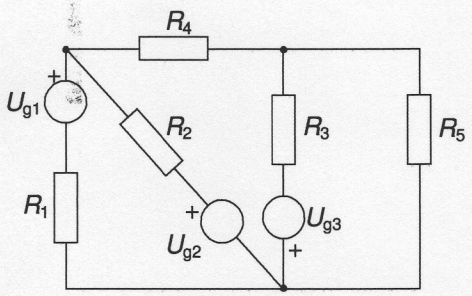
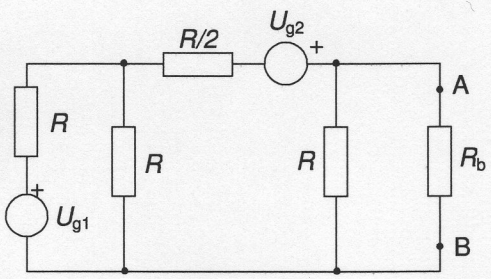
5. domača naloga iz Osnov elektrotehnike I

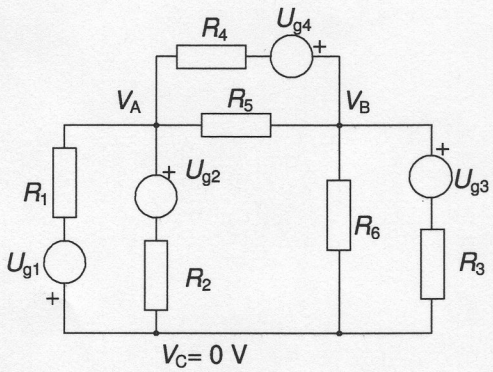
1 Določite toke v vezavi na sliki. Podatki elementov so: $R_1 = R_2 = 6\ \Omega$, $R_3 = 4\ \Omega$, $R_4 = 8\ \Omega$, $R_5 = 6\ \Omega$, $U_{g1} = 40$ V, $U_{g2} = 20$ V in $U_{g3} = 10$ V



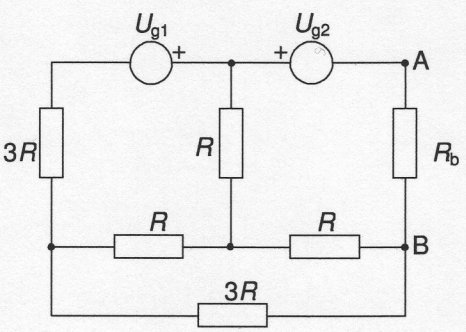
2. V vezju na sliki določite tok skozi upor R_b tako, da preostanek vezja (med sponkama A in B) predstavite kot **aktivni dvopol**. Podatki elementov so: $U_{g1} = 20$ V, $U_{g2} = 10$ V, $R = 20\ \Omega$ in $R_b = 10\ \Omega$.



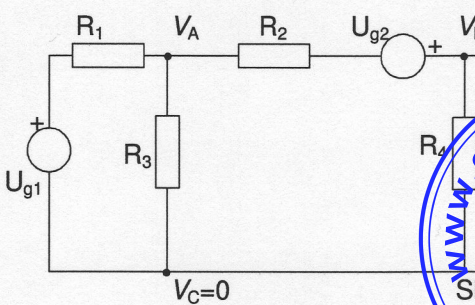
3. Po metodi **vozliščnih potencialov** določite toke v vezavi na sliki. Podatki elementov so: $R_1 = 2\ \Omega$, $R_2 = 6\ \Omega$, $R_3 = 3\ \Omega$, $R_4 = 6\ \Omega$, $R_5 = R_6 = 2\ \Omega$, $U_{g1} = 12$ V, $U_{g2} = 18$ V in $U_{g3} = U_{g4} = 12$ V



4. V vezju na sliki 2 določite tok skozi upor R_b tako, da preostanek vezja (med sponkama A in B) predstavite kot **aktivni dvopol**. Podatki elementov so: $U_{g1} = 48$ V, $U_{g2} = 6$ V, $R = 2\ \Omega$ in $R_b = 3\ \Omega$.

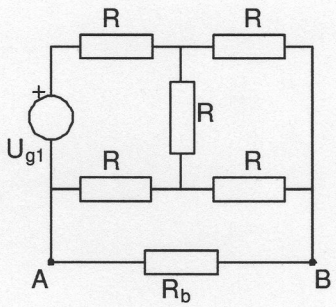


5. Po metodi **vozliščnih potencialov** določite toke v vezavi na sliki. Podatki elementov so: $R_1 = 10\ \Omega$, $R_2 = 20\ \Omega$, $R_3 = 5\ \Omega$, $R_4 = 10\ \Omega$, $R_5 = 10\ \Omega$, $U_{g1} = 20$ V in $U_{g2} = 30$.



Slika 5

6. V vezju na sliki določite tok skozi upor R_b tako, da preostanek vezja (med sponkama A in B) predstavite kot **aktivni dvopol**. Podatki elementov so: U_g = 80 V, R = 20 Ω in R_b = 60 Ω. Kakšen bi moral biti upor R_1, da bi se na njem trošila maksimalna moč?



