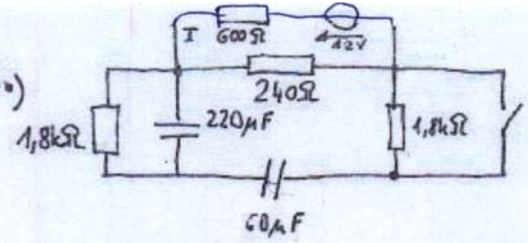
3.)

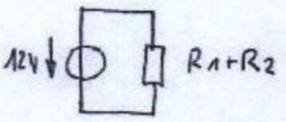


In der gezeichneten Schaltung ist der Schalter S zuerst über relativ lange Zeit geöffnet und wird dann zum Zeitpunkt $t = 0$ geschlossen.

Berechnen Sie die Werte des Stroms I unmittelbar vor und unmittelbar nach dem Schließen von S.

Lösung:

$t = 0-$:



$$I = \frac{U_R}{(600+240)\Omega} = \underline{\underline{-14{,}3\,mA}}$$

$$U_{C1}(t=0-) = 0V$$

$$U_{C1}(t=0+) = 0V$$

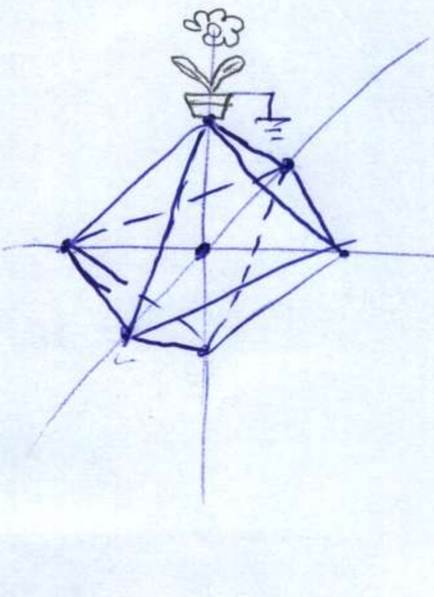
$t = 0+$:

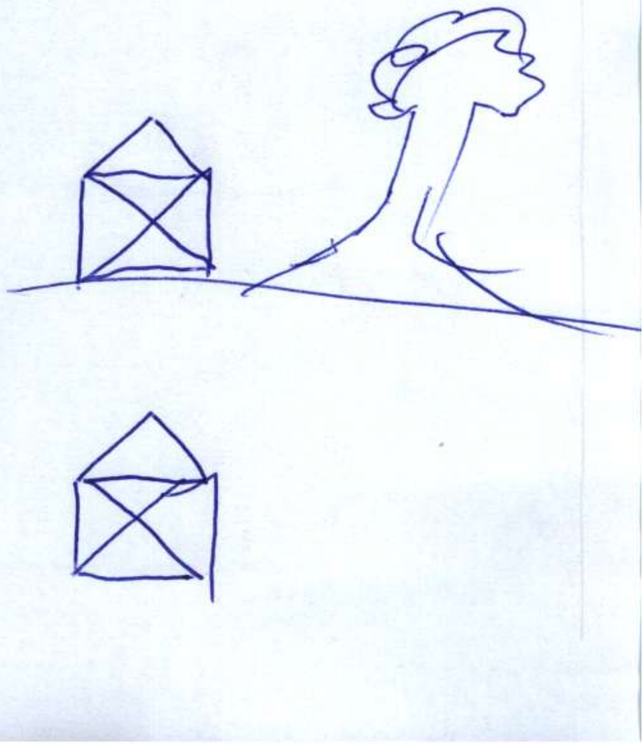
$U_{C1}(t=0+) = 0V \quad \Rightarrow I_2 = 0$

