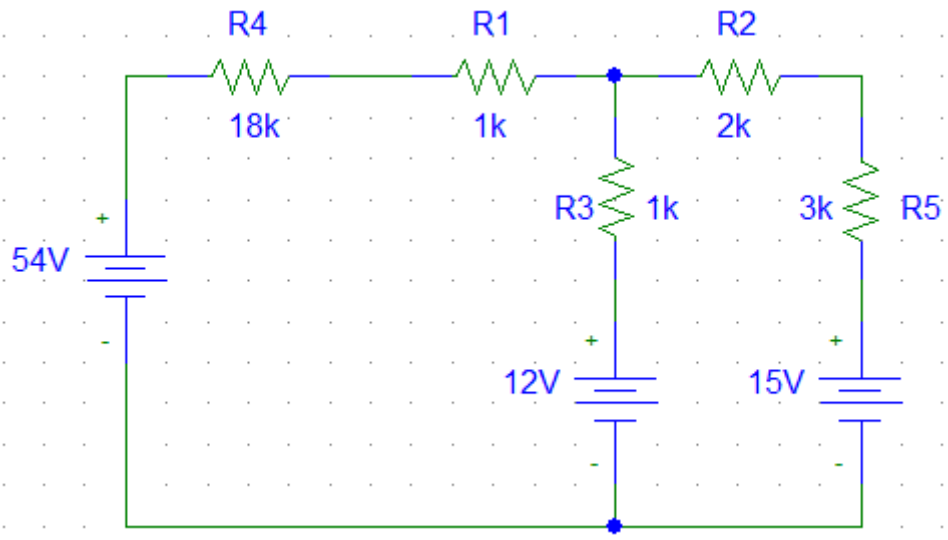


$$\begin{vmatrix} 18+1+1 & -1 \\ -1 & 1+2+3 \end{vmatrix} \begin{vmatrix} IR1 \\ IR5 \end{vmatrix} = \begin{vmatrix} 12-54 \\ 15-12 \end{vmatrix}$$

$$\begin{vmatrix} 18+1+1 & -1 \\ -1 & 1+2+3 \end{vmatrix} \begin{vmatrix} IR1 \\ IR5 \end{vmatrix} = \begin{vmatrix} -42 \\ 3 \end{vmatrix}$$

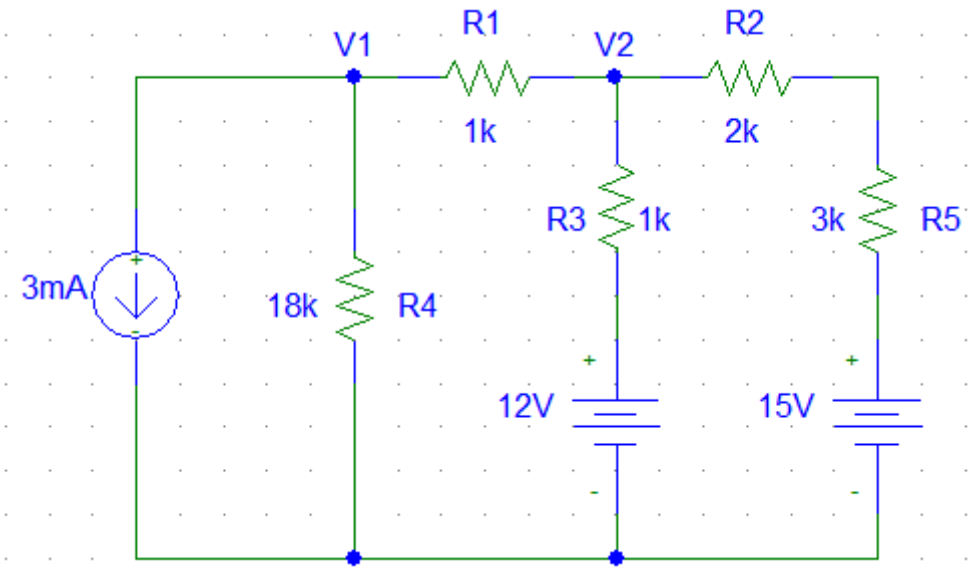
$$I_{R1} = \frac{\begin{vmatrix} -42 & -1 \\ 3 & 6 \end{vmatrix}}{\begin{vmatrix} 20 & -1 \\ -1 & 6 \end{vmatrix}} = \frac{-42x6-(3x(-1))}{20x6-((-1)(-1))} = \frac{-252+3}{120-1} = -2{,}092436975mA$$

$$I_{R5} = I_{R2} = \frac{\begin{vmatrix} 20 & -42 \\ -1 & 3 \end{vmatrix}}{\begin{vmatrix} 20 & -1 \\ -1 & 6 \end{vmatrix}} = \frac{20x3-((-1)x(-42))}{20x6-((-1)(-1))} = \frac{60-42}{120-1}$$

$$I_{R5} = I_{R2} = 0{,}151260504mA$$

$$I_{R1} = I_{R3} + I_{R2}$$

$$I_{R3} = I_{R1} - I_{R2} = -2{,}092436975 - 0{,}151260504 = -2{,}243697479mA$$



$$0{,}003 + \frac{V_1}{18000} + \frac{V_1 - V_2}{1000} = 0$$

$$\frac{V_2 - V_1}{1000} + \frac{V_2 - 12}{1000} + \frac{V_2 - 15}{2000 + 3000} = 0$$

$$V_1\left[\frac{1}{18000} + \frac{1}{1000}\right] - \frac{V_2}{1000} = -\frac{3}{1000}$$

$$-V_1\left[\frac{1}{1000}\right] + V_2\left[\frac{1}{1000} + \frac{1}{1000} + \frac{1}{5000}\right] = \frac{12}{1000} + \frac{15}{5000}$$

$$V_1\left[\frac{1}{18000} + \frac{1}{1000}\right] - \frac{V_2}{1000} = -\frac{3}{1000}$$

$$-V_1\left[\frac{1}{1000}\right] + V_2\left[\frac{1}{1000} + \frac{1}{1000} + \frac{1}{5000}\right] = \frac{12}{1000} + \frac{15}{5000}$$

$$(1 + 18).V_1 - 18.V_2 = -54$$

$$-18.V_1 + (18 + 18 + 3{,}6).V_2 = 216 + 54$$

$$19.V_1 - 18.V_2 = -54$$

$$-18.V_1 + 39{,}6.V_2 = 270$$

$$V_1 = \frac{\begin{vmatrix} -54 & -18 \\ 270 & 39{,}6 \end{vmatrix}}{\begin{vmatrix} 19 & -18 \\ -18 & 39{,}6 \end{vmatrix}} = \frac{(-54x39{,}6) - (270X(-18)}{19x39{,}6 - (-18).(-18)} = \frac{2138{,}4 + 4860}{752{,}4 - 324} = \frac{6998{,}4}{428.4} = 16{,}33613445$$

$$I_{\mathrm{R1}} = \frac{V_1 - V2}{1000} = \frac{16{,}33613445 - 14{,}24369748 - 54}{1000} = 2{,}09243745mA$$

$$I_{\mathrm{R4}} = \frac{V_1}{18} = \frac{16{,}33613445}{18} = 0{,}907563025mA$$

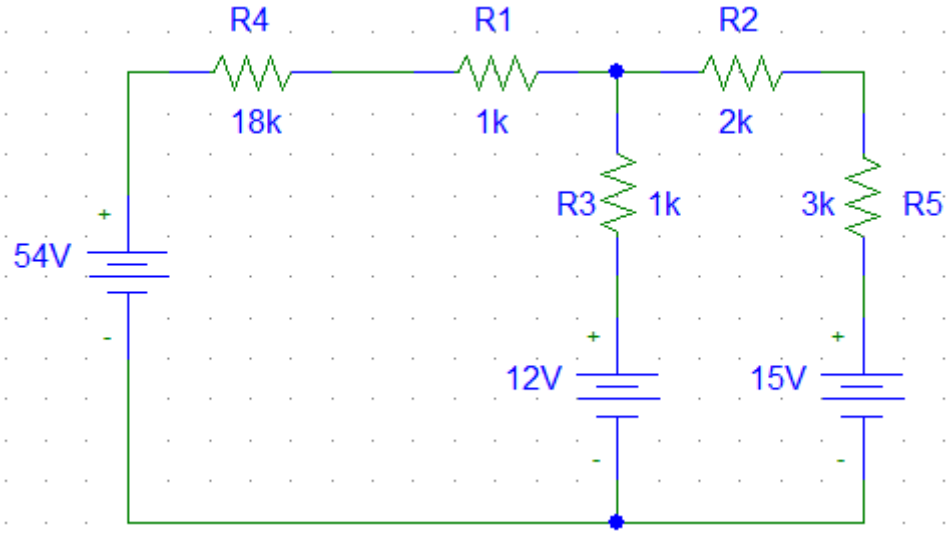
$$I_{\mathrm{R4}} = 3 - 2{,}09243745 = 0{,}90756255mA$$

$$I_{\mathrm{R1}} = I_{\mathrm{R4}} = \frac{V_1 - 54}{19} = \frac{14{,}24369748 - 54}{19} = -2{,}092436975mA$$

$$V_2 = \frac{\begin{vmatrix} 19 & -54 \\ -18 & 270 \end{vmatrix}}{\begin{vmatrix} 19 & -18 \\ -18 & 39{,}6 \end{vmatrix}} = \frac{19X270 - (-18)X(-54)}{19x39{,}6 - (-18).(-18)} = \frac{5130 + 972}{752{,}4 - 324} = \frac{6102}{428.4} = 14{,}24369748$$

$$I_{\mathrm{R2}} = I_{\mathrm{R5}} = -\left(\frac{V_1 - 15}{5}\right) = \frac{-14{,}24369748 + 15}{5} = 0{,}151260504mA$$

$$I_{\mathrm{R3}} = -\left(\frac{V_1 - 12}{1}\right) = \frac{-14{,}24369748 + 12}{1} = -2{,}24369748mA$$



$$\frac{V_1 - 54}{19} + \frac{V_1 - 12}{1} + \frac{V_1 - 15}{5} = 0$$

$$V_1\left[\frac{1}{\frac{19}{5}} + \frac{1}{\frac{1}{95}} + \frac{1}{\frac{5}{19}}\right] = \frac{54}{\frac{19}{5}} + \frac{12}{\frac{1}{95}} + \frac{15}{\frac{5}{19}}$$

$$V_1(5 + 95 + 19) = (54x5 + 12x95 + 15x19)$$

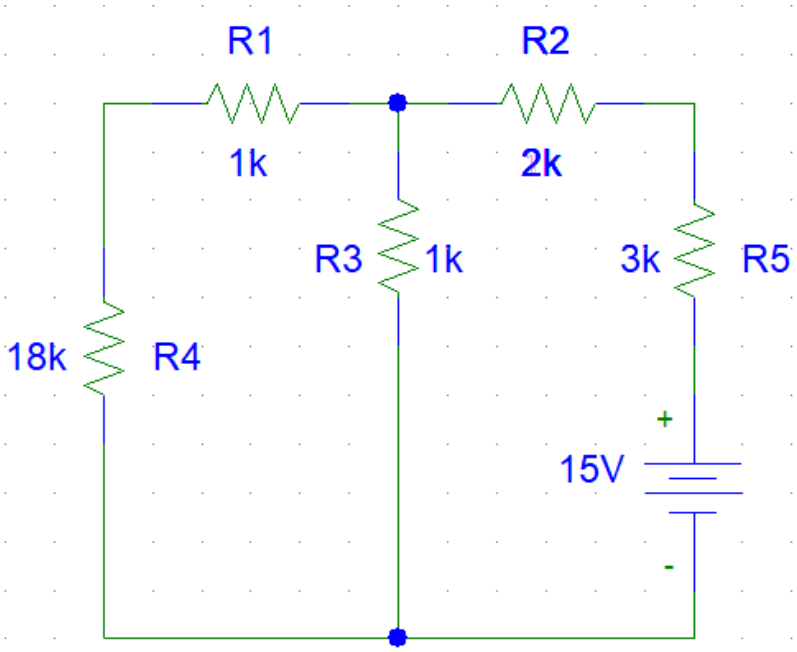
$$V_1(119) = (270 + 1140 + 285)$$

$$V_1 = \frac{1695}{119} = 14{,}24369748$$

$$I_{R3} = -\left(\frac{V_1 - 12}{1}\right) = \frac{-14{,}24369748 + 12}{1} = -2{,}24369748 mA$$

$$I_{R2} = I_{R5} = -\left(\frac{V_1 - 15}{5}\right) = \frac{-14{,}24369748 + 15}{5} = 0{,}151260504 mA$$

