	2.00000	1.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	1.00000	0.00000	0.00000
0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	14.00000

```
>> B=[2 ; -2 ; -1 ; 0 ; 1 ;3; 3 ;8; 8 ;14]
```

B =

2
-2
-1
0
1
3
3
8
8
14

```
>> x=inv(A)*B
```

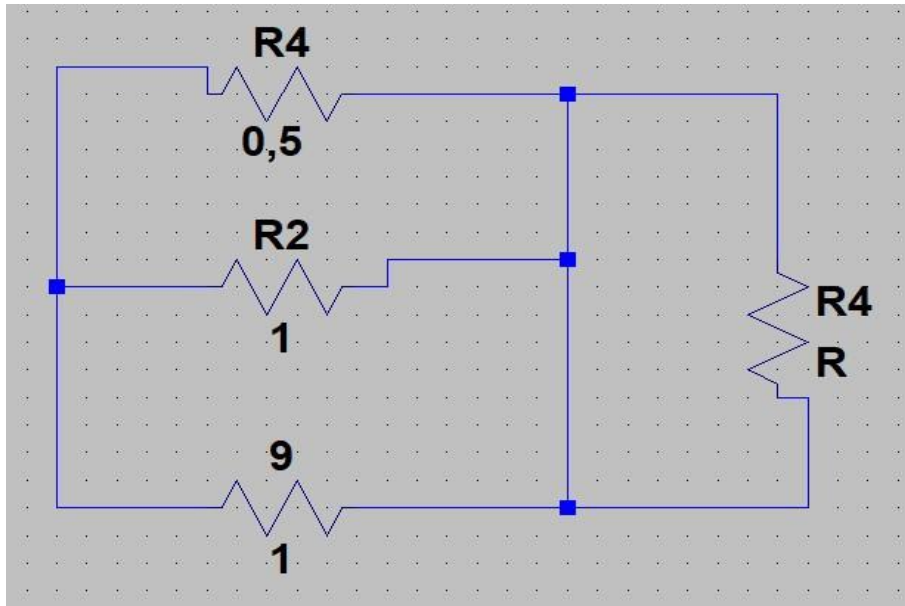
x =

1
1
3
4
3
1
3
8
2
1

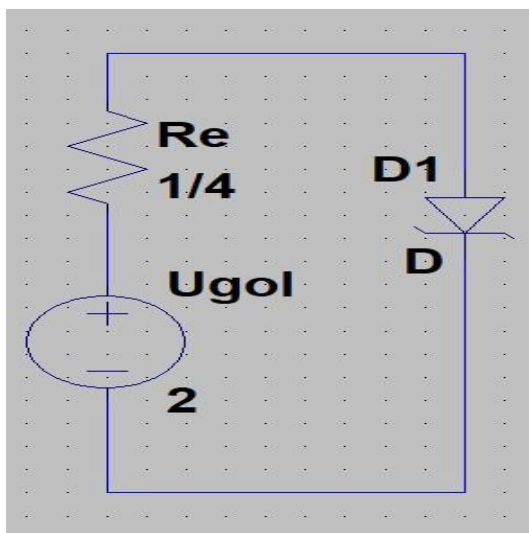
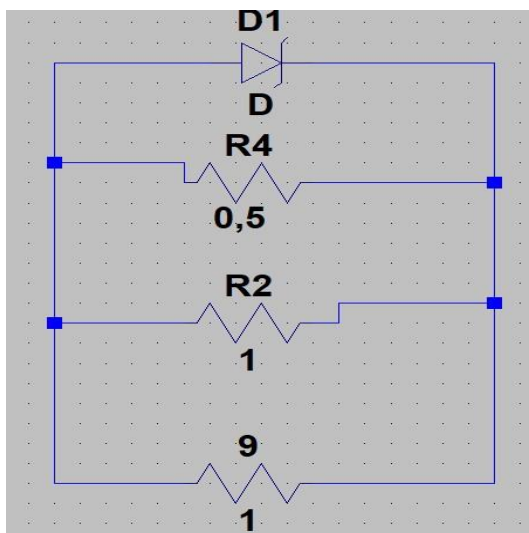
Valorile rezultate in urma modificarii sunt identice cu cele rezultate din sistemului initial.Cum era si normal.

