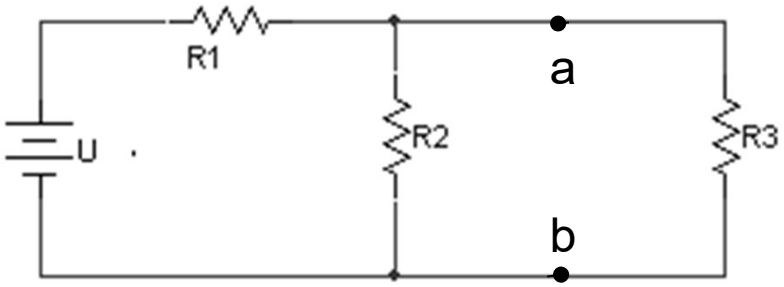
THEVENINOV TEOREM ILI METODA PRAZNOG HODA

- I ova metoda (kao i Nortonova metoda) omogućava da se odredi pad napona ili struja samo na nekom određenom mjestu mreže.
- Najprije se element na kojemu proračunavamo U i I, odvoji od mreže, i na tom mjestu se računa Theveninov napon (U_T).
- Na onome dijelu mreže koji je preostao, računa se theveninov otpor (R_T).
- Novi nadomjesni izvor ima EMS "U_T" i unutrašnji otpor "RT".
- Doda se nadomjesnom izvoru i otporu dio mreže koji smo prije odvojili, a struja se računa izravno.

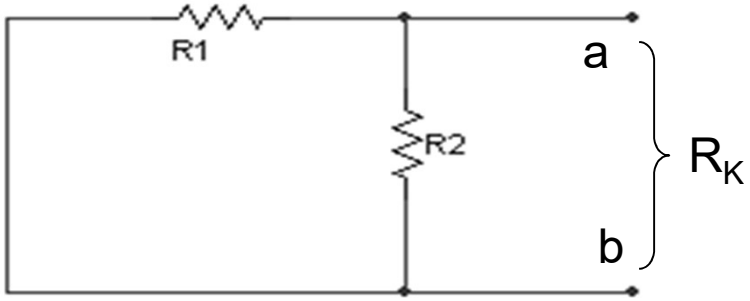
Primjer:



Izračunati struju kroz otpor R_3 i pad napona na njemu.

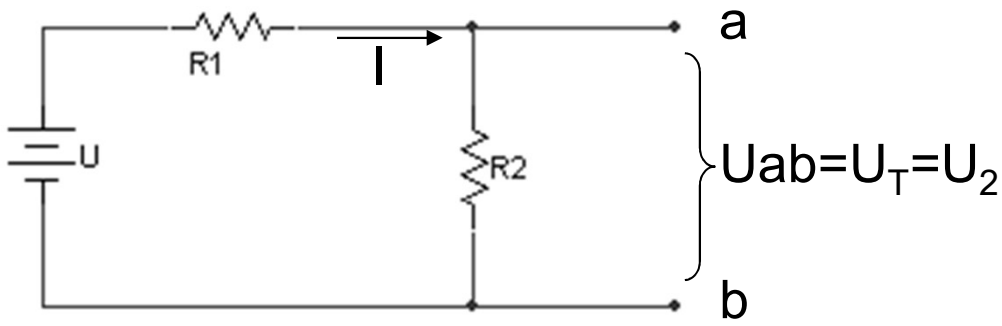
a) Na mjestu a-b, odvojimo otpor R_3

b) Na ostatku mreže, izvor napona kratko spojimo, a na izvodima a-b računamo otpor R_T (kao kod nortonove metode)



$$R_T = \frac{R_1 \times R_2}{R_1 + R_2}$$

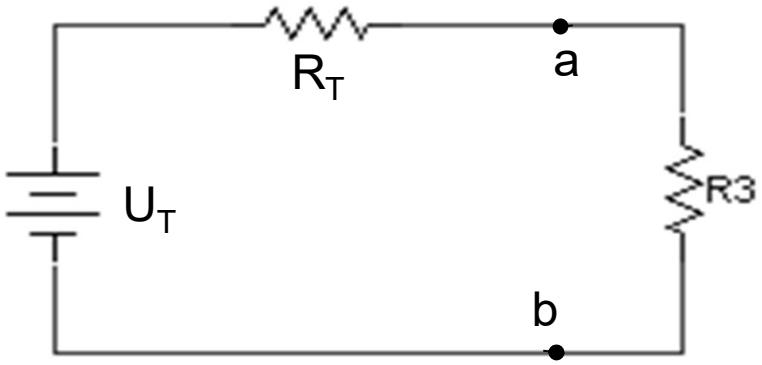
c) Gledajući zadanu shemu, točke a-b odvojimo te računamo struju napon U_T (napon praznog hoda)



$$U_T = I \times R_2$$

$$I = \frac{U}{R_1 + R_2}$$

d) Cijelu mrežu s lijeve strana točaka a-b zamjenjujemo nadomjesnim otporom R_T i izvorom U_T, te sa desne strane točaka a-b, dodajemo element koji smo odvojili u točki a).