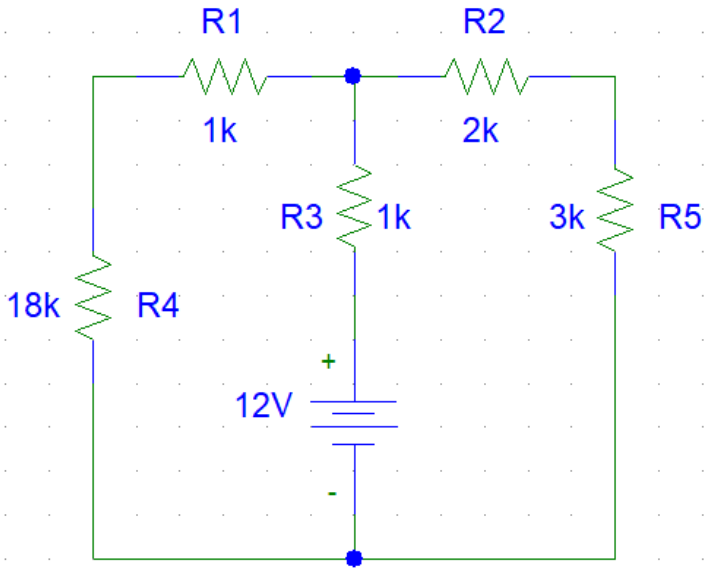
$$I_{R1} = I_{R4} = \frac{V_1 - 54}{19} = \frac{14{,}24369748 - 54}{19} = -2{,}092436975 mA$$



$$I_{R2} = I_{R5} = \frac{15}{\frac{(1+18).1}{(1+18)+1}+.(2+3)} = \frac{15}{\frac{19}{20}+5} = \frac{15X20}{19+100} = \frac{300}{119} = 2{,}521008403mA$$

$$I_{R3} = -0{,}002521008403x\frac{1+18}{1+18+1} = -2{,}394957983mA$$

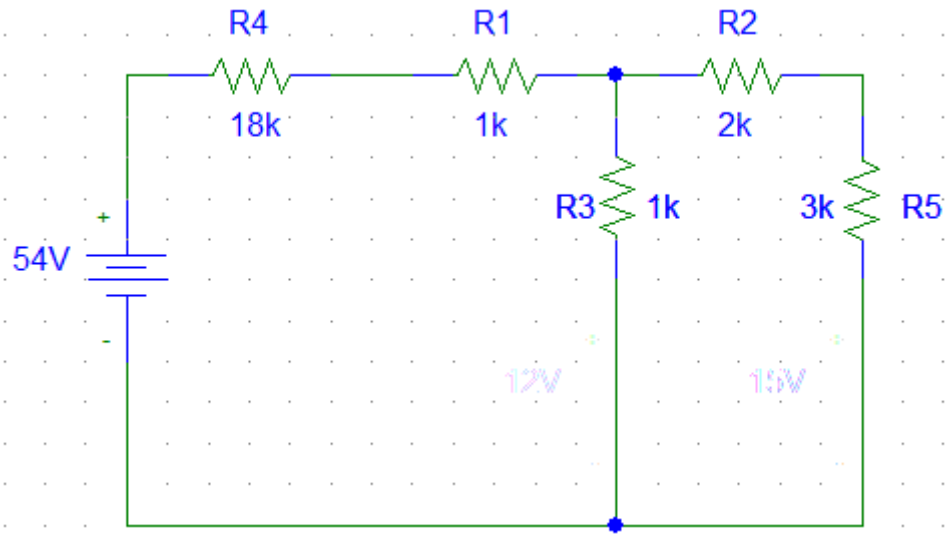
$$I_{R1} = I_{R4} = 0{,}002521008403x\frac{1}{1+18+1} = 0{,}12605042mA$$



$$I_{R3} = \frac{12}{\frac{(1+18).(2+3)}{(1+18)+(2+3)}+1} = \frac{12}{\frac{95}{24}+1} = \frac{12X24}{95+24} = \frac{288}{119} = 2{,}420168067mA$$

$$I_{R2} = I_{R5} = -0{,}002420168067x\frac{1+18}{1+18+2+3} = -1{,}915966387mA$$

$$I_{R1} = I_{R4} = 0{,}002420168067x\frac{2+3}{1+18+2+3} = 0{,}50420168mA$$



$$R_{\text{eş}} = \frac{(2+3)x1}{(2+3)+1} = 0{,}8333K\Omega$$

$$I_{\text{R4}} = I_{\text{R1}} = -\frac{54}{18+1+0{,}8333} = -2{,}722689121mA$$

$$I_{\text{R3}} = -0{,}002722689121x\frac{2+3}{1+2+3} = -2{,}268907601mA$$

$$I_{\text{R2}} = I_{\text{R5}} = -0{,}002722689121x\frac{1}{1+2+3} = -0{,}45378152mA$$

$$I_{R2} = I_{R5} = \frac{15}{\frac{(1+18).1}{(1+18)+1}+.(2+3)} = \frac{15}{\frac{19}{20}+5} = \frac{15X20}{19+100} = \frac{300}{119} = 2{,}521008403mA$$

$$I_{R2} = I_{R5} = 0{,}002420168067x\frac{1+18}{1+18+2+3} = 1{,}915966387mA$$

$$I_{R2} = I_{R5} = 0{,}002722689121x\frac{1}{1+2+3} = 0{,}45378152mA$$

$$I_{R2} = I_{R5} = 2{,}521008403 - 1{,}915966387 - 0{,}45378152$$

$$I_{R2} = I_{R5} = 0{,}151260496$$

$$I_{R1} = I_{R4} = 0{,}002521008403x\frac{1}{1+18+1} = 0{,}12605042mA$$

$$I_{R1} = I_{R4} = 0{,}002420168067x\frac{2+3}{1+18+2+3} = 0{,}50420168mA$$

$$I_{R4} = I_{R1} = \frac{54}{18+1+0{,}8333} = 2{,}722689121mA$$

$$I_{R1} = I_{R4} = 0{,}12605042 + 0{,}50420168 - 2{,}722689121$$

$$I_{R1} = I_{R4} = * 2{,}092437021mA$$

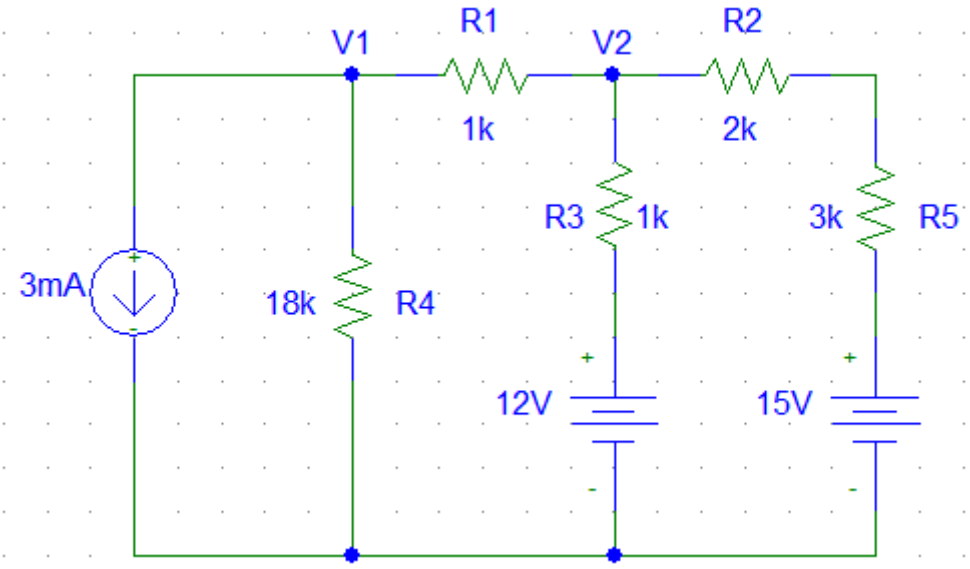
$$I_{R3} = -0{,}002521008403x\frac{1+18}{1+18+1} = -2{,}394957983mA$$

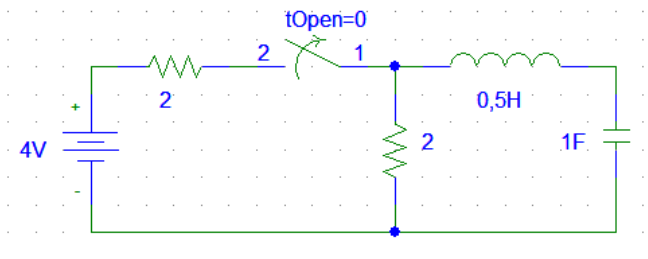
$$I_{R3} = \frac{12}{\frac{(1+18).(2+3)}{(1+18)+(2+3)}+1} = \frac{12}{\frac{95}{24}+1} = \frac{12X24}{95+24} = \frac{288}{119} = 2{,}420168067mA$$

$$I_{R3} = -0{,}002722689121x\frac{2+3}{1+2+3} = -2{,}268907601mA$$

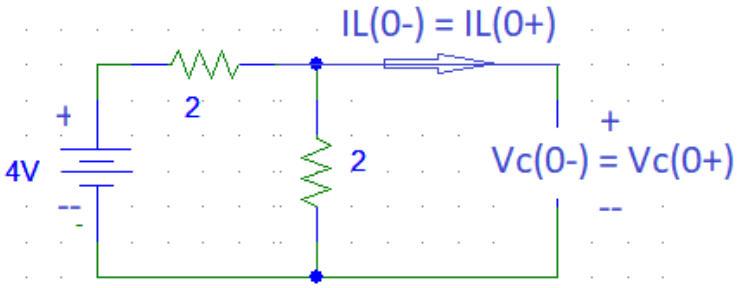
$$I_{R3} = -2{,}394957983 + 2{,}420168067 - 2{,}268907601$$

$$I_{R3} = -2{,}243697517$$


V1
R1
V2
R2
1k
2k
R3
1k
3k
R5
3mA
18k
R4
12V
15V

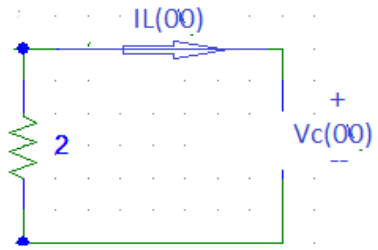

tOpen=0
2
1
2
0,5H
4V
2
1F

Anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. $t \geq 0$ için IL(t) ve VL(t)'yi bulunuz.

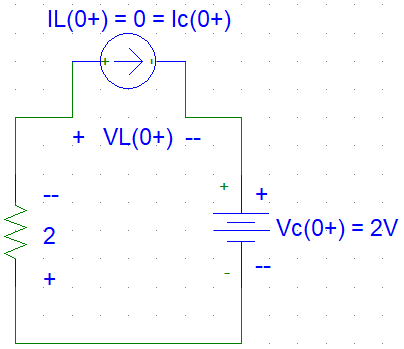


1.durum $I_L(0^-) = 0 = I_L(0^+) = I_C(0^+)$

$$V_c(0^-) = \frac{4}{(2+2)} x2 = 2V = V_c(0^+)$$



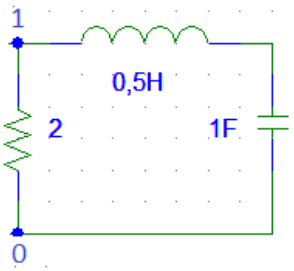
2.durum $I_L(\infty) = 0 = ILzor$



$V_R(0^+) + V_L(0^+) + V_c(0^+) = 0$ $\quad$ $2. I_L(0^+) + V_L(0^+) + V_c(0^+) = 0$

$V_L(0^+) = -2xI_L(0^+) - V_c(0^+)$ $\quad$ $V_L(0^+) = -2x0 - 2$ $\quad$ $V_L(0^+) = -2$

$I_C(0^+) = 0$



2. durum $\frac{1}{2}+\frac{1}{0,5.r+\frac{1}{r.1}}=0$

$\frac{1}{2}+\frac{r.1}{0,5.r^2+1}=0$

$\frac{\frac{1}{2}}{0,5.r^2+1}+\frac{r.1}{\frac{0,5.r^2+1}{2}}=0$

$0,5.r^2+1+2.r=0 \qquad 0,5.r^2+2.r+1=0$

$r_1, r_2=\frac{-b\mp\sqrt{b^2-4.a.c}}{2.a}$

$r_1, r_2=\frac{-2\mp\sqrt{2^2-4.0,5.1}}{2.0,5}=\frac{-2\mp\sqrt{4-2}}{1}=-2\mp\sqrt{2}$

