

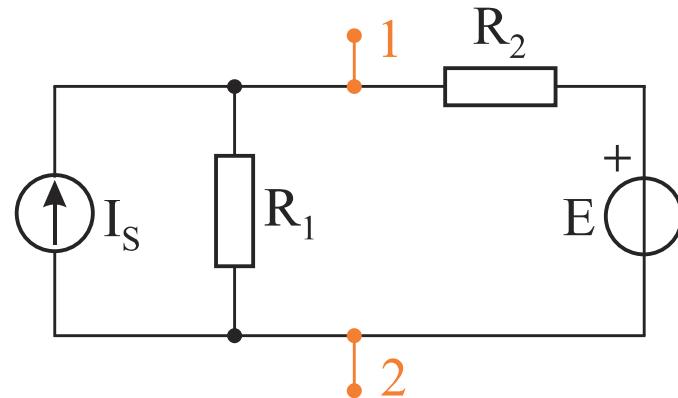
Utorak, 11.01.2022.

Vežbe 25 (termin predavanja)

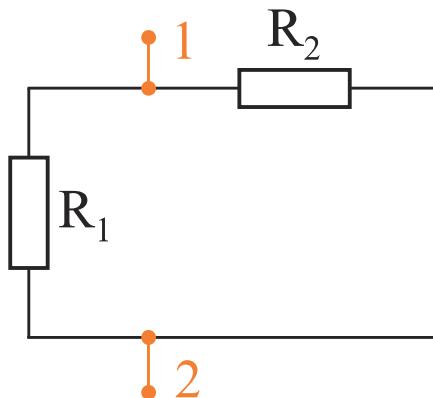
Vremenski konstantne  
električne struje

**Zadatak 1.** Odrediti elemente Nortonovog generatora između priključaka 1 i 2.

Brojni podaci:  $R_1 = 30 \Omega$ ,  $R_2 = 60 \Omega$ ,  $E = 30 \text{ V}$ ,  $I_S = 2 \text{ A}$ .



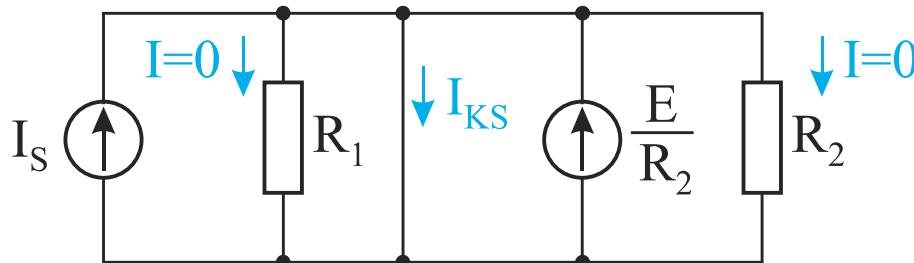
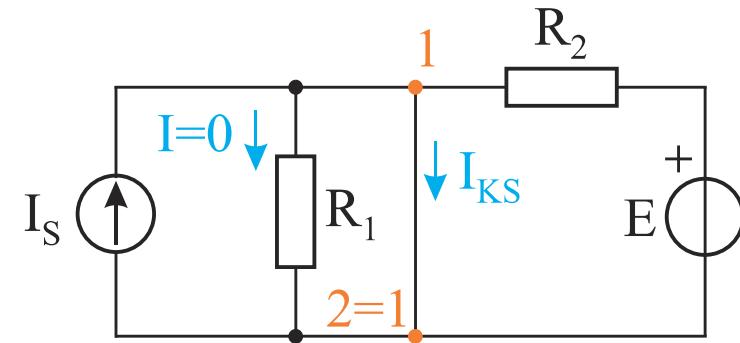
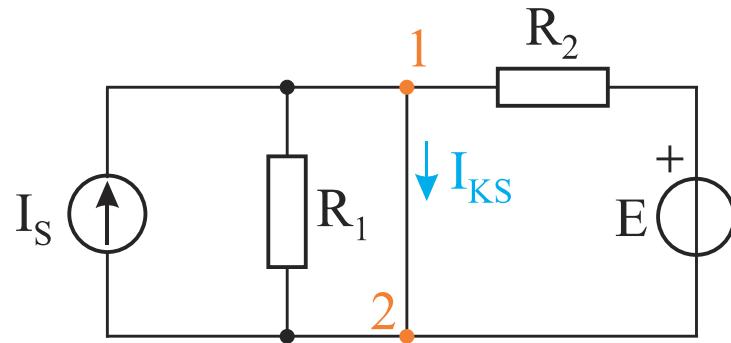
Određivanje  $R_N$ :



$$R_N = R_{12} = R_1 \parallel R_2$$

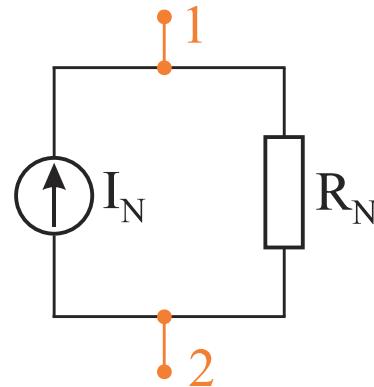
$$R_N = 20 \Omega$$

Određivanje  $I_N$ :