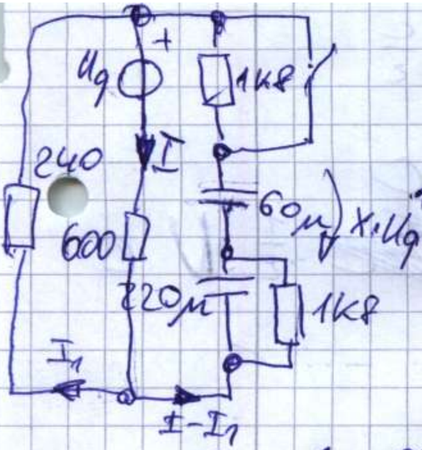
also wie bei $t = 0-$

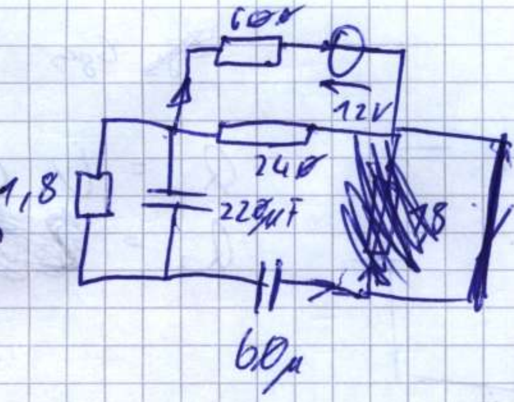
$$I = \frac{-12V}{(600+240)\Omega} = \underline{\underline{-14{,}3\,mA}}$$

ET1 3. Klausur WS 2003

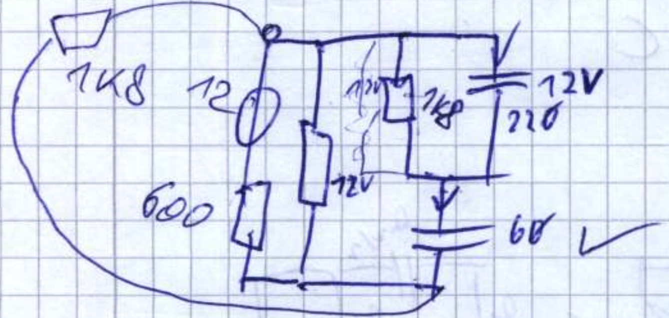






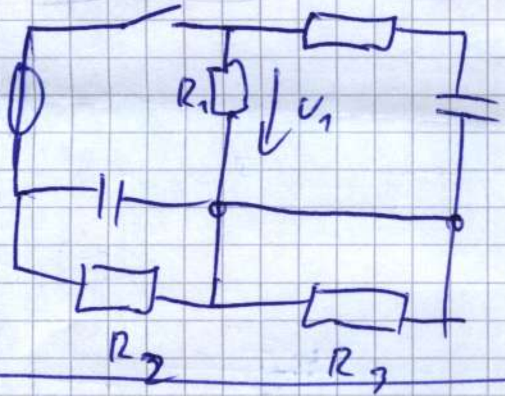


$$I = 0 - | = \frac{12V}{600+240} = \frac{12}{840} = 14{,}28\,mA$$



$2r\pi \cdot h \cdot \frac{160}{360}$

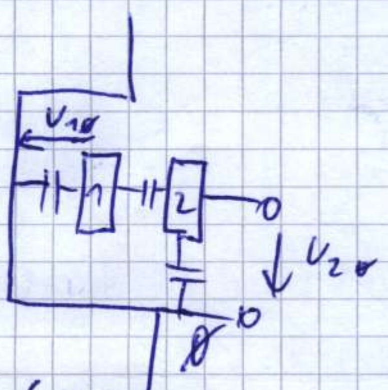
$C = \varepsilon \cdot \frac{A}{l}$



$$V_1 = U_0 \frac{R_1}{R_1+R_2}$$

$|Q_{21}| = |Q_{10}|$

$U_{21} \cdot C_{21} = U_{10} \cdot C_{10}$



$\cancel{U_{20} = U_{21} + U_{10}}$

$$U_{10} = U_{20} \frac{C_{21}}{C_{21}+C_{10}}$$

$\cancel{|Q_1| = |Q_1|}$ $C_{20} U_{20} F$

$\cancel{U_{10} = U_{20} - U_{21}}$

$\cancel{U_{10} = U_{20} - U_{20} \cdot C_{20}}$

$$U_{10} = U_{20} - \frac{U_{10} \cdot C_{10}}{C_{21}}$$

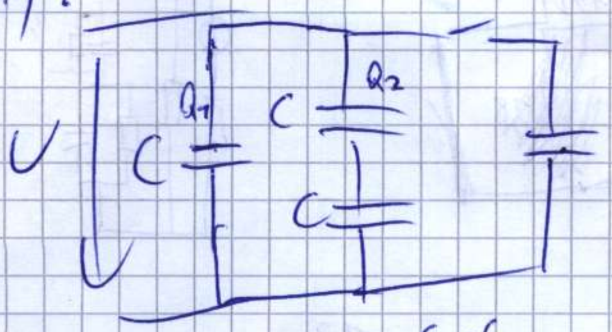
$|Q_{20}| = |Q_{21}|$

$C_{20} \cdot U_{10} = C_{21} \cdot U_{21}$

$$U_{21} = \frac{C_{21}}{C_{20} \cdot U_{20}}$$

BRUNNEN

Q (1):