$r_1=-3,414 \qquad r_2=-0,586$

$(r_1+3,414).(r_2+0,586)=0$

$I_L(t)=A.e^{r.t}+B.e^{r.t}+I_L(\infty)$

$I_L(t)=A.e^{-3,414.t}+B.e^{-0,586.t}+0$

$I_L(t)=A.e^{-3,414.t}+B.e^{-0,586.t}+0$

t = 0 için $I_L(0^+)=0 \qquad 0=A.1+B.1+0 \qquad A.+B=0$

$$V_L(t) = L.\frac{d_{iL}}{dt} = 0{,}5.\left((-3{,}414).A.e^{-3{,}414.t} + (-0{,}586).B.e^{-0{,}586.t}\right)$$

t = 0 için $V_L(0^+) = -2$ $\quad -2 = 0{,}5.\left((-3{,}414).A.1 + (-0{,}586).B.1\right)$

$$-3{,}414A - 0{,}586.B = -4 \qquad A.+B = 0$$

$$+3{,}414A + 3{,}414.B = 0$$

$$-3{,}414A - 0{,}586.B = -4$$

$$+3{,}414A + 3{,}414.B = 0$$

$$2{,}828.B = -4 \qquad B = -\frac{4}{2{,}828} = -1{,}414$$

$$A.+B = 0 \qquad A.-1{,}414 = 0 \qquad A.= 1{,}414$$

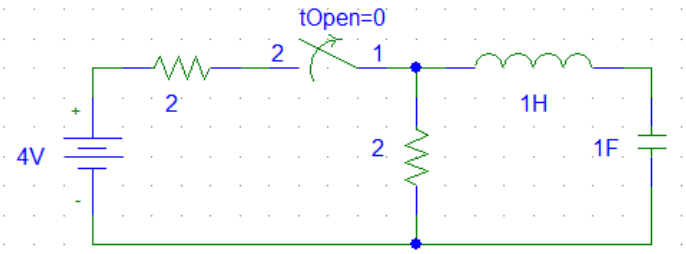
$$I_L(t) = A.e^{-3{,}414.t} + B.e^{-0{,}586.t} + I_L(\infty)$$

$$I_L(t) = 1{,}414.e^{-3{,}414.t} - 1{,}414.e^{-0{,}586.t} + 0$$

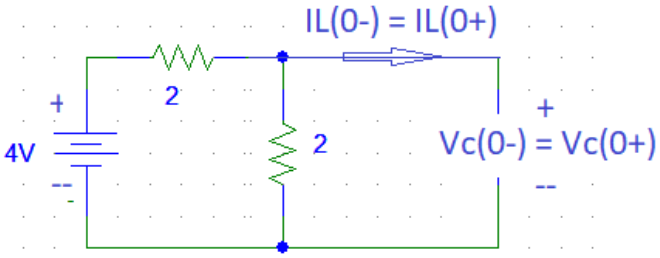
$$V_L(t) = L.\frac{d_{iL}}{dt} = 0{,}5.\left((-3{,}414).A.e^{-3{,}414.t} + (-0{,}586).B.e^{-0{,}586.t}\right)$$

$$V_L(t) = 0{,}5.\left((-3{,}414).1{,}414.e^{-3{,}414.t} + (-0{,}586).(-1{,}414).e^{-0{,}586.t}\right)$$

$$V_L(t) = -2{,}414.e^{-3{,}414.t} + 0{,}414.e^{-0{,}586.t}$$

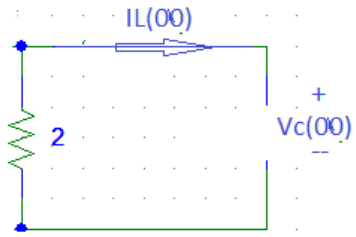


Anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. $t \geq 0$ için IL(t) ve VL(t)'yi bulunuz.

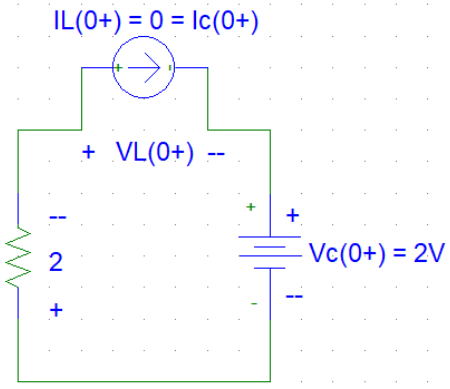


1.durum $I_L(0^-) = 0 = I_L(0^+) = I_C(0^+)$

$$V_c(0^-) = \frac{4}{(2+2)} x2 = 2V = V_c(0^+)$$



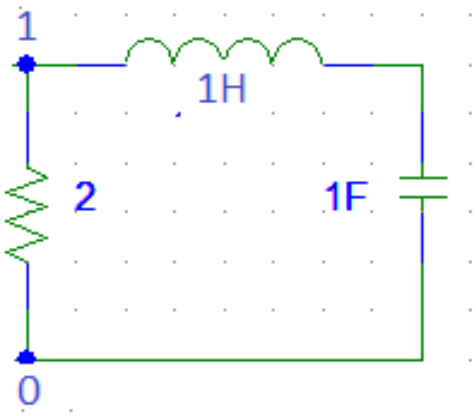
2.durum $I_L(\infty) = 0 = ILzor$



$V_R(0^+) + V_L(0^+) + V_c(0^+) = 0$ $2. I_L(0^+) + V_L(0^+) + V_c(0^+) = 0$

$V_L(0^+) = -2xI_L(0^+) - V_c(0^+)$ $V_L(0^+) = -2x0 - 2$ $V_L(0^+) = -2$

$I_C(0^+) = 0$



$$\frac{1}{2}+\frac{1}{r.1+\frac{1}{r.1}}=0$$

$$\frac{1}{2}+\frac{r}{r^2+1}=0$$

$$\frac{\frac{1}{2}}{r^2+1}+\frac{r.1}{\frac{r^2+1}{2}}=0$$

$$r^2+1+2.r=0 \qquad r^2+2.r+1=0$$

$$(r+1)^2=0 \quad (r_1+1)(r_2+1)=0$$

$$r_1,r_2=\frac{-b\mp\sqrt{b^2-4.a.c}}{2.a} \qquad r_1,r_2=\frac{-2\mp\sqrt{2^2-4..1}}{2.1}=\frac{-2\mp\sqrt{4-2}}{2}=-1$$

$$(r_1+1)(r_2+1)=0$$

$I_L(t)=A.e^{r1.t}+B.t.e^{r2.t}+I_L(\infty)$ kökler katlı

$$I_L(t)=A.e^{-1.t}+B.t.e^{-1.t}+0$$

$$I_L(t) = A.e^{-1.t} + B.t.e^{-1.t} + 0$$

t = 0 için $I_L(0^+) = 0$

$$0 = A.1 + B.0.1 + 0 \qquad A. = 0$$

$$I_L(t) = A.e^{-1.t} + B.t.e^{-1.t}$$

$$V_L(t) = L.\frac{d_{\mathrm{iL}}}{\mathrm{dt}} = 1.(-1.A.e^{-1.t} + B.1.e^{-1.t} - 1.B.t.e^{-1.t})$$

t = 0 için $V_L(0^+) = -2$

$$-2 = 1.(-1.A.1 + B.1.1 - 1.B.0.1)$$

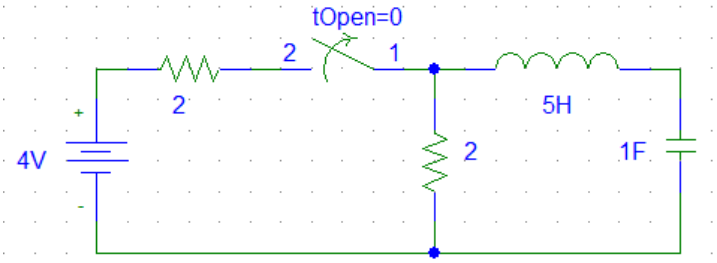
$$-2 = 1.(0 + B - 0)$$

$$-2 = 1.B \qquad B = -2 \qquad A. = 0$$

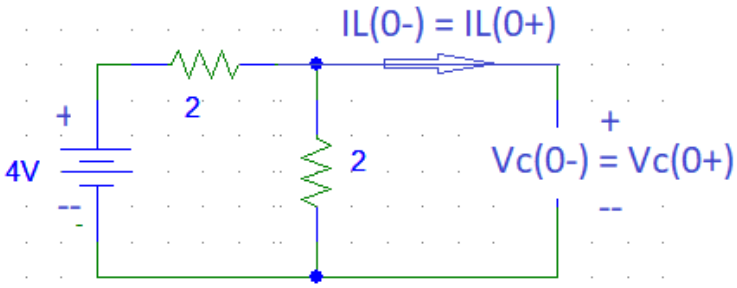
$$I_L(t) = A.e^{-1.t} + B.t.e^{-1.t}$$

$$I_L(t) = 0.e^{-1.t} - 2.t.e^{-1.t}$$

$$I_L(t) = -2.t.e^{-1.t}$$

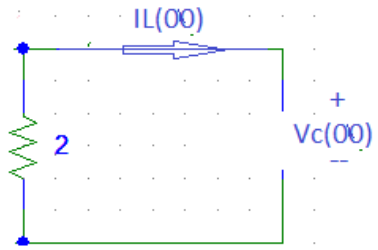


Anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. $t \geq 0$ için IL(t) ve VL(t)'yi bulunuz.

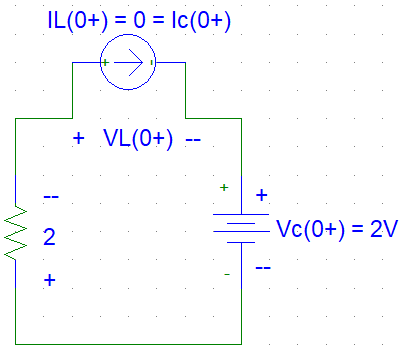


1.durum $I_L(0^-) = 0 = I_L(0^+) = I_C(0^+)$

$$V_c(0^-) = \frac{4}{(2+2)} x2 = 2V = V_c(0^+)$$



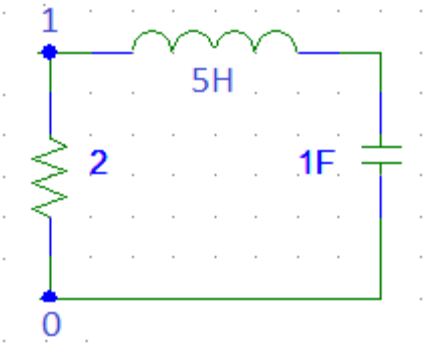
2.durum $I_L(\infty) = 0 = ILzor$



$V_R(0^+) + V_L(0^+) + V_c(0^+) = 0$ $2. I_L(0^+) + V_L(0^+) + V_c(0^+) = 0$

$V_L(0^+) = -2xI_L(0^+) - V_c(0^+)$ $V_L(0^+) = -2x0 - 2$ $V_L(0^+) = -2$

$I_C(0^+) = 0$



$$\frac{1}{2}+\frac{1}{5.r+\frac{1}{r.1}}=0$$

$$\frac{1}{2}+\frac{r.1}{5.r^2+1}=0$$

$$\frac{\frac{1}{2}}{5.r^2+1}+\frac{r.1}{\frac{5.r^2+1}{2}}=0$$

$$5.r^2+1+2.r=0$$

$$5.r^2+2.r+1=0$$

$$r_1,r_2=\frac{-b\mp\sqrt{b^2-4.a.c}}{2.a} \quad r_1,r_2=\frac{-2\mp\sqrt{2^2-4.5.1}}{2.5}=\frac{-2\mp\sqrt{-16}}{10}=-0{,}2\mp j.0{,}4$$

$$r_1=-0{,}2+j.0{,}4 \qquad r_2=-0{,}2-j.0{,}4$$

$$(r_1+0{,}2-j.0{,}4).(r_1-0{,}2+j.0{,}4)=0$$

$$I_L(t)=e^{-0{,}2.t}(A.Cos0{,}4t+B.Sin0{,}4t)+I_L(\infty)$$

$$I_L(t)=e^{-0{,}2.t}(A.Cos0{,}4t+B.Sin0{,}4t)+0$$

$$I_L(t) = e^{-0,2.t}(A.Cos0,4t + B.Sin0,4t) + 0$$

t = 0 için $I_L(0^+) = 0 \qquad 0 = 1(A.1 + 0) + 0 \qquad A = 0$

$$V_L(t) = L.\frac{d_{iL}}{dt} = 5.\frac{d_{iL}}{dt}\left(e^{-0,2.t}(A.Cos0,4t + B.Sin0,4t)\right)$$

$$V_L(t) = L.\frac{d_{iL}}{dt} = 5.\frac{d_{iL}}{dt}(e^{-0,2.t}(A.Cos0,4t + e^{-0,2.t}.(B.Sin0,4t).)$$