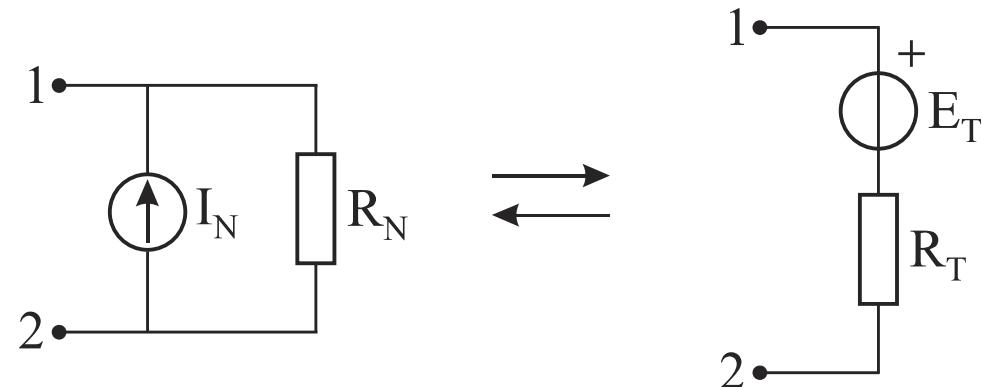


$$I_N = I_{KS} = I_S + \frac{E}{R_2}$$

$$I_N = 2,5 \text{ A}$$



Prebacivanje iz Nortonovog u Tevenenov generator.



$$R_T = R_N = 20 \Omega$$

$$E_T = R_N \cdot I_N = 50 V$$

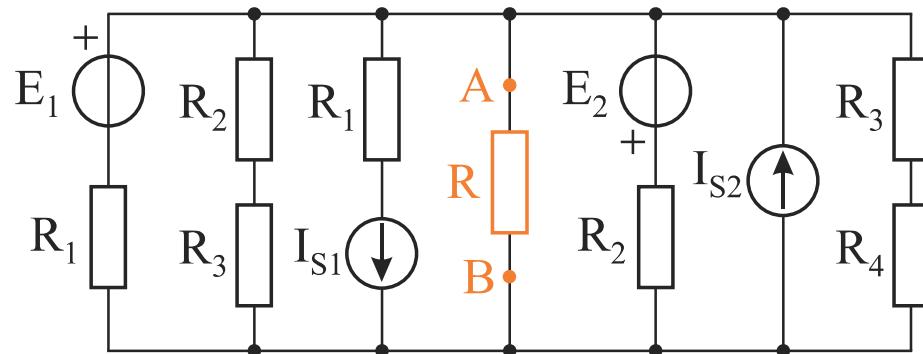
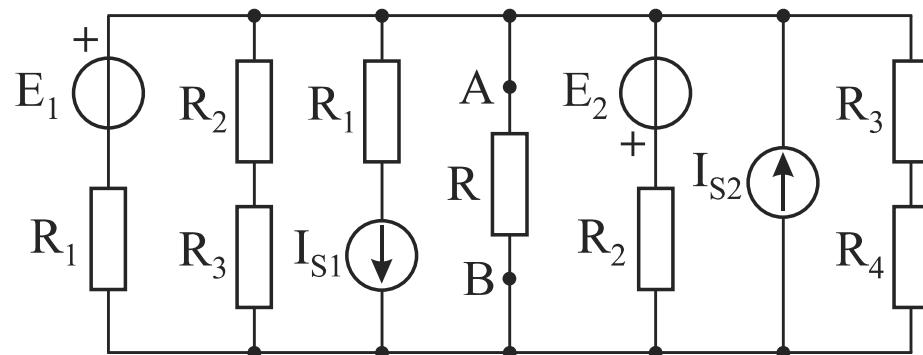
$$R_N = R_T$$

$$I_N = \frac{E_T}{R_T}$$

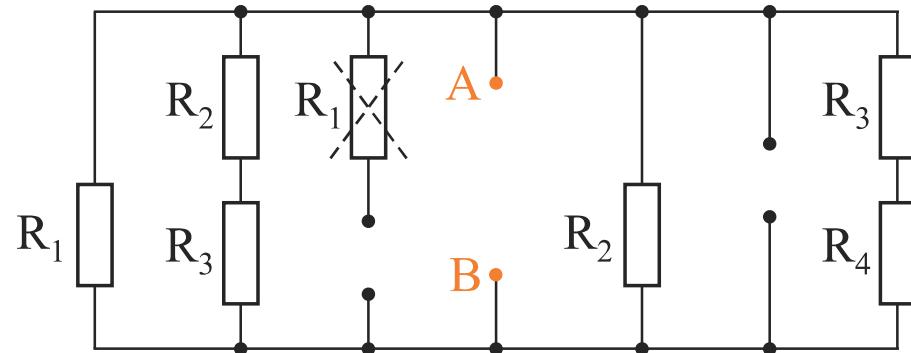
**Zadatak 2.** Odrediti elemente Nortonovog generatora između priključaka A i B.