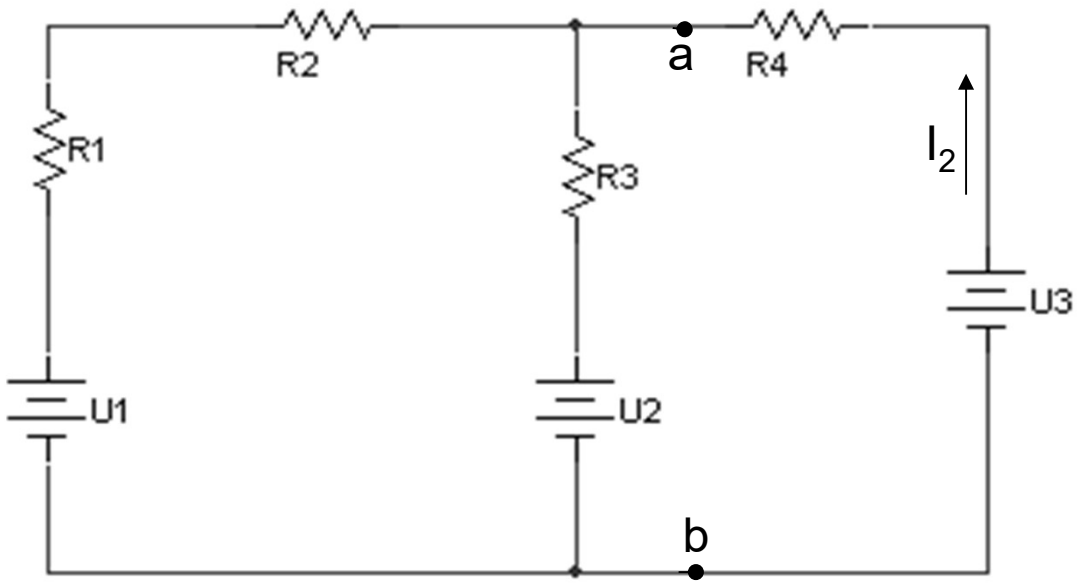
$$I_3 = \frac{U_T}{R_T + R_3}$$

$$U_3 = I_3 \times R_3$$

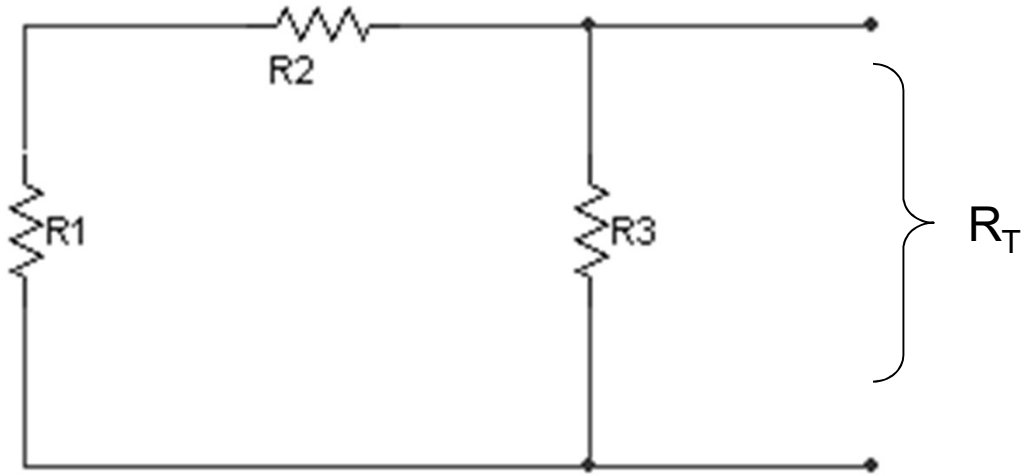
Zadatak 3:

Theveninovom metodom izračunati struju I_2 koja teče otpornikom R_4

$U_1 = 36$ V
$U_2 = 4$ V
$U_3 = 24$ V
$R_1 = 1\ \Omega$
$R_2 = 3\ \Omega$
$R_3 = 1\ \Omega$
$R_4 = 6\ \Omega$
$I_2 = ?$