Rešitve:

1 I_1= 3 A

I_2= 0,323 A

I_3= 2,61 A

I_4= 2,69 A

I_5= 0,075 A

2. U_0= 10 V, R_n= 10 Ω, I_{br}= 0,5 A

3. V_A= -2,25 V

V_B= 3 V

I_1= 4,875 A

I_2= 3,375 A

I_3= 3 A

I_4= 1,125 A

I_5= 2,625 A

I_6= 1,5 A

4. U_0= 6 V, R_n= 3 Ω, I_{br}= 1 A

5. V_A= 2,353 V

V_B= 6,47 V

I_1= 1,76 A

I_2= 1,29 A

I_3= 0,47 A

I_4= 0,647 A

I_5= 0,647 A

6. U_0= 40 V, R_n= 20 Ω, I_{br}= 0,5 A

5 DN / 1 E10542004 GREGOR NIKOLIĆ

(Z.T.)

$R_1 = R_2 = 6\Omega$

$R_3 = 4\Omega$

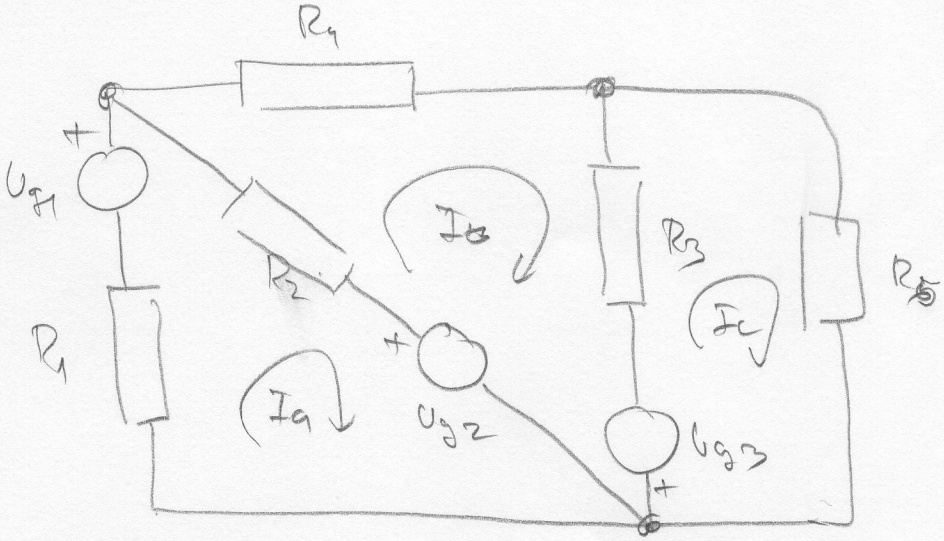
$R_4 = 8\Omega$

$R_5 = 6\Omega$

$U_{g1} = 40V$

$U_{g2} = 20V$

$U_{g3} = 10V$



$I_a = I_1$

$I_b = I_4$

$I_c = I_5$

$I_2 = I_B - I_A$

$I_3 = I_B - I_C$

A: $I_a(R_1+R_2) - I_B R_2 - U_{g1} - U_{g2} = 0$

B: $I_b(R_2+R_4+R_3) - I_a R_2 - I_c R_3 - U_{g2} - U_{g3} = 0$

C: $I_c(R_5+R_3) \quad I_B R_3 + U_{g3} = 0$

	a)	b)	c)	Σ
a)	R_1+R_2 (12)	$-R_2$ (-6)	0	$+U_{g1}+U_{g2}$ (20)
b)	$-R_2$ (-6)	$R_2+R_4+R_3$ (18)	$-R_3$ (-4)	$U_{g2}+U_{g3}$ (30)
c)	0	$-R_3$ (4)	R_3+R_5 (10)	$-U_{g3}$ (-10)

$$I \begin{bmatrix} 3{,}01 \\ 2{,}68 \\ 0{,}075 \end{bmatrix}$$

$I_1 = 3{,}01\,A$

$I_2 = 2{,}68 - 3{,}01 = -0{,}33\,A$

$I_3 = 2{,}68 - 0{,}075 = 2{,}61\,A$

$I_4 = 2{,}68\,A$

$I_5 = 0{,}075\,A$

5. DN / 2   E1054204   GREGOR NIKOLIĆ

	a)	b)	c)	U
a)	R_1+R_2 (40)	$-R_2$ (−20)	∅	U_{g1} (20)
b)	$-R_2$ (−20)	$R_2+R_4+\frac{R_3}{2}$ (50)	R_4 (−20)	U_{g2} (10)
c)	∅	R_4 (−20)	R_4+R_B (30)	∅