Brojni podaci:

$$\begin{aligned} R_1 &= 10 \Omega, R_2 = 40 \Omega, R_3 = 25 \Omega, R_4 = 50 \Omega, \\ I_{S1} &= 0,21 \text{ A}, I_{S2} = 0,5 \text{ A}, E_1 = 12 \text{ V}, E_2 = 20 \text{ V}. \end{aligned}$$



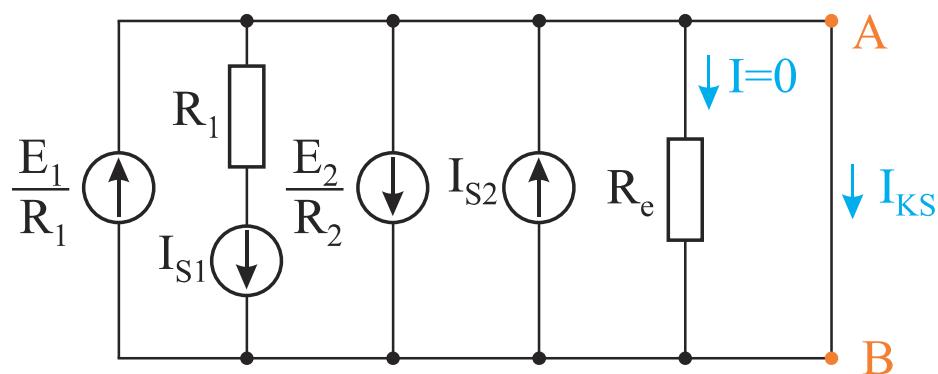
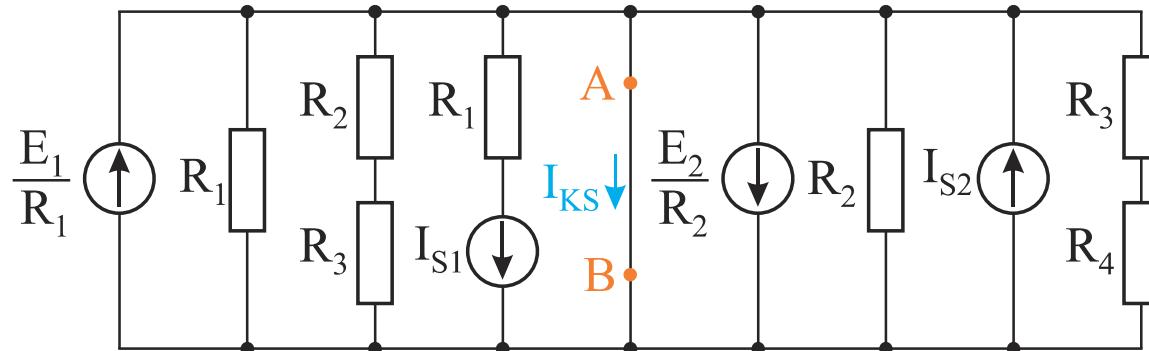
Određivanje  $R_N$ :



$$R_N = R_{AB} = R_1 \parallel (R_2 + R_3) \parallel R_2 \parallel (R_3 + R_4)$$

$$R_N = 6,5 \Omega$$

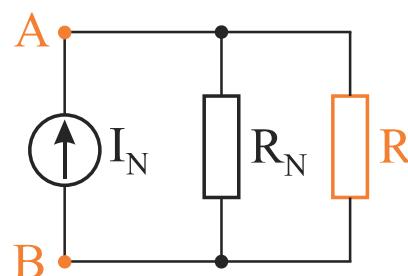
Određivanje  $I_N$ :



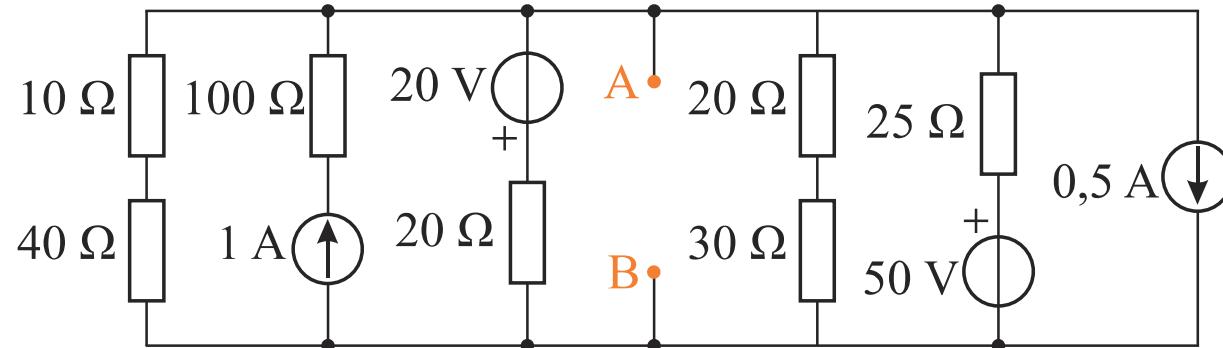
$$R_e = R_1 \parallel (R_2 + R_3) \parallel R_2 \parallel (R_3 + R_4) = 6,5 \Omega$$