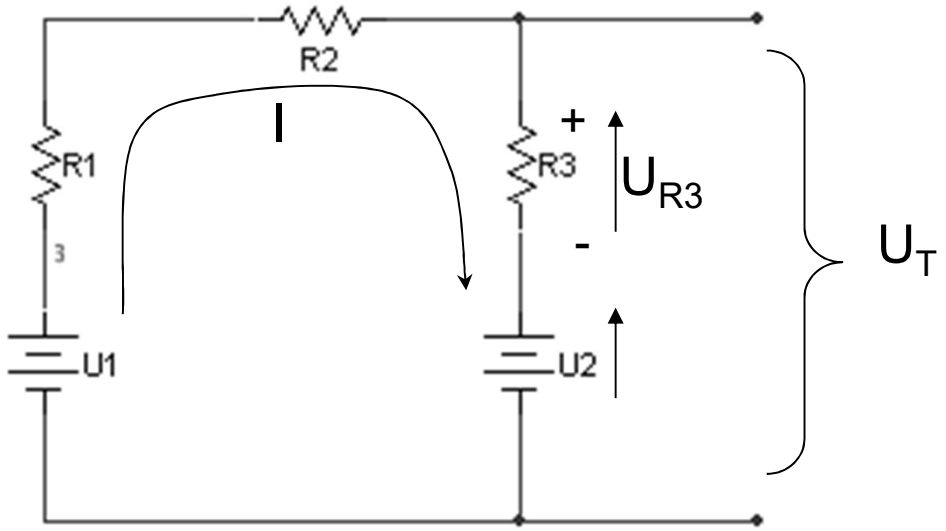


a) R_T = ?



$$R_T = \frac{(R_1 + R_2) \times R_3}{R_1 + R_2 + R_3} = 0{,}8\Omega$$

b) U_T = ?

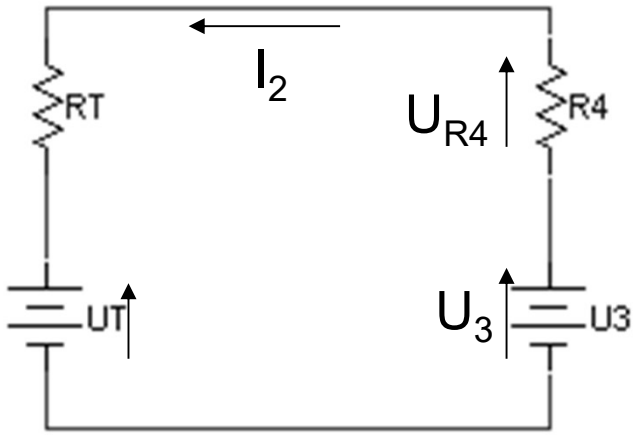


$$I_T = \frac{U_1 - U_2}{R_1 + R_2 + R_3} = \frac{36 - 4}{1 + 3 + 1} = 6{,}4\,A$$

$$U_{R3} = I \times R_3 = 6{,}4 \times 1 = 6{,}4V$$

$$U_T = U_{R3} + U_2 = 6{,}4 + 4 = 10{,}4V$$

c) I_3, U_3=?



$$I_2 = \frac{U_3 - U_T}{R_T + R_4} = \frac{24 - 10{,}4}{0{,}8 - 6} = \frac{13{,}6}{6{,}8} = 2A$$

Zadatak:4 (Thevenin)