$$V_L(t) = 5.\left(-0,2.e^{-0,2.t}.(A.Cos0,4t) - 0,4.A.Sin0,4t.e^{-0,2.t} + -0,2.e^{-0,2.t}.(B.Sin0,4t) + (0,4.B.Cos0,4t).e^{-0,2.t}\right)$$

t = 0 için $V_L(0^+) = -2$

$$-2 = 5.(-0,2.1.A.1 - 0,4.0.0.1 - 0,2.1.B.0 + 0,4.B1.1)$$

$$-2 = 5.(-0,2.A + 0,4.B)$$

$$-2 = 5(-0,2.0 + 0,4.B) \qquad 0,4.5B = -2 \qquad B = -1$$

$$I_L(t) = e^{-0,2.t}(A.Cos0,4t + B.Sin0,4t) + I_L(\infty)$$

$$I_L(t) = e^{-0,2.t}(0.Cos0,4t - 1.Sin0,4t) + 0$$

$$I_L(t) = e^{-0,2.t}(-1.Sin0,4t)$$

$$V_L(t) = L.\frac{d_{iL}}{dt} = 5.\frac{d_{iL}}{dt}\left(e^{-0,2.t}(-1.Sin0,4t)\right)$$

$$V_L(t) = 5.(-0,2e^{-0,2.t}(-1.Sin0,4t) - 1.0,4.Cos0,4t).e^{-0,2.t}$$

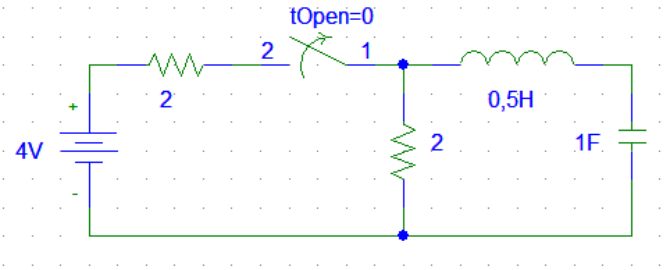
$$V_L(t) = e^{-0,2.t}.Sin0,4t - 2.Cos0,4t.e^{-0,2.t}$$

$$V_L(t) = L.\frac{d_{iL}}{dt} = 5.\frac{d_{iL}}{dt}\left(e^{-0,2.t}(A.Cos0,4t + B.Sin0,4t)\right)$$

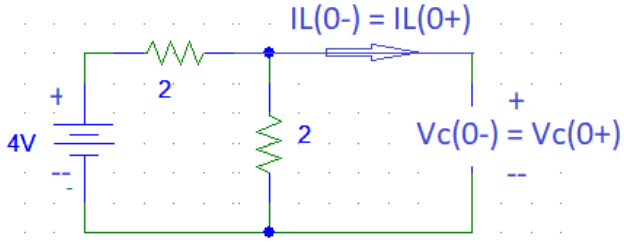
$$V_L(t) = 5.\left(-0,2.e^{-0,2.t}.(A.Cos0,4t) - 0,4.A.Sin0,4t.e^{-0,2.t} - 0,2.e^{-0,2.t}.(B.Sin0,4t) + (0,4.B.Cos0,4t).e^{-0,2.t}\right)$$

$$V_L(t) = 5.\left(-0,2.e^{-0,2.t}.(0.Cos0,4t) - 0,4.0.Sin0,4t.e^{-0,2.t} - 0,2.e^{-0,2.t}.((-1).Sin0,4t) + (0,4.(-1).Cos0,4t).e^{-0,2.t}\right)$$

$$V_L(t) = e^{-0,2.t}.Sin0,4t - 2.Cos0,4t.e^{-0,2.t}$$

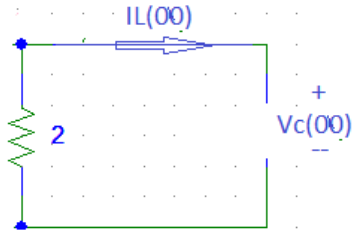


Anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. $t \geq 0$ için Vc(t) ve Ic(t)'yi bulunuz.

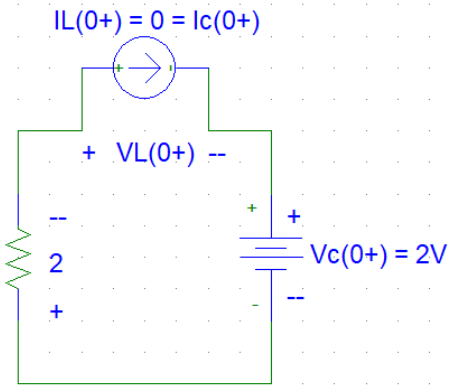


1.durum $V_c(0^-) = \frac{4}{(2+2)} x2 = 2V = V_c(0^+)$

$I_L(0^-) = 0 = I_L(0^+) = I_C(0^+)$



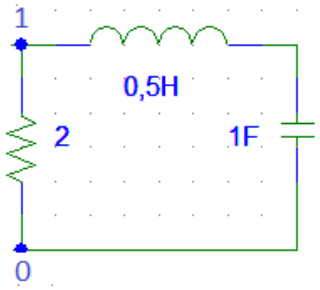
2.durum $V_c(\infty) = 0V = V_c zor$



$V_R(0^+) + V_L(0^+) + V_c(0^+) = 0$ $2. I_L(0^+) + V_L(0^+) + V_c(0^+) = 0$

$V_L(0^+) = -2x I_L(0^+) - V_c(0^+)$ $V_L(0^+) = -2x0 - 2$ $V_L(0^+) = -2$

$I_C(0^+) = 0$



2. durum $\frac{1}{2}+\frac{1}{0,5.r+\frac{1}{r.1}}=0$

$\frac{1}{2}+\frac{r.1}{0,5.r^2+1}=0$

$\frac{\frac{1}{2}}{0,5.r^2+1}+\frac{r.1}{\frac{0,5.r^2+1}{2}}=0$

$0,5.r^2+1+2.r=0 \qquad 0,5.r^2+2.r+1=0$

$r_1,r_2=\frac{-b\mp\sqrt{b^2-4.a.c}}{2.a}$

$r_1,r_2=\frac{-2\mp\sqrt{2^2-4.0,5.1}}{2.0,5}=\frac{-2\mp\sqrt{4-2}}{1}=-2\mp\sqrt{2}$

$r_1=-3,414 \qquad r_2=-0,586$

$(r_1+3,414).(r_2+0,586)=0$

$V_c(t)=A.e^{r1.t}+B.t.e^{r2.t}+V_c(\infty)$

$V_c(t)=A.e^{-3,414.t}+B.e^{-0,586.t}+0$

$$V_c(t) = A.e^{-3,414.t} + B.e^{-0,586.t} + 0$$

t = 0 için $V_c(0^+) = 2$ $\quad 2 = A.1 + B.1 + 0$ $\quad A.+B = 2$

$$I_c(t) = C.\frac{d_{\mathrm{Vc}}}{\mathrm{dt}} = 1.\left((-3,414).A.e^{-3,414.t} + (-0,586).B.e^{-0,586.t}\right)$$

t = 0 için $I_c(0^+) = 0$ $\quad 0 = 1.\left((-3,414).A.1 + (-0,586).B.1\right)$

$$-3,414A - 0,586.B = 0 \qquad A.+B = 2$$
$$+3,414A + 3,414.B = 6,828$$

$$-3,414A - 0,586.B = 0$$
$$+3,414A + 3,414.B = 6,828$$
$$2,828.B = 6,828 \qquad B = \frac{6,828}{2,828} = 2,414$$

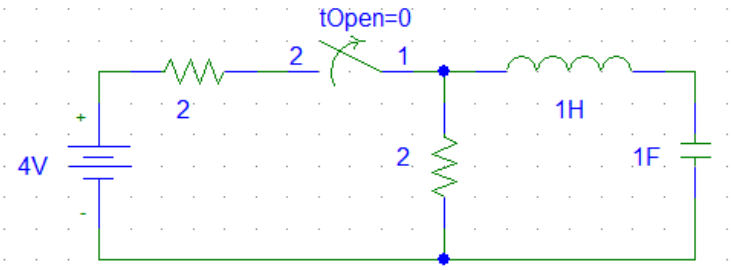
$A.+B = 2$ $\quad A + 2,414 = 2$ $\quad A. = -0,414$

$$V_c(t) = A.e^{-3,414.t} + B.e^{-0,586.t} + 0$$

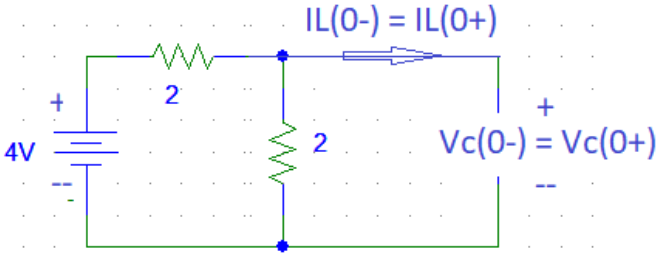
$$V_c(t) = -0,414.e^{-3,414.t} + 2,414.e^{-0,586.t}$$

$$I_c(t) = C.\frac{d_{\mathrm{Vc}}}{\mathrm{dt}} = 1.\left((-0,414).e^{-3,414.t} + 2,414.e^{-0,586.t}\right)$$

$$I_c(t) = 1.\left((-3,414).(-0,414).e^{-3,414.t} + (-0,586).(2,414).e^{-0,586.t}\right)$$

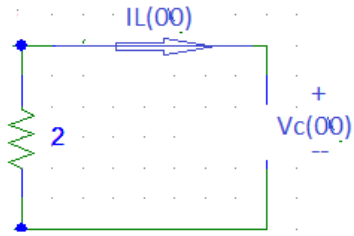


Anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. $t \geq 0$ için Vc(t) ve Ic(t)'yi bulunuz.

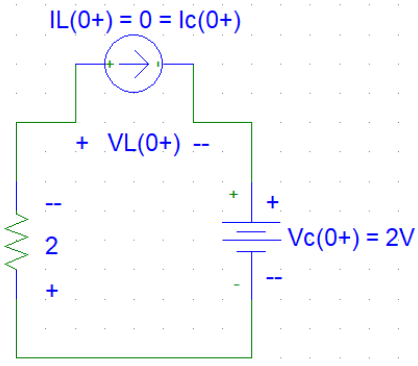


1.durum $V_c(0^-) = \frac{4}{(2+2)} x2 = 2V = V_c(0^+)$

$I_L(0^-) = 0 = I_L(0^+) = I_C(0^+)$



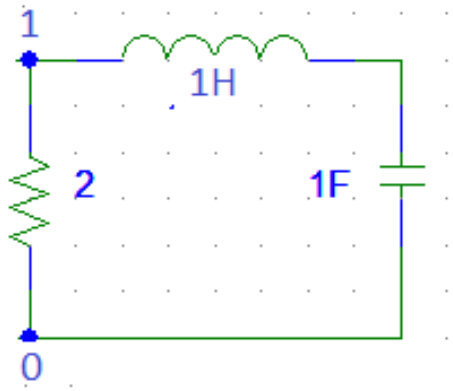
2.durum $V_c(\infty) = 0V = V_c zor$



$V_R(0^+) + V_L(0^+) + V_c(0^+) = 0$ $\quad 2.\, I_L(0^+) + V_L(0^+) + V_c(0^+) = 0$

$V_L(0^+) = -2xI_L(0^+) - V_c(0^+)$ $\quad V_L(0^+) = -2x0 - 2$ $\quad V_L(0^+) = -2$