$$I_{KS} = \frac{E_1}{R_1} - I_{S1} - \frac{E_2}{R_2} + I_{S2} = 0,99 \text{ A} = 1 \text{ A}$$

$$I_N = I_{KS} = 1 \text{ A}$$



**Zadatak 3. – DOMAĆI** Odrediti elemente Nortonovog generatora između priključaka A i B.



$$R_N = \frac{100}{13} \Omega$$

$$I_N = 1,5\text{ A}$$

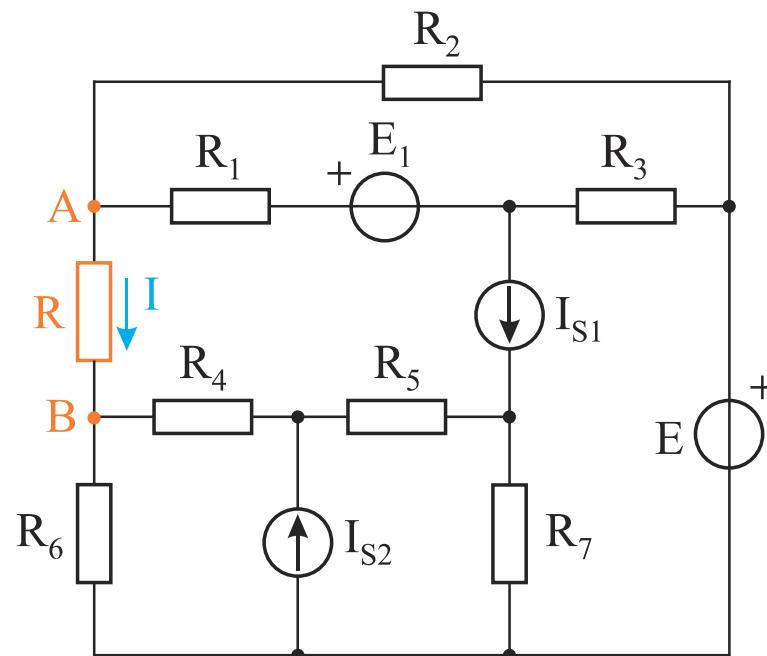
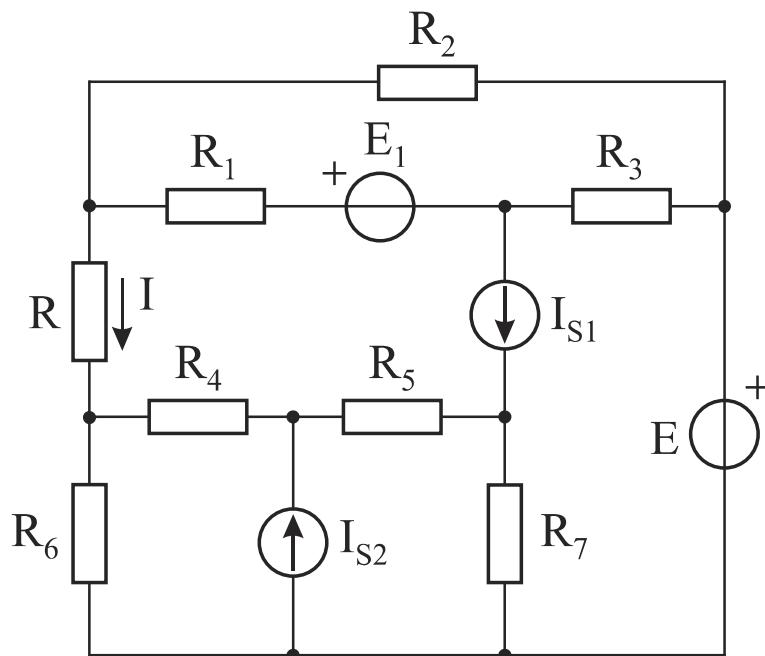
**Zadatak 4.** U mreži vremenski konstantne struje sa slike odrediti otpornost otpornika  $R$  tako da jačina struje, koja kroz njega protiče, ima vrednost  $I=1$  A, u naznačenom referentnom smeru. Pri rešavanju zadatka najpre primeniti teoremu o kompenzaciji, a zatim metodu konturnih struja.