3. Rezolvarea circuitelor rezistive neliniare.

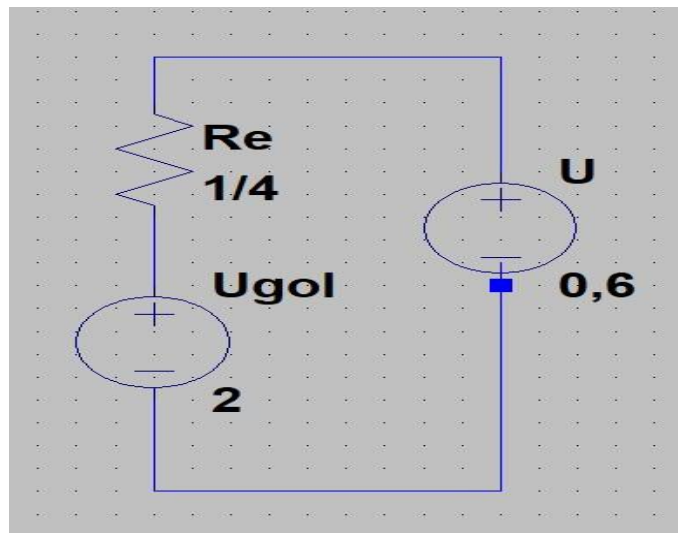
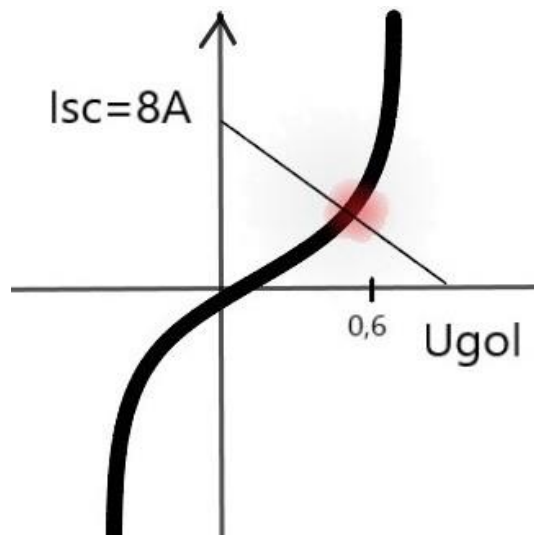
Se pasivizeaza circuitul: se elimina sursele ideale de curent, iar sursele ideale de tensiune se transforma in conductori perfecti. Se observa ca R_4 din partea dreapta se poate elimina pentru ca se scurt-circuiteaza.



Am adaugat Dioda Zener. Rezistenta echivalenta este $R_e = R_9 + R_2 + R_4 = 1/4$. Tensiunea de mers in gol este $U_{gol} = 2V$. De unde va rezulta $I_{sc} = U_{gol}/R_e = 8A$.



Pentru tensiunea de deschidere am folosit valoarea conventionala de 0.6V. Pentru intersectia cu graficul generat de Dioda am folosit algoritmul lui Newton.