$I_C(0^+) = 0$



$$\frac{1}{2}+\frac{1}{r.1+\frac{1}{r.1}}=0$$

$$\frac{1}{2}+\frac{r}{r^2+1}=0$$

$$\frac{\frac{1}{2}}{r^2+1}+\frac{r.1}{\frac{r^2+1}{2}}=0$$

$$r^2+1+2.r=0 \qquad r^2+2.r+1=0$$

$$(r+1)^2=0 \quad (r_1+1)(r_2+1)=0$$

$$r_1,r_2=\frac{-b\mp\sqrt{b^2-4.a.c}}{2.a} \qquad r_1,r_2=\frac{-2\mp\sqrt{2^2-4..1}}{2.1}=\frac{-2\mp\sqrt{4-2}}{2}=-1$$

$$(r_1+1)(r_2+1)=0$$

$$V_c(t)=A.e^{r1.t}+B.e^{r2.t}+V_c(\infty)$$

$$V_c(t)=A.e^{-1.t}+B.t.e^{-1.t}+0$$

$$V_c(t) = A.e^{-1.t} + B.t.e^{-1.t} + 0$$

t = 0 için $V_c(0^+) = 2$

$$2 = A.1 + B.0.1 + 0 \qquad A = 2$$

$$I_C(t) = C.\frac{d_{\mathrm{VC}}}{\mathrm{dt}} = 1.(-1.A.e^{-1.t} + B.1.e^{-1.t} - 1.B.t.e^{-1.t})$$

t = 0 için $I_c(0^+) = 0$

$$0 = 1.(-1.A.1 + B.1.1 - 1.B.0.1)$$

$$-1.A + B = 0 \qquad A = 2$$

$$-1.2 + B = 0 \qquad B = 2$$

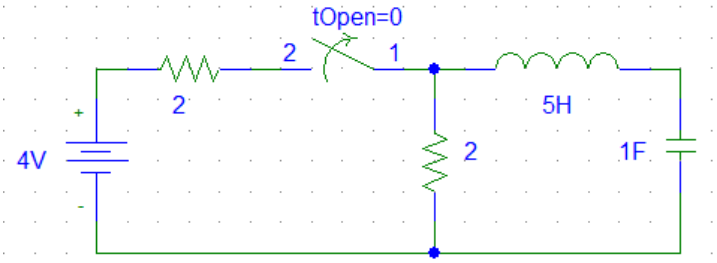
$$V_c(t) = A.e^{-1.t} + B.t.e^{-1.t} + 0$$

$$V_c(t) = 2.e^{-1.t} + 2.t.e^{-1.t}$$

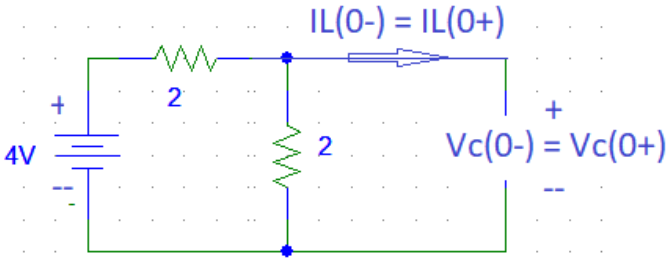
$$I_C(t) = C.\frac{d_{\mathrm{VC}}}{\mathrm{dt}} = 1.(-1.2.e^{-1.t} + 2.1.e^{-1.t} - 1.2.t.e^{-1.t})$$

$$I_C(t) = -2.e^{-1.t} + 2.e^{-1.t} - 2.t.e^{-1.t}$$

$$I_C(t) = -2.t.e^{-1.t}$$

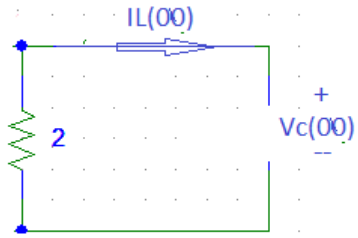


Anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. $t \geq 0$ için IL(t) ve VL(t)'yi yada Vc(t) ve Ic(t)'yi bulunuz.

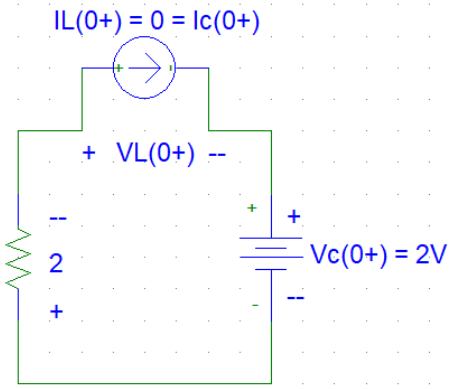


1.durum $V_c(0^-) = \frac{4}{(2+2)} x2 = 2V = V_c(0^+)$

$I_L(0^-) = 0 = I_L(0^+) = I_C(0^+)$



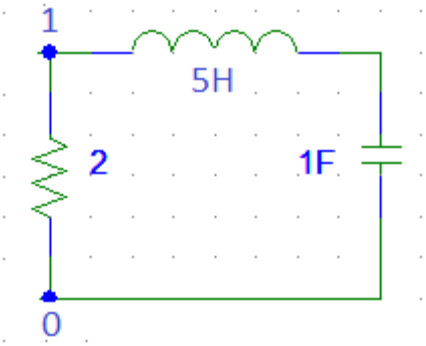
2.durum $V_c(\infty) = 0V = V_c zor$



$V_R(0^+) + V_L(0^+) + V_c(0^+) = 0$ $2. I_L(0^+) + V_L(0^+) + V_c(0^+) = 0$

$V_L(0^+) = -2xI_L(0^+) - V_c(0^+)$ $V_L(0^+) = -2x0 - 2$ $V_L(0^+) = -2$

$I_C(0^+) = 0$



$$\frac{1}{2}+\frac{1}{5.r+\frac{1}{r.1}}=0$$

$$\frac{1}{2}+\frac{r.1}{5.r^2+1}=0$$

$$\frac{\frac{1}{2}}{5.r^2+1}+\frac{r.1}{\frac{5.r^2+1}{2}}=0$$

$$5.r^2+1+2.r=0$$

$$5.r^2+2.r+1=0$$

$$r_1,r_2=\frac{-b\mp\sqrt{b^2-4.a.c}}{2.a} \qquad r_1,r_2=\frac{-2\mp\sqrt{2^2-4.5.1}}{2.5}=\frac{-2\mp\sqrt{-16}}{10}=-0{,}2\mp j.0{,}4$$

$$r_1=-0{,}2+j.0{,}4 \qquad r_2=-0{,}2-j.0{,}4$$

$$(r_1+0{,}2-j.0{,}4).(r_1-0{,}2+j.0{,}4)=0$$

$$V_c(t)=e^{-0{,}2.t}(A.Cos0{,}4t+B.Sin0{,}4t)+V_c(\infty)$$

$$V_c(t)=e^{-0{,}2.t}(A.Cos0{,}4t+B.Sin0{,}4t)+0$$

$$V_c(t) = e^{-0,2.t}(A.Cos0,4t + B.Sin0,4t) + 0$$

t = 0 için $V_c(0^+) = 2 \qquad 2 = 1(A.1 + 0) + 0 \qquad A = 2$

$$I_c(t) = C.\frac{d_{Vc}}{dt} = 1.\frac{d_{Vc}}{dt}\left(e^{-0,2.t}(A.Cos0,4t) + e^{-0,2.t}(B.Sin0,4t)\right)$$

$$I_c(t) = 1.\left(-0,2.e^{-0,2.t}.(A.Cos0,4t) - 0,4.A.Sin0,4t.e^{-0,2.t} + -0,2.e^{-0,2.t}.(B.Sin0,4t) + (0,4.B.Cos0,4t).e^{-0,2.t}\right)$$

t = 0 için $I_c(0^+) = 0$

$$0 = 1.(-0,2.1.2.1 - 0,4.2.0.1 - 0,2.1.B.0 + 0,4.B1.1)$$

$$0 = 1.(-0,4. + 0,4.B) \qquad 0,4.B = 0,4 \qquad B = 1$$

$$V_c(t) = e^{-0,2.t}(A.Cos0,4t + B.Sin0,4t) + V_c(\infty)$$

$$V_c(t) = e^{-0,2.t}(2.Cos0,4t + 1.Sin0,4t) + 0$$

$$V_c(t) = e^{-0,2.t}.2.Cos0,4t + e^{-0,2.t}.Sin0,4t$$

$$I_c(t) = 1.\left(-0,2.e^{-0,2.t}.(2.Cos0,4t) - 0,4.2.Sin0,4t.e^{-0,2.t} - 0,02.e^{-0,2.t}.(1.Sin0,4t) + (0,4.1.Cos0,4t).e^{-0,2.t}\right)$$

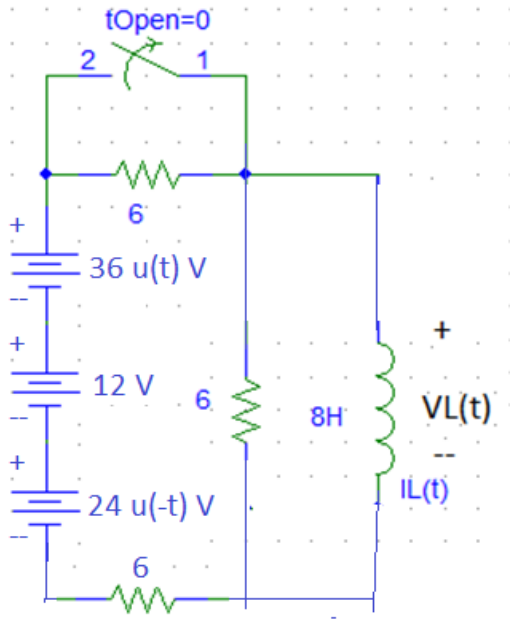
$$I_c(t) = C.\frac{d_{Vc}}{dt} = 1.\frac{d_{Vc}}{dt}(e^{-0,2.t}A.Cos0,4t + e^{-0,2.t}B.Sin0,4t)$$

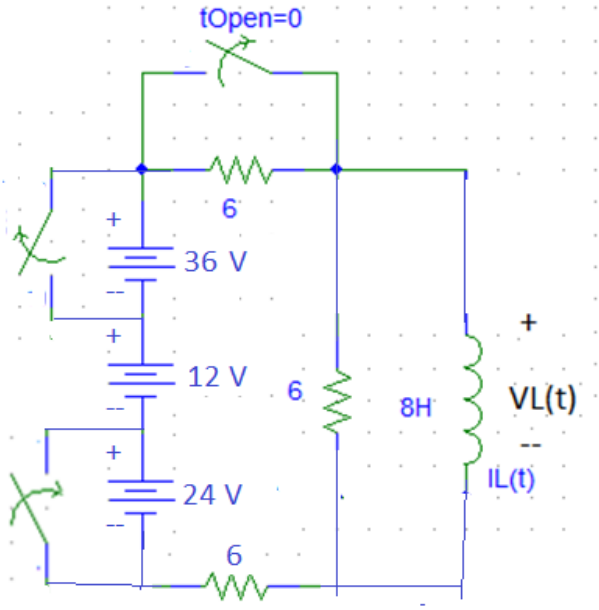
$$I_c(t) = 1.\left(-0,2.e^{-0,2.t}.(A.Cos0,4t) - 0,4.A.Sin0,4t.e^{-0,2.t} - 0,2.e^{-0,2.t}.(B.Sin0,4t) + (0,4.B.Cos0,4t).e^{-0,2.t}\right)$$

$$I_c(t) = 1.\left(-0,2.e^{-0,2.t}.(2.Cos0,4t) - 0,4.2.Sin0,4t.e^{-0,2.t} - 0,2.e^{-0,2.t}.(1.Sin0,4t) + (0,4.1.Cos0,4t).e^{-0,2.t}\right)$$

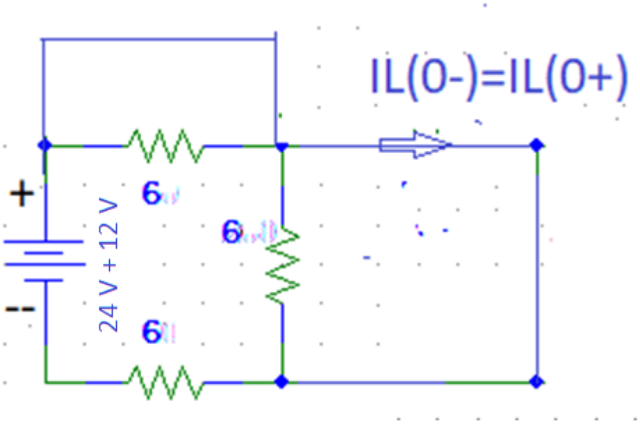
$$I_c(t) = 1.(-0,4.2.Sin0,4t.e^{-0,2.t} - 0,2.e^{-0,2.t}.(1.Sin0,4t)$$

$$I_c(t) = -1.Sin0,4t.e^{-0,2.t}$$

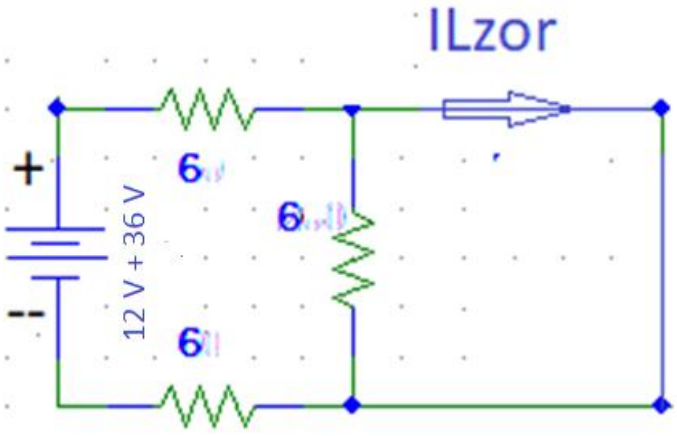




6 Ohm'un üstündeki anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. $t \geq 0$ için IL(t) ve VL(t)'yi bulunuz.

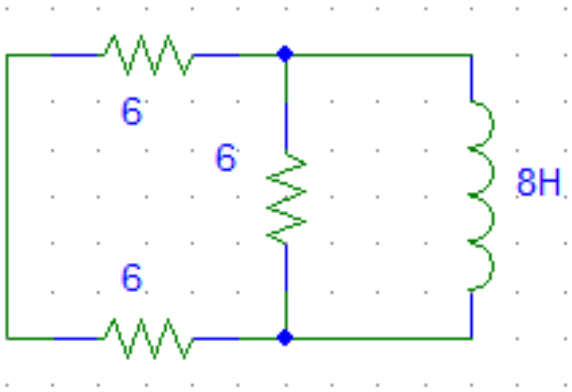


1.durum $I_L(0^-) = \frac{36}{6} = 6A = I_L(0+)$ 6 Ohm kısa devre



2.durum $I_L(\infty) = \frac{48}{6+6} = 3A = ILzor$ 6 Ohm kısa devre

Zaman sabiti $\tau = L/R_{eş}$ $R_{eş}$ => (2. durumda selften görülen eşdeğer direnç, gerilim kaynağı kısa devre, akım kaynağı açık devre yapılarak bulunur.)