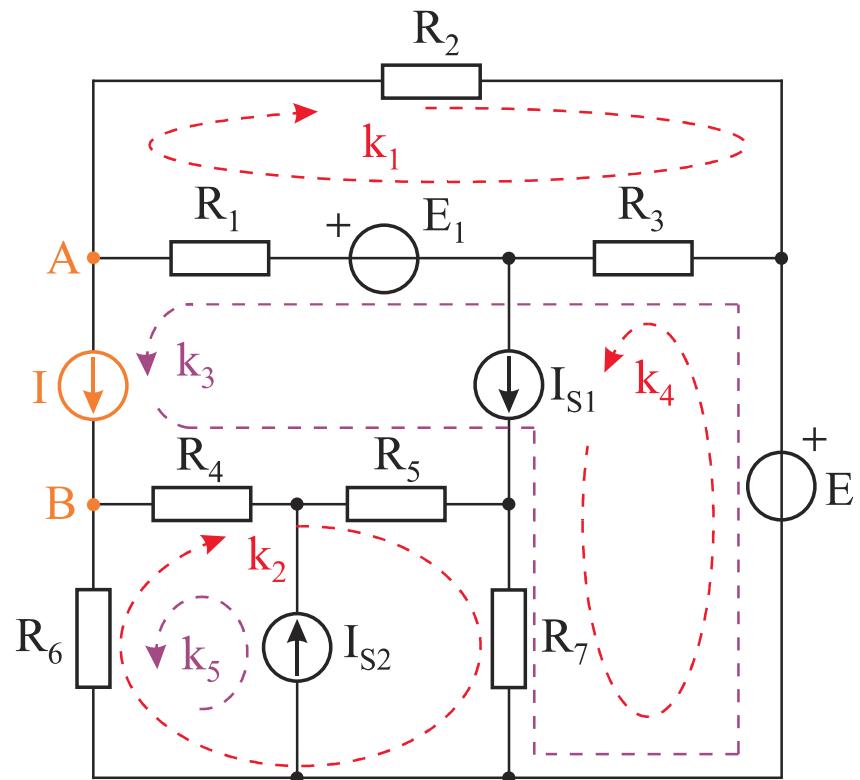
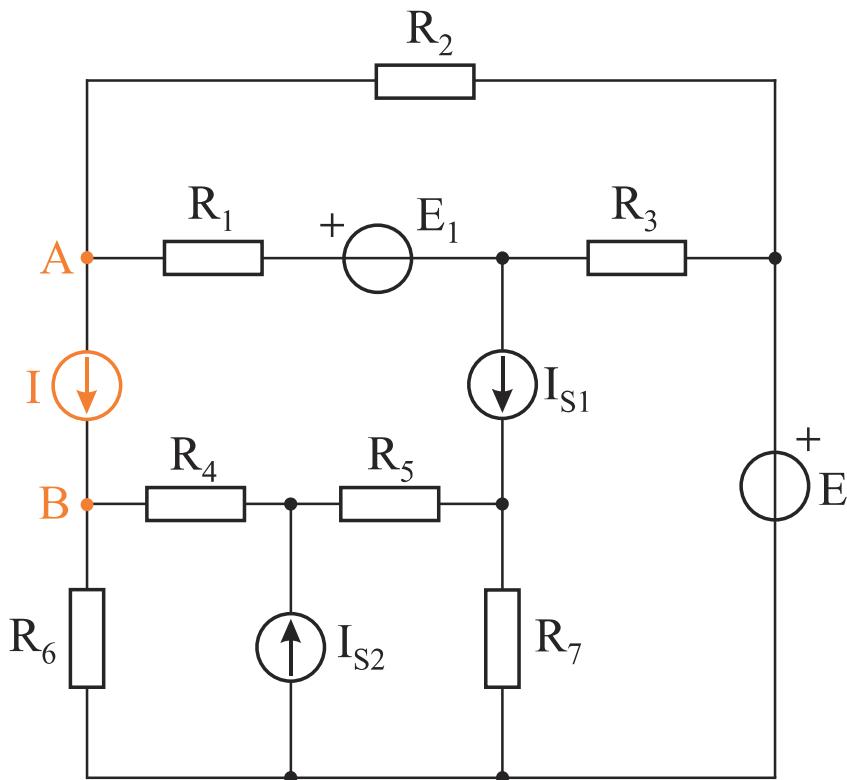
Kolika treba da bude granična vrednost dozvoljene snage otpornika  $R$ ?