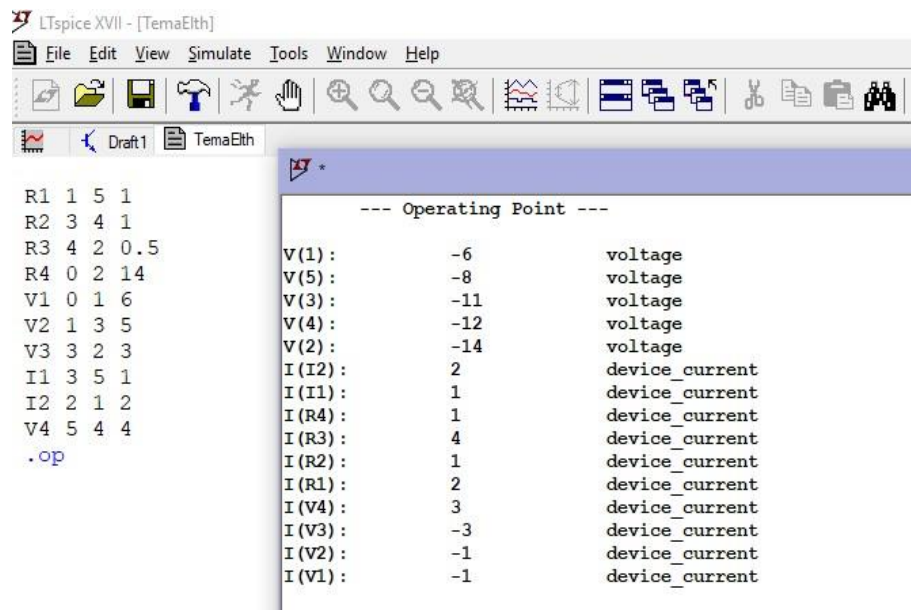


$$0,6 = 2 + \frac{1}{4} * I$$

noul I este $-5,6A$

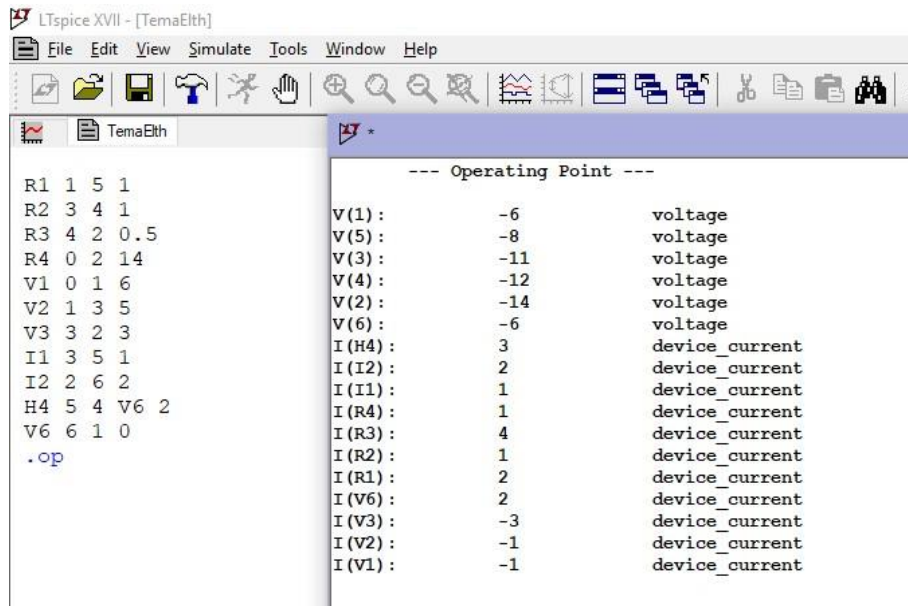
4. Simulator Spice.

Netlist-ul pentru circuitul initial, cel fara sursa comandata



Sursa de tensiune comandata in curent genereaza o tensiune proportionala cu curentul I_j dintr-o ramura diferita a retelei. Rezistenta de transfer R_t este multiplicatã cu I_j pentru a genera tensiunea sursei comandate. Ramura de comanda nu se poate specifica prin nodurile sale. De aceea, trebuie sa introducem o sursa de tensiune independenta de valoare 0, in serie cu ramura ce contine curentul de comanda astfel incat curentul de comanda sa fie in sens invers fata de sursa. Comanda pe care am folosit-o este:

HnumENNvauxiliarV aloare



2 Referinte

- [1] Daniel Ioan, Circuite electrice rezistive - breviare teoretice ,si probleme, <http://www.lmn.pub.ro/ daniel/culegere.pdf>, 2000.
- [2] G. Ciuprina, A. Gheorghe, M. Popescu, D. Niculae, A.S. Lup, R. B̃arbulescu, D. Ioan, Modelarea ,si simularea circuitelor electrice. Indrumar de laborator ^ , Disponibil pe site-ul de cursuri <https://acs.curs.pub.ro/2018/course/view.php?id=1095>.
- [3] Gabriela Ciuprina Template pentru redactarea rapoartelor in LaTeX (v3), Disponibil la <http://www.lmn.pub.ro/ gabriela/LatexTemplate4Students/>