$$R_{eş} = \frac{6x(6+6)}{6+(6+6)} = 4\Omega$$

$$\tau = \frac{L}{Reş} = \frac{8}{4} = 2$$

$$r = -\frac{1}{\tau} \qquad \tau = -\frac{1}{r}$$

$$\frac{1}{6+6} + \frac{1}{6} + \frac{1}{8.r} = 0$$

$$\frac{1}{\underset{6.r}{12}} + \frac{1}{\underset{12.r}{6}} + \frac{1}{\underset{9}{8.r}} = 0$$

$$6.r + 12.r + 9 = 0$$

$$18.r + 9 = 0$$

$$r = -\frac{1}{2}$$

$$I_L(t) = \text{A}.\,e^{-\frac{t}{\tau}} + I_L(\infty)$$

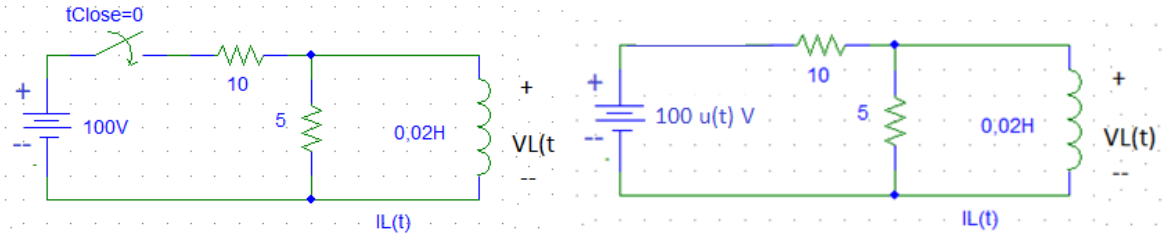
$$I_L(t) = \text{A}.\,e^{-\frac{t}{2}} + 3$$

t = 0 için $I_L(0^+) = 6A$

$$6 = \text{A}.1 + 3 \qquad A = 3$$

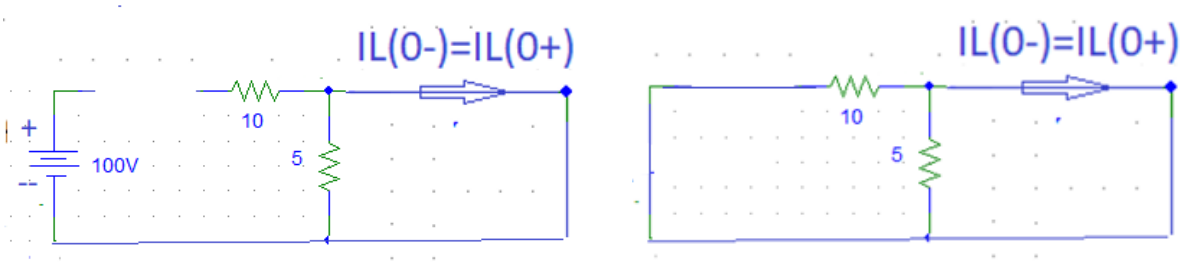
$$I_L(t) = \left(3.e^{-\frac{t}{2}} + 6\right).u(t)$$

$$V_L(t) = L.\frac{d_{iL}}{dt} = 8.\left((-0.5).3.e^{-\frac{t}{2}}\right) = -12.e^{-\frac{t}{2}}V$$



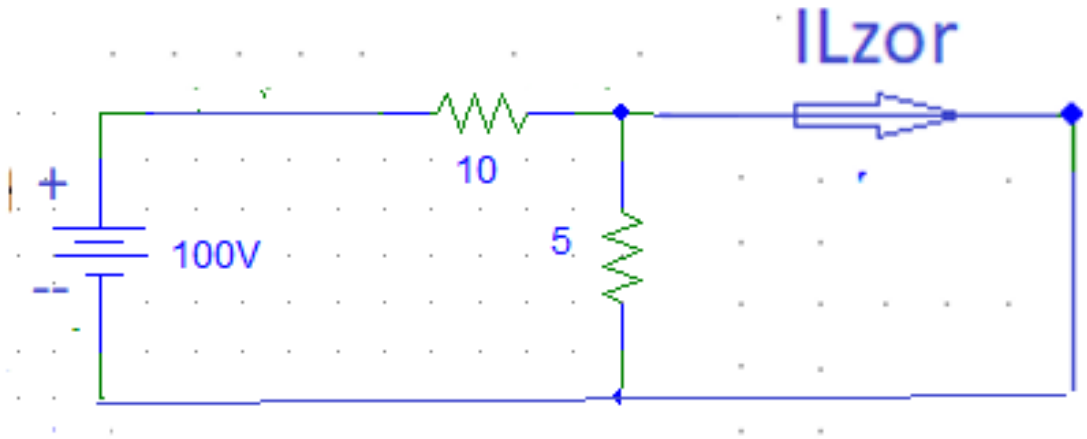
(a) (b)

Anahtar uzun süre açık kaldıktan sonra t = 0 anında kapatılıyor. $t \geq 0$ için IL(t) ve VL(t)'yi bulunuz.



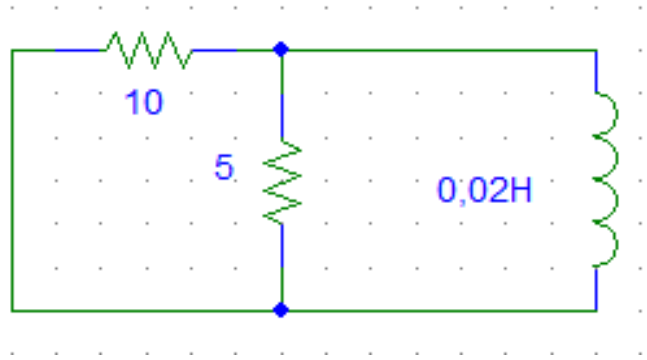
(a) (b)

1.durum kaynak yok $I_L(0^-) = 0A = I_L(0+)$



2.durum $I_L(\infty) = \frac{100}{10} = 10A = ILzor$ 5 Ohm kısa devre

Zaman sabiti $\tau = L/R_{eş}$ $R_{eş}$ => (2. durumda selften görülen eşdeğer direnç, gerilim kaynağı kısa devre, akım kaynağı açık devre yapılarak bulunur.)



$R_{eş} = \frac{10x5}{10+5} = \frac{50}{15}\,\Omega$ $\tau = \frac{L}{Reş} = \frac{0,02}{\frac{50}{15}} = \frac{0.3}{50} = \frac{1}{166,66}$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$\frac{1}{10} + \frac{1}{5} + \frac{1}{0,02.r} = 0$ $\frac{1}{\frac{10}{5.r}} + \frac{1}{\frac{5}{10.r}} + \frac{1}{\frac{0.02.r}{2500}} = 0$

$5.r + 10.r + 2500 = 0$ $15.r + 2500 = 0$ $r = -\frac{2500}{15} = -166,66$

$I_L(t) = \text{A}.\,e^{-\frac{t}{\tau}} + I_L(\infty)$

$I_L(t) = \text{A}.\,e^{-\frac{t}{\frac{1}{166,667}}} + 10$

t = 0 için $I_L(0^+) = 0A$

$0 = \text{A}.1 + 10$ $\text{A} = -10$

$I_L(t) = (-10.e^{-166,67.t} + 10).u(t)A$

$V_L(t) = L.\frac{d_{iL}}{dt} = 0,02.(-166,67).(-10).e^{-166,67.t}V$

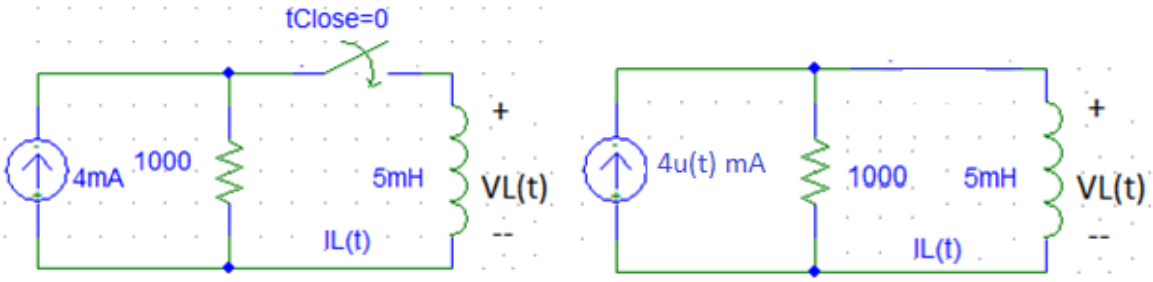
$V_L(t) = 33,333.e^{-166,67.t}$

$I_5(t) = \frac{V_L(t)}{5} = \frac{33,333.e^{-166,67}}{5} = 6,67.e^{-166,67.t}$

$.-100 + 10.I_{10}(t) + V_L(t) = 0$ $I_{10}(t) = \frac{100-V_L(t)}{10}$

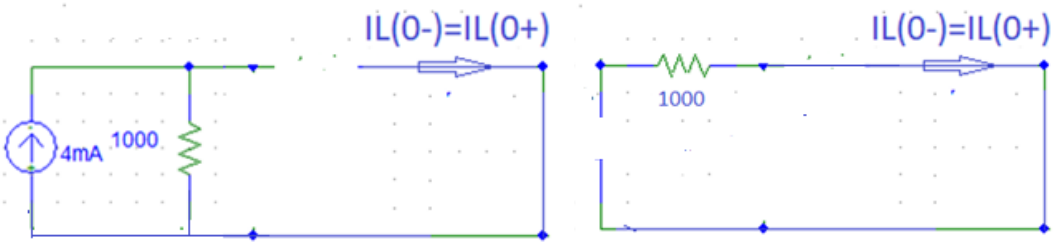
$I_{10}(t) = \frac{100-33,333.e^{-166,67.t}}{10}$

$I_{10}(t) = 10 - 3.3333.e^{-166,67.t}$



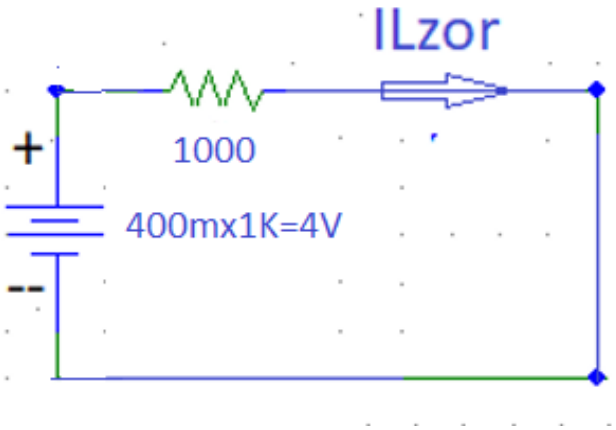
(a) (b)

Anahtar uzun süre açık kaldıktan sonra t = 0 anında kapatılıyor. $t \geq 0$ için IL(t) ve VL(t)'yi bulunuz.



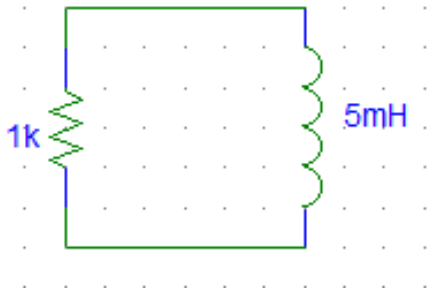
(a) (b)

1.durum $I_L(0^-) = 0A = I_L(0+)$



2.durum $I_L(\infty) = \frac{4}{1000} = 4mA = ILzor$

Zaman sabiti $\tau = L/R_{eş}$ $R_{eş}$ => (2. durumda selften görülen eşdeğer direnç, gerilim kaynağı kısa devre, akım kaynağı açık devre yapılarak bulunur.)