Brojni podaci:

$$R_1 = 2 \Omega, R_2 = 3 \Omega, R_3 = 10 \Omega, R_4 = R_5 = 12 \Omega, R_6 = R_7 = 6 \Omega,$$

$$E_1 = 6 \text{ V}, E = 15 \text{ V}, I_{S1} = I_{S2} = 0,5 \text{ A}.$$



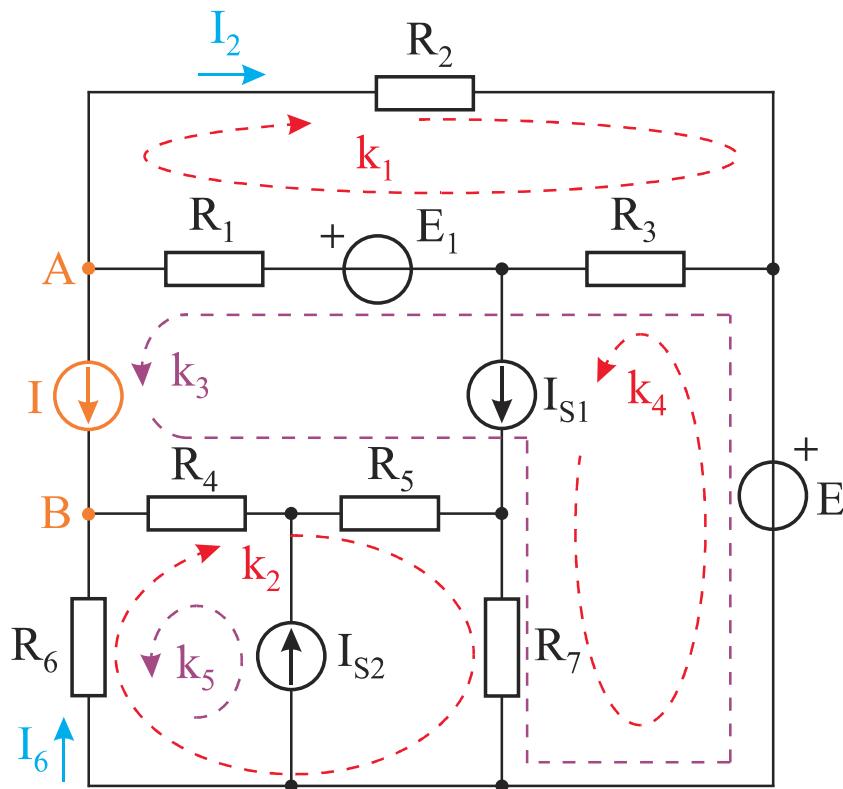


$$I_{k3} = I = 1 \text{ A} \quad I_{k4} = I_{S1} = 0,5 \text{ A} \quad I_{k5} = I_{S2} = 0,5 \text{ A}$$

$$k1: (R_1 + R_2 + R_3) \cdot I_{k1} + (R_1 + R_3) \cdot I_{k3} + R_3 \cdot I_{k4} = E_1$$

$$k2: (R_4 + R_5 + R_6 + R_7) \cdot I_{k2} - (R_6 + R_4) \cdot I_{k5} + (R_4 + R_5 + R_7) \cdot I_{k3} + R_7 \cdot I_{k4} = 0$$

$$I_{k1} = -\frac{11}{15} \text{ A} \quad I_{k2} = -\frac{2}{3} \text{ A}$$



$$I_2 = I_{k1} = -\frac{11}{15} A$$

$$I_6 = I_{k2} - I_{k5} = -\frac{7}{6} A$$

$$U_{AB} = R_2 \cdot I_2 + E + R_6 \cdot I_6 = 5,8 V$$

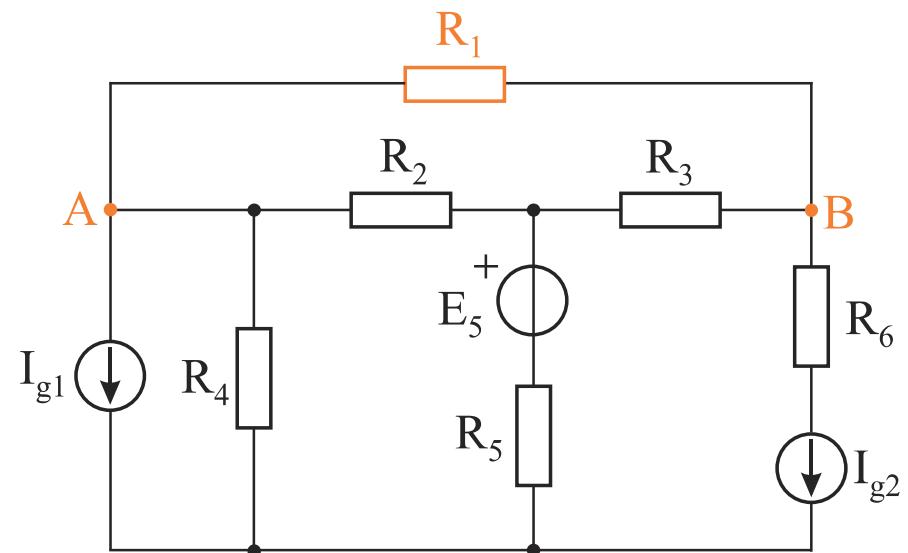
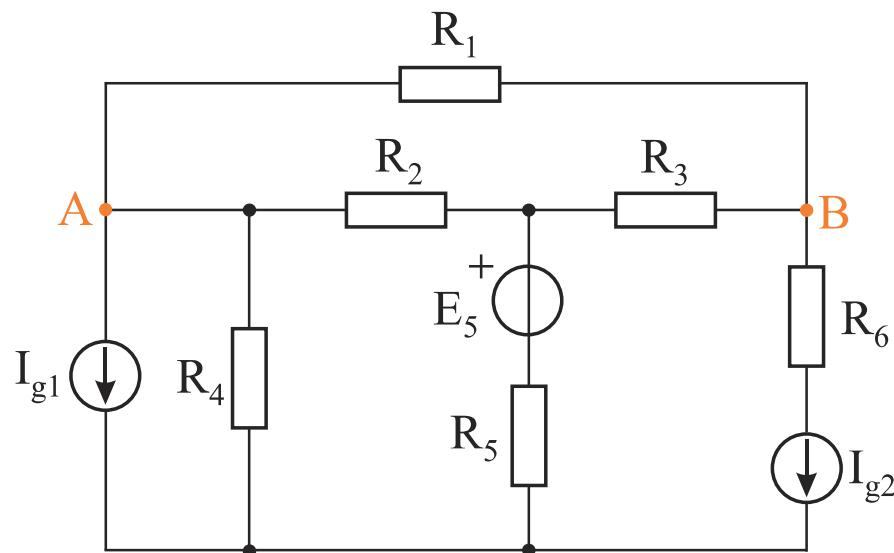
$$R = \frac{U_{AB}}{I} = 5,8 \Omega$$