$I_1 = I_a$

$I_c = I_{B}$

$I_2 = I_a \; I_b$

$I_3 = I_b$

$I_4 = I_b + I_c$

$$I = \begin{bmatrix} 0{,}875 \\ 0{,}75 \\ 0{,}5 \end{bmatrix}$$

$I_1 = 0{,}875\ A$ $I_4 = 1{,}25\ A$

$I_2 = 0\ 125\ A$ $I_{B2} = 0{,}5\ A$

$I_3 = 0{,}75\ A$

$$R_N = \left(\left(\frac{20}{2} + \frac{20}{2}\right)^{-1} + 20^{-1}\right)^{-1} = 10\ \Omega$$

$$U_0 = \frac{10 + 10}{0{,}5} = 10V$$

DN 5/3.

	a)	b)	c)	d)	U
a)	R_1+R_2 (8)	$-R_2$ (−6)	∅	∅	$-U_{g1}-U_{g2}$ (−30)
b)	$-R_2$ (−6)	$R_2+R_5+R_6$ (10)	R_6 (−2)	$-R_5$ (−2)	U_{g2} (18)
c)	∅	$-R_6$ (−2)	R_6+R_3 (5)	∅	$-U_{g3}$ (−12)
d)	∅	$-R_5$ (−2)	∅	R_4+R_5 ([illegible])	U_{g4} (12)

$I_1 = I_a$

$I_2 = I_B - I_A$

$I_3 = I_c$

$I_4 = I_D$

$I_5 = I_D - I_B$

$I_6 = I_B - I_c$

$$I = \begin{bmatrix} -4{,}875 \\ -1{,}499 \\ -3{,}000 \\ 1{,}125 \end{bmatrix}$$

$I_1 = -4{,}875\ A$

$I_2 = 1{,}499 + 4{,}873 = 3{,}374\ A$

$I_3 = 3\ A$

$I_4 = 1{,}125\ A$

$I_5 = 1{,}125 + 1{,}499 = 2{,}624\ A$

$I_6 = -1{,}499 + 3 = 1{,}5\ A$

$U_{R_2} = 3{,}374 \cdot 6 = 2{,}24\ V = V_A$

$U_{R_6} = 1{,}5 \cdot 2 - 3V = V_B$

DNS/4   21.05.4.2014   GREGOR   NIKOLIĆ

$I_1 = I_a$

$I_2 = I_a \; I_B$

$I_3 = I_B$

$I_4 = I_A - I_C$

$I_5 = I_C - I_B$

$I_6 = I_C$

	a)	b)	c)	v)
a)	5R (10)	-R (-2)	-R (-2)	U_{g1} (48)
b)	-R (-2)	2R + R_B (7)	-R (-2)	$-U_{g2}$
c)	-R	-R	5R	∅

$$I \begin{bmatrix} 5,249 \\ 1,000 \\ 1,250 \end{bmatrix}$$

$I_1 = 5,249 A$

$I_2 = 5,249 - 1 = 4,249 A$

$I_3 = 1 A$

$I_4 = 5,249 - 1,25 = 3,99 A$

$I_5 \; 1,25 \; 1 = 0\,25 A$

$I_6 \; 1,25 A$

$I_{RB} = I_3 = \underline{\underline{1A}}$

DNS/5

$I_A = I_A$

$I_2 = I_B$

$I_3 = I_A - I_D$

$I_4 = I_B - I_C$

$I_5 = I_C$

	a)	b)	c)	v)
a)	$R_1 + R_3$ (15)	$-R_3$ (-5)	∅	U_{g1} (20)
b)	$-R_3$ (-5)	$R_3 + R_2 + R_4$ (35)	$-R_4$ (-10)	U_{g2} (30)
c)	∅	$-R_4$ (-10)	$R_4 + R_5$ (20)	∅

$$I \begin{bmatrix} 1,765 \\ 1,294 \\ 0,647 \end{bmatrix}$$

$I_1 = 1,765 A$

$I_2 = 1,294 A$

$I_3 = 1,765 - 1,294 = 0,471 A$

$I_4 = 1,294 - 0,647 = 0,647 A$

$I_5 = 0,647 A$

$V_A = 5 \cdot 0,471 = 2,36 V$

$V_B = 10 \cdot 0,647 = 6,47 V$

DN5/6 E1054209 GREGOR NIKOLIĆ

$I_A = I_a$

$I_2 = I_B$

$I_3 = I_A - I_B$

$I_4 = I_A \; I_C$

$I_5 = I_B - I_C$

$I_6 = I_C$

	a)	b)	c)	γ)
a)	3R (60)	−R	−R	U_{g1} (80)
b)	−R (20)	3R (60)	−R	∅
c)	−R	−R	2R + R_B (100)	∅

$$I \begin{bmatrix} 1{,}75 \\ 0{,}75 \\ 0{,}50 \end{bmatrix}$$

$I_{RB} = I_C = 0{,}5\ A$

$I_2 = 0{,}75\ A$

$I_3 = 1{,}75 - 0{,}75 = 1\ A$

$I_4 = 1{,}75 - 0{,}5 = 1{,}25\ A$

$I_5 = 0{,}75 - 0{,}5 = 0{,}25\ A$

$I_6 = 0{,}5\ A$

$U_0 - I_{RB} \cdot R_B = 0{,}5 \cdot 60 = \underline{30V}$

$P_{max} \Rightarrow R_{BR} =$