$C_{ges} = \frac{C}{2}$

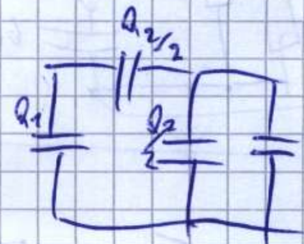
$Q_1 = U \cdot C$

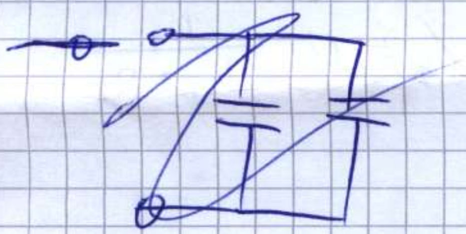
$Q_2 = \frac{1}{2} \cdot U \cdot C$

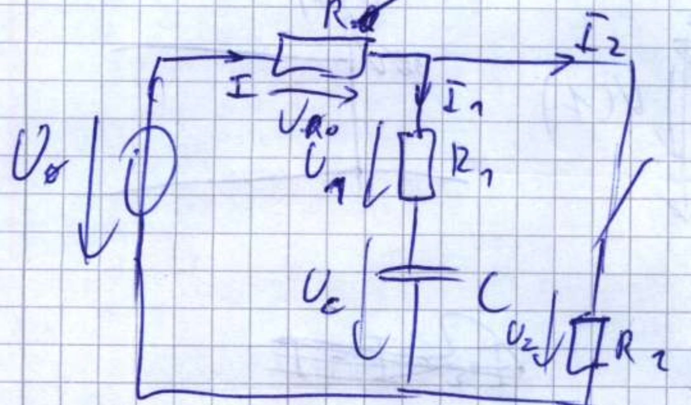
$C + C \cdot C \quad \frac{3}{2} \cdot C$

$Q = U \cdot \frac{3}{2} C$

$Q_2 = \frac{Q_1}{2}$

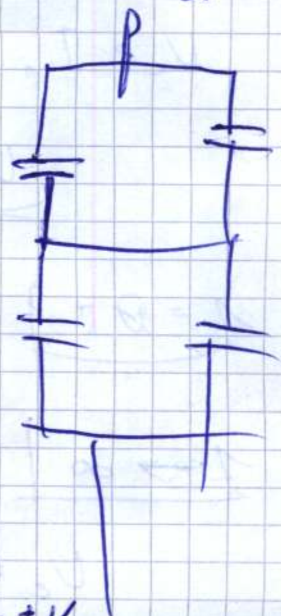






$I_{R0} = \frac{U_{R0}}{R_0}$

$U_2 = U_0 - \cancel{U_{R0}}\ U_{C0}$

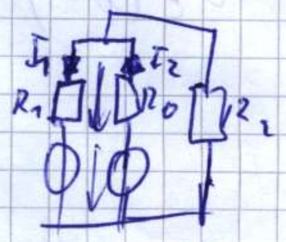


$t = 0^-$ | $I_1 = 0 \quad U_C = U_0$

$t = 0^+$ | $I = I_1 + I_2 \quad I_1 = I - \underset{\frac{U_2}{R_2}}{I_2}$

$I = \frac{U_0}{R_1 + R_2}$

$$\frac{U_0\,(\cancel{R_1+R_2})\cdot R_2}{R_1 \cdot R_2 + R_1 \cdot R_0 + R_1 \cdot R_0} = \frac{U_0\,(R_0 + R_2)}{R_1 \cdot R_2 + R_2 \cdot R_0 + R_1 \cdot R_0}$$