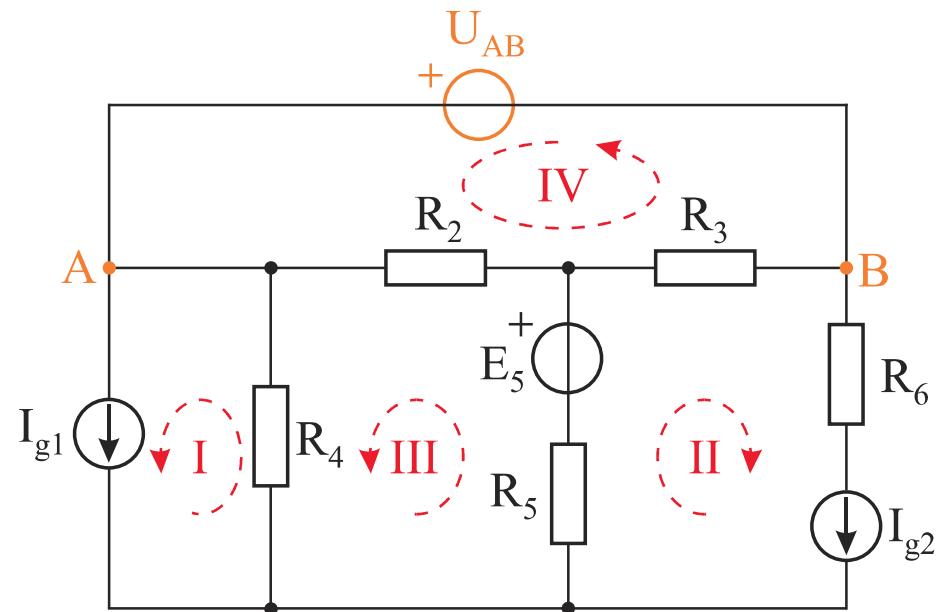
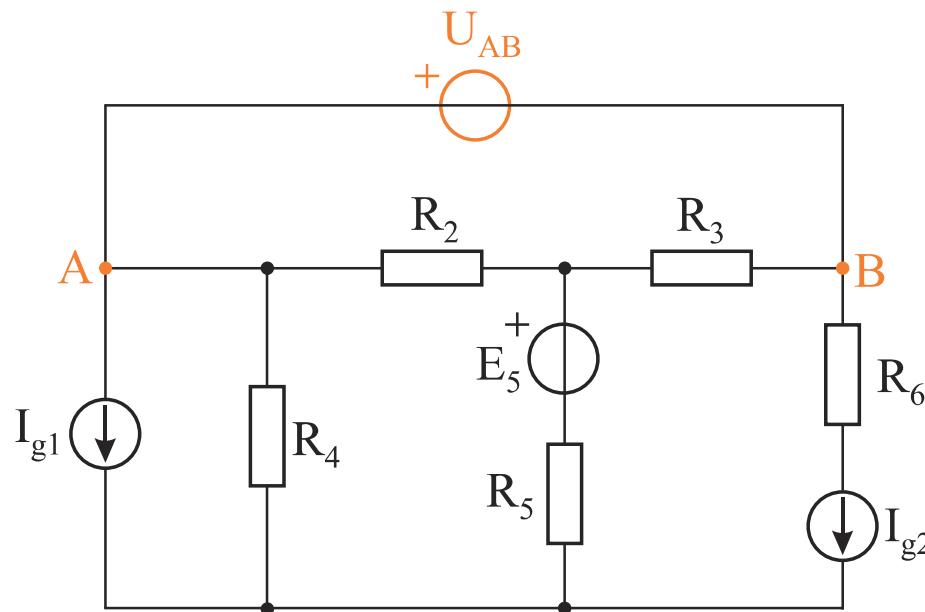
$$P_{\min} \geq R \cdot I^2 = 5,8 W$$