$R_{eş} = 1000\Omega$

$$\tau = \frac{L}{Reş} = \frac{5mH}{1000} = \frac{1}{2x10^5}$$

$$r = -\frac{1}{\tau} \qquad \tau = -\frac{1}{r}$$

$$\frac{1}{1000} + \frac{1}{0{,}005.r} = 0$$

$$\frac{\frac{1}{1000}}{0{,}005.r} + \frac{1}{\frac{0{,}005.r}{1000}} = 0$$

$$5.r + 10.r + 2500 = 0$$

$$0{,}005.r + 1000 = 0$$

$$r = -\frac{1000}{0{,}005} = -200000 = -2x10^5$$

$$I_L(t) = A.e^{-\frac{t}{\tau}} + I_L(\infty)$$

$$I_L(t) = A.e^{-\frac{t}{\frac{1}{2x10^5}}} + 0{,}004$$

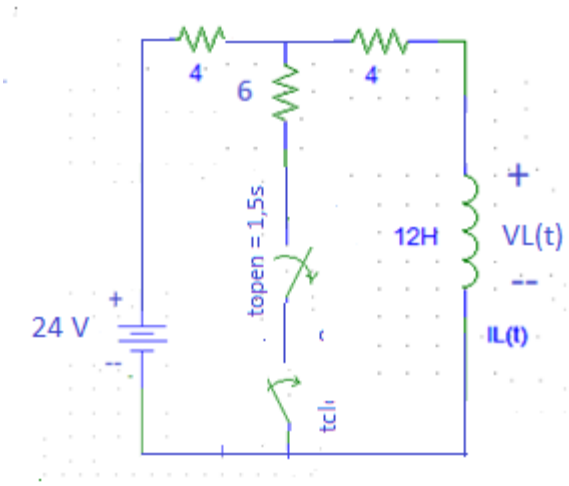
t = 0 için $I_L(0^+) = 0A$

$$0 = A + 0{,}004 \quad A = 0{,}004$$

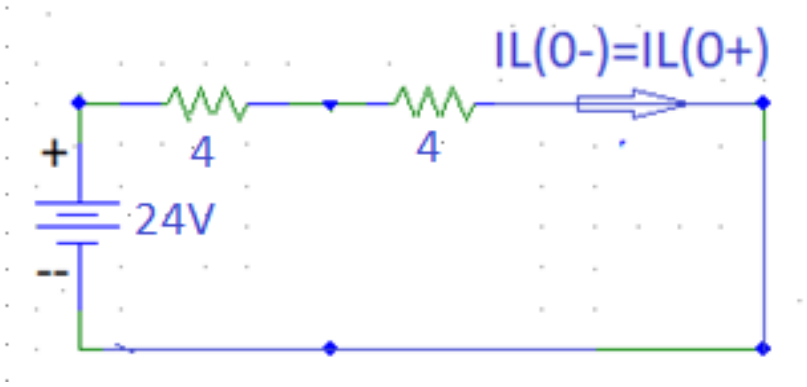
$$I_L(t) = A.e^{-\frac{t}{\tau}} + I_L(\infty)$$

$$I_L(t) = \left(0{,}004.e^{-\frac{t}{\frac{1}{2x10^5}}} + 0{,}004\right).u(t)A$$

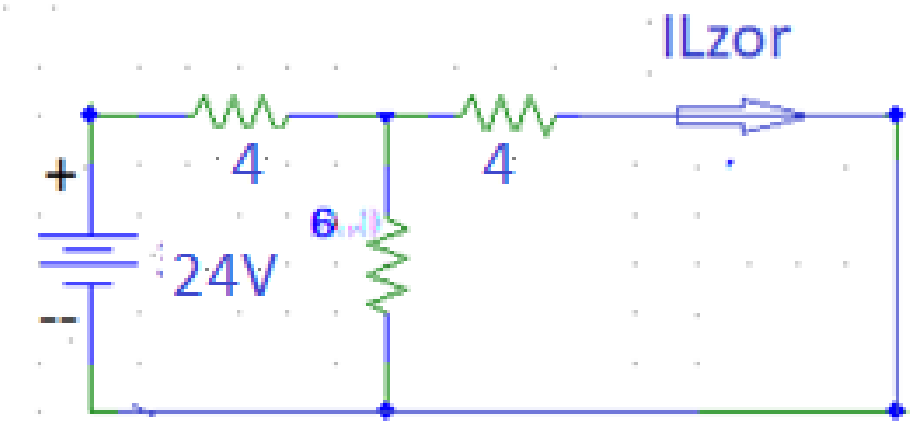
$$V_L(t) = L.\frac{d_{iL}}{dt} = 0{,}005.\left((0.004).(-2x10^5).e^{-2x10^5 t}\right)V$$



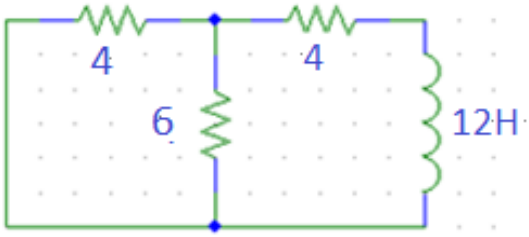
Anahtar uzun süre açık kaldıktan sonra t = 0 anında kapatılıyor. Daha sonra t=1,5s sonunda açılıyor. $t \geq 0$ için IL(t) ve VL(t)'yi bulunuz.



1.durum $I_L(0^-) = \frac{24}{4+4} = 3A = I_L(0+)$



2.durum $I_L(\infty) = \frac{24}{\frac{4x6}{4+6}+4} x \frac{6}{4+6} = 2{,}25A = ILzor$



2.durum Zaman sabiti $\tau = L/R_{eş}$ $R_{eş}$ => (2. durumda selften görülen eşdeğer direnç, gerilim kaynağı kısa devre, akım kaynağı açık devre yapılarak bulunur.)

$$R_{eş} = \frac{4x6}{4+6} + 4 = 6{,}4\Omega$$

$$\tau = \frac{L}{Reş} = \frac{12}{6{,}4}$$

$$r = -\frac{1}{\tau} \qquad \tau = -\frac{1}{r}$$

$$\frac{1}{4} + \frac{1}{6} + \frac{1}{4+12.r} = 0$$

$$\frac{1}{\frac{4}{3(4+12.r)}} + \frac{1}{\frac{6}{2(4+12.r)}} + \frac{1}{\frac{4+12.r}{12}} = 0$$

$$12 + 36.r + 8 + 24.r + 12 = 0$$

$$60.r + 32 = 0$$

$$r = -\frac{32}{60} = -\frac{6{,}4}{12}$$

$$I_L(t) = \text{A.}\, e^{-\frac{t}{\tau}} + I_L(\infty)$$

$$I_L(t) = \text{A.}\, e^{-\frac{t}{\frac{12}{6{,}4}}} + 2{,}25$$

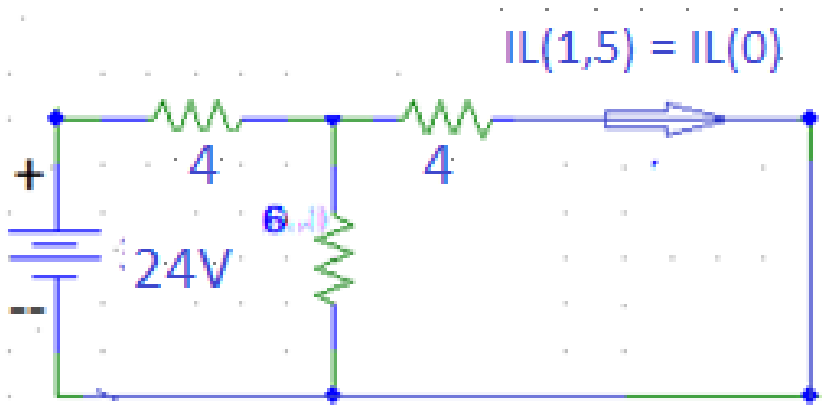
t = 0 için $I_L(0^+) = 3A$

$$3 = \text{A.}\, 1 + 2{,}25 \qquad A = 0{,}75$$

$$I_L(t) = \text{A.}\, e^{-\frac{t}{\tau}} + I_L(\infty)$$

$$I_L(t) = \left(0{,}75.\, e^{-\frac{t}{\frac{12}{6{,}4}}} + 2{,}25\right).u(t)A$$

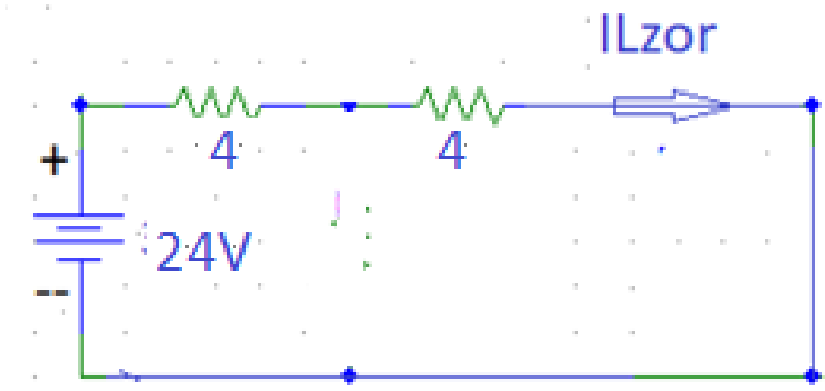
$$I_L(t) = \left(0{,}75.\, e^{-\frac{6{,}4.t}{12}} + 2{,}25\right).u(t)A$$



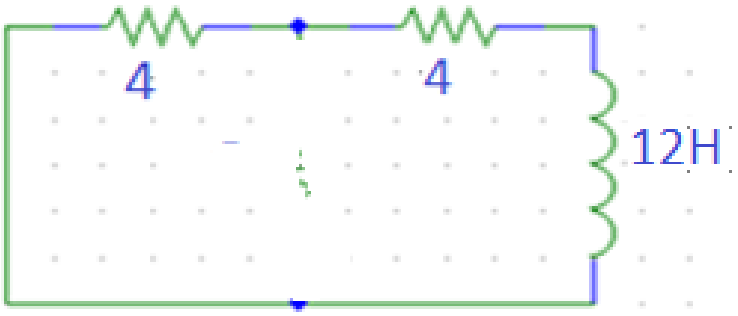
$$I_L(t) = \left(0{,}75.\, e^{-\frac{6{,}4.t}{12}} + 2{,}25\right).u(t)A \qquad (0 \leq t \leq 1{,}5s)$$

$$I_L(t) = \left(0{,}75.\, e^{-\frac{6{,}4.1{,}5}{12}} + 2{,}25\right).u(t)A$$

$$I_L(1{,}5) = 2{,}59A = I_L(0+)$$



$$I_{\mathrm{L}}(\infty) = \frac{24}{4+4} = 3A = ILzor$$



1.durum Zaman sabiti $\tau = L/R_{eş}$ $R_{eş}$ => (2. durumda selften görülen eşdeğer direnç, gerilim kaynağı kısa devre, akım kaynağı açık devre yapılarak bulunur.)