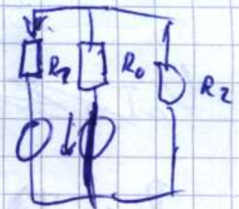


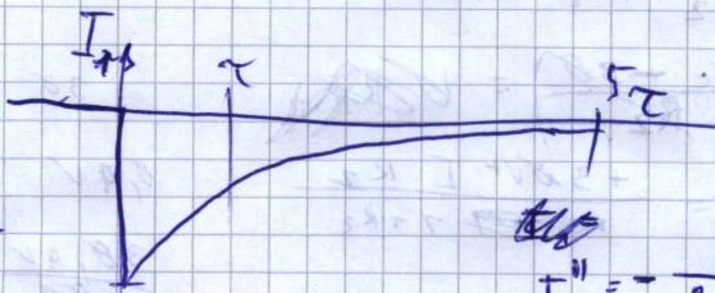
$t \to \infty$ | $I_1 = 0$

$U_2 = U_1 + U_C$

I_2

$$\boxed{-\frac{U_0 \cdot R_0}{R_1 \cdot R_2 + R_2 \cdot R_0 + R_1 \cdot R_0}} \quad \tau = \left(R_1 + \frac{R_2 \cdot R_0}{R_2 + R_0}\right) \cdot C$$





$I_1 = I \cdot \frac{R_2}{R_1 + R_2}$

$I_1' = \frac{U_0}{R_0 + R_1 \| R_2} \cdot \frac{R_2}{R_1 + R_2}$

$I_1'' = -\frac{U_0}{R_1 + R_0 \| R_2}$

$U_C + U_1 - U_2 = 0 \qquad U_C = I_2 \cdot R_2 -$

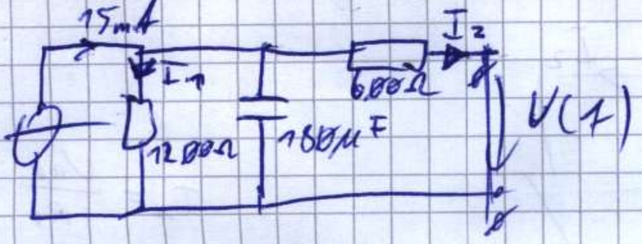
$\cancel{-U_0} + U_{R0} + U_1 + \cancel{U_C} = 0 \quad \to U_1 = -U_{R0}$

$-U_0 + U_{R0} + U_2 = 0$

$-U_0 - U_1 + U_2 = 0 \qquad -U_0 + U_{R0} + U_2 = 0$

$-U_0 - U_1 + U_2 = U_C + U_1 - U_2$

$$\cancel{2U_C + 2U_1 = 2U_2} \quad \frac{U_0}{R_0 + \frac{R_1 \cdot R_2}{R_1 + R_2}} \cdot \frac{R_2}{R_1 + R_2} - \frac{U_0}{R_1 + \frac{R_0 \cdot R_2}{R_0 + R_2}}$$



$t = 0-$

$I = I_1 + I_2$

$U_c = I_1 \cdot R_1 = I_2 \cdot R_2 \qquad I - I_2 = I_1$

$$U_c = I \cdot \frac{R_1 \cdot R_2}{R_1 + R_2}$$

$\frac{1200 \cdot 600}{1800} = 400 \cdot 15$

6V

$t = 0+ \qquad U_c(0+) = U_c(0-)$

$1200 \cdot 6$

7200

10800

$t \to \infty$

$U_c = \underbrace{U_{R_2}}_{I_2 \cdot R_2} + U(t) \qquad I = I_1 + I_2$

$U_c = I_1 \cdot R_1 = (I - I_2) \cdot R_1$

$U_c = I_2 \cdot R_2 + 30V$

$R_1\left(I - \frac{U_c - 30}{R_2}\right) = U_c$

$U_c = \frac{+30V + I \cdot R_2}{1 + R_2}$

30

0,9V

$\frac{30,9V}{601\,\Omega}$

$\cancel{I \cdot R_2 - U_c + 30 = U_c \cdot R_2 + U_c}$

$R_2 R_1 \cdot I - U_c \cdot R_1 + 30 \cdot R_1 = U_c \cdot R_2$

$$U_c = \frac{30 R_1 + R_1 R_2 I}{R_1 + R_2} = \frac{10800 + 36000}{1800}$$

$\frac{468}{18} = 2$

$468 : 18 = 25$

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