**Zadatak 5.** U kolu vremenski konstantne struje sa slike, primenom teoreme o kompenzaciji odrediti otpornost otpornika  $R_1$  tako da napon između tačaka A i B ima vrednost  $U_{AB}=15$  V. Izračunati takođe snage svih generatora u mreži.

Brojni podaci:

$$R_2 = 1 \text{ k}\Omega, R_3 = 4 \text{ k}\Omega, R_4 = 2 \text{ k}\Omega, R_5 = 5 \text{ k}\Omega, R_6 = 6 \text{ k}\Omega, \\ E_5 = 8 \text{ V}, I_{g1} = 5 \text{ mA}, I_{g2} = 9 \text{ mA}.$$





$$I_I = I_{g1} = 5 \text{ mA}$$

$$I_{II} = I_{g2} = 9 \text{ mA}$$

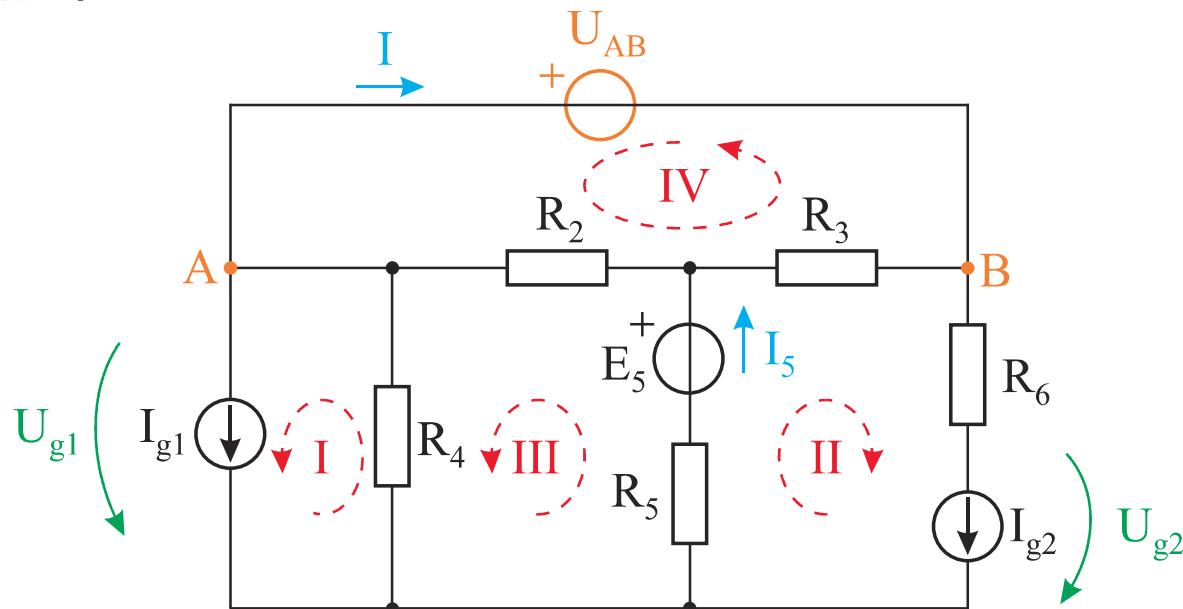
$$III: (R_2 + R_4 + R_5) \cdot I_{III} - R_4 \cdot I_I + R_5 \cdot I_{II} - R_2 \cdot I_{IV} = E_5$$

$$IV: (R_2 + R_3) \cdot I_{IV} - R_2 \cdot I_{III} + R_3 \cdot I_{II} = U_{AB}$$


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$$I_{III} = -4 \text{ mA}$$

$$I_{IV} = -5 \text{ mA}$$



$$I = -I_{IV} = 5 \text{ mA}$$

$$R_1 = \frac{U_{AB}}{I} = 3 \text{ k}\Omega$$

$$P_{Ig1} = I_{g1} \cdot U_{g1} = I_{g1} \cdot [R_4 \cdot (I_{g1} - I_{III})]$$

$$P_{Ig1} = 90 \text{ mW}$$

$$P_{Ig2} = I_{g2} \cdot U_{g2} = I_{g2} \cdot [U_{g1} + U_{AB} + R_6 \cdot I_{g2}]$$

$$P_{Ig2} = -189 \text{ mW}$$

$$P_{E5} = E_5 \cdot I_5 = E_5 \cdot (I_{II} + I_{III})$$

$$P_{E5} = 40 \text{ mW}$$