$U_1 = 18\ V$

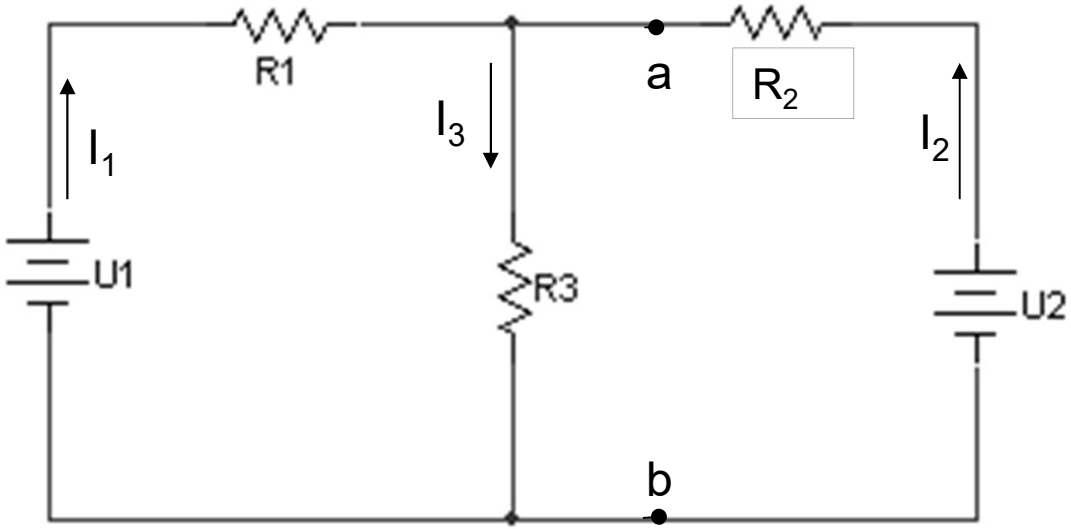
$U_2 = 16\ V$

$R_1 = 2\Omega$

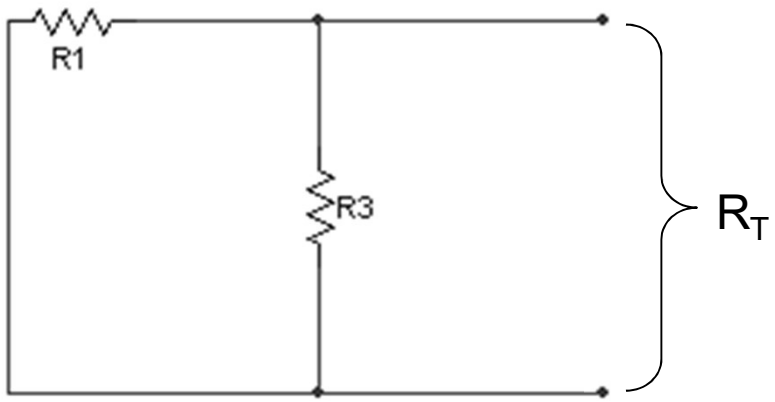
$R_2 = 4\ \Omega$

$R_3 = 6\ \Omega$

$I_2 = ?$

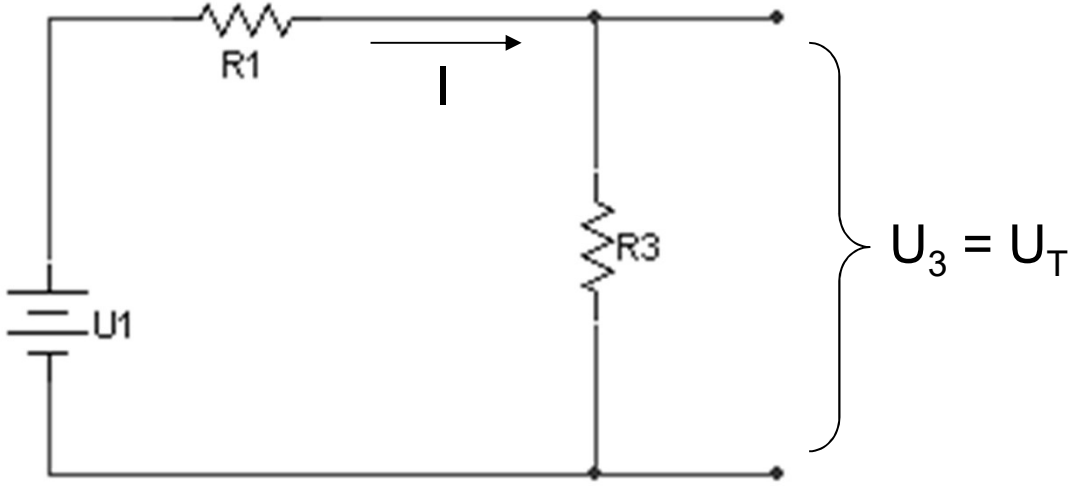


a) R_T = ?



$$R_T = \frac{R_1 \times R_3}{R_1 + R_3} = 1{,}5\Omega$$

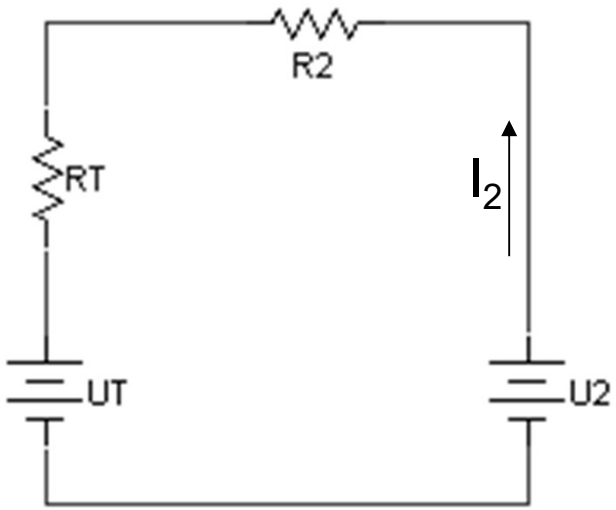
b) U_T = ?



$$I = \frac{U_1}{R_1 + R_3} = \frac{18}{2+6} = 2{,}25A$$

$$U_3 = U_T = I \times R_3 = 2{,}25 \times 6 = 13{,}5V$$

c) $I_2 = ?$



$$I_2 = \frac{U_2 - U_T}{R_T + R_2} = \frac{16 - 13{,}5}{1{,}5 + 4} = \frac{2{,}5}{5{,}5} = 0{,}45A$$