$R_{eş} = 4 + 4 = 8\Omega$

$\tau = \frac{L}{Reş} = \frac{12}{8}$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$\frac{1}{4+4} + \frac{1}{12.r} = 0$

$\frac{\frac{1}{8}}{12.r} + \frac{1}{\frac{12r}{8}} = 0$

$12.r + 8 = 0$

$r = -\frac{8}{12}$

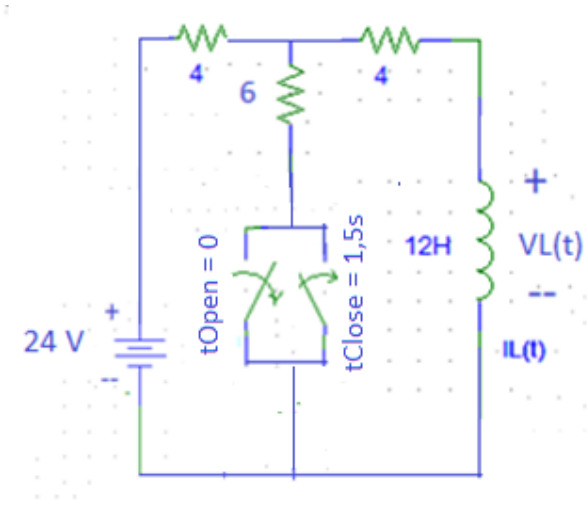
$I_L(t) = A.e^{-\frac{t}{\tau}} + I_L(\infty)$

$I_L(t) = A.e^{-\frac{t}{\frac{12}{8}}} + 3$

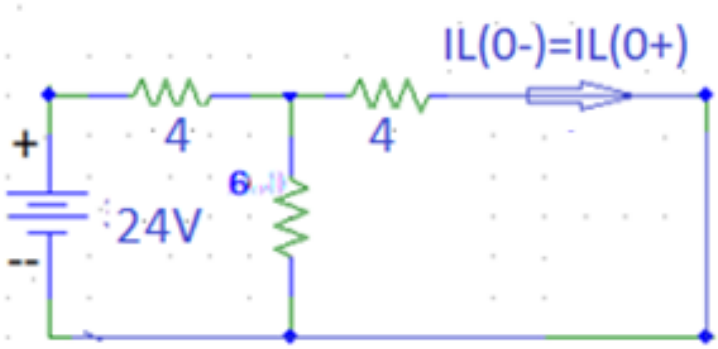
t = 0 için $I_L(1,5) = 2,59A$ $t \geq 1,5$

$2,4 = A.1 + 3$ $A = -0,6$

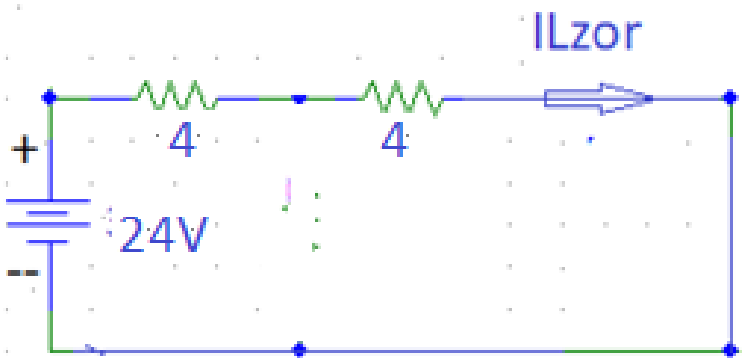
$I_L(t) = \left(-0,41 . e^{-\frac{8}{12}.(t-1,5)} + 3\right).u(t)A$ $1,5s \geq t$



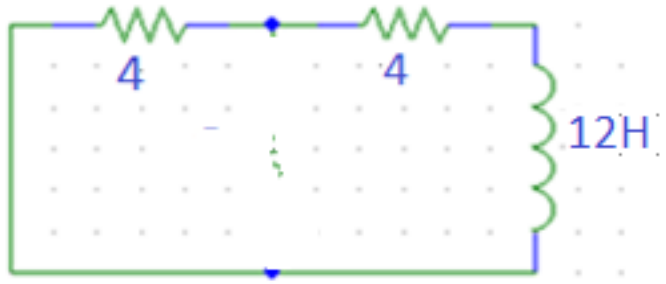
Anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. Daha sonra t=1,5s sonunda kapatılıyor. $t \geq 0$ için IL(t) ve VL(t)'yi bulunuz.



1.durum $I_L(0^-) = \frac{24}{\frac{4x6}{4+6}+4} x \frac{6}{4+6} = 2{,}25A = I_L(0+)$



2.durum $I_L(\infty) = \frac{24}{4+4} = 3A = I_L(0+)$



2.durum Zaman sabiti $\tau = L/R_{eş}$ $R_{eş}$ => (2. durumda selften görülen eşdeğer direnç, gerilim kaynağı kısa devre, akım kaynağı açık devre yapılarak bulunur.)

$R_{eş} = 4 + 4 = 8\Omega$

$\tau = \frac{L}{Reş} = \frac{12}{8}$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$\frac{1}{4+4} + \frac{1}{12.r} = 0$

$\frac{\frac{1}{8}}{12.r} + \frac{1}{\frac{12.r}{8}} = 0$

$12.r + 8 = 0$

$r = -\frac{8}{12}$

$I_L(t) = A.e^{-\frac{t}{\tau}} + I_L(\infty)$

$I_L(t) = A.e^{-\frac{t}{\frac{12}{8}}} + 3$

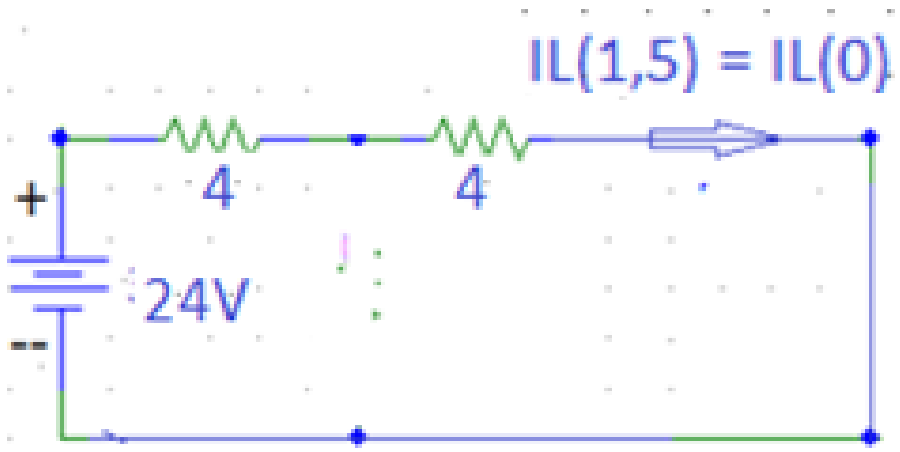
t = 0 için $I_L(0^+) = 2{,}25A$

$2{,}25 = A.1 + 3$ $A = -0{,}75$

$I_L(t) = A.e^{-\frac{t}{\tau}} + I_L(\infty)$

$I_L(t) = \left(-0{,}75.e^{-\frac{t}{\frac{12}{8}}} + 2{,}25\right).u(t)A$

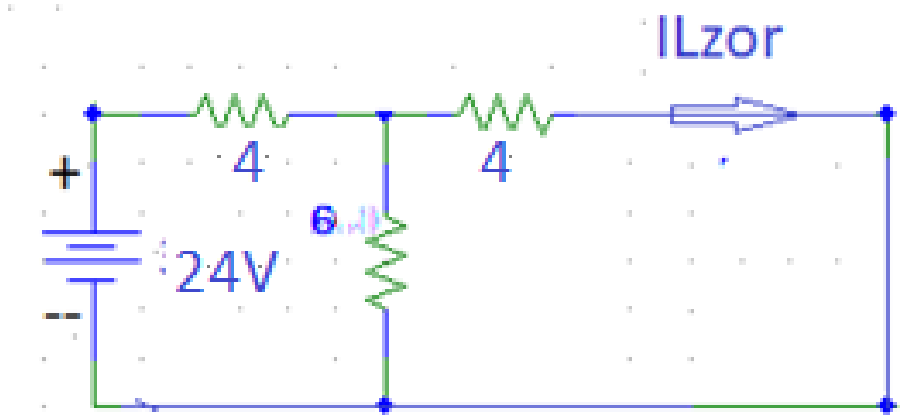
$I_L(t) = \left(-0{,}75.e^{-\frac{12.t}{8}} + 2{,}25\right).u(t)A$



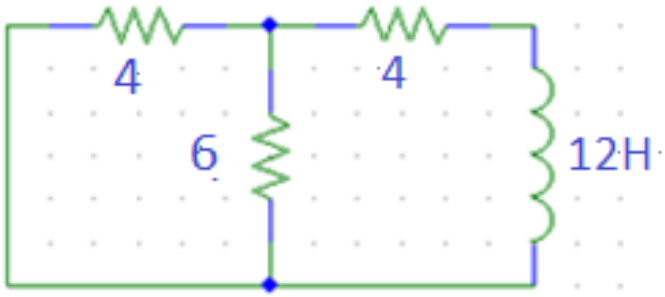
$I_L(t) = \left(-0{,}75.\, e^{-\frac{12.t}{8}} + 2{,}25\right).u(t)A \qquad (0 \leq t \leq 1{,}5s)$

$I_L(t) = \left(-0{,}75.\, e^{-\frac{12.1{,}5}{8}} + 2{,}25\right).u(t)A$

$I_L(1{,}5) = 2{,}17A = I_L(0+)$



2.durum $I_L(\infty) = \frac{24}{\frac{4x6}{4+6}+4} x \frac{6}{4+6} = 2{,}25A = ILzor$



1.durum Zaman sabiti $\tau = L/R_{eş}$ $R_{eş}$ => (2. durumda selften görülen eşdeğer direnç, gerilim kaynağı kısa devre, akım kaynağı açık devre yapılarak bulunur.)

$$R_{eş} = \frac{4x6}{4+6} + 4 = 6{,}4\Omega$$

$$\tau = \frac{L}{Reş} = \frac{12}{6{,}4}$$

$$r = -\frac{1}{\tau} \qquad \tau = -\frac{1}{r}$$

$$\frac{1}{4} + \frac{1}{6} + \frac{1}{4+12.r} = 0$$

$$\frac{1}{\frac{4}{3(4+12.r)}} + \frac{1}{\frac{6}{2(4+12.r)}} + \frac{1}{\frac{4+12.r}{12}} = 0$$

$$12 + 36.r + 8 + 24.r + 12 = 0$$

$$60.r + 32 = 0$$

$$r = -\frac{32}{60} = -\frac{6{,}4}{12}$$

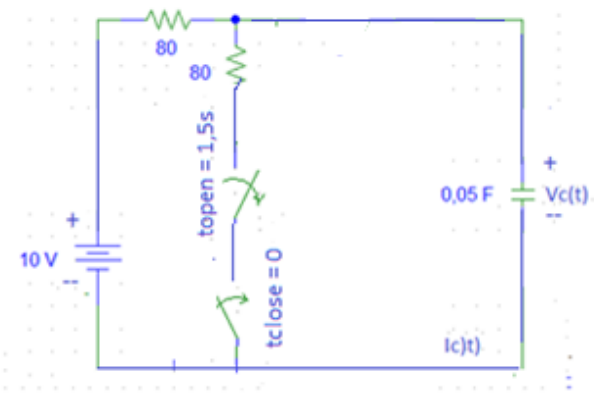
$$I_L(t) = A.\, e^{-\frac{t}{\tau}} + I_L(\infty)$$

$$I_L(t) = A.\, e^{-\frac{t}{\frac{12}{6{,}4}}} + 2{,}25$$

t = 0 için $I_L(1{,}5) = 2{,}17A$ $\quad$ t ≥1,5

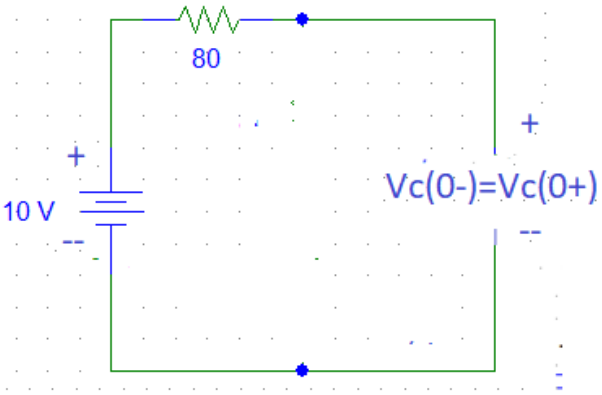
$$2{,}17 = A.1 + 2{,}25 \qquad A = -0{,}08$$

$$I_L(t) = \left(-0{,}08 \,.\, e^{-\frac{6{,}4}{12}.(t-1{,}5)} + 2{,}25\right).u(t)A \qquad 1{,}5s \geq t$$

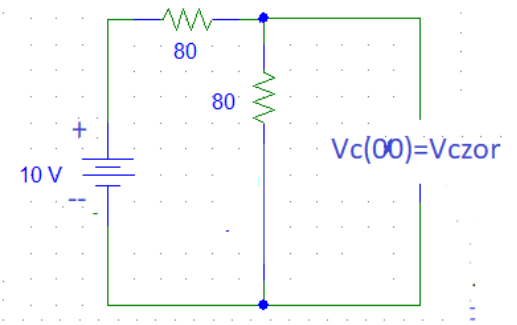


Anahtar uzun süre açık kaldıktan sonra t = 0 anında kapatılıyor. Daha sonra t=1,5s sonunda açılıyor. t ≥ 0 için Vc(t) ve Ic(t)'yi bulunuz.

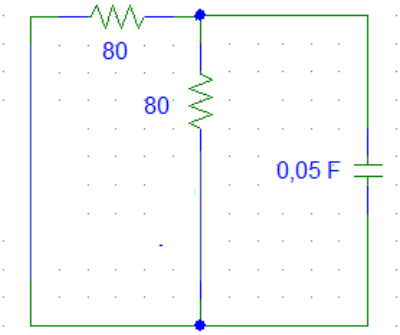
$V_c(t) = V_{cöz} + V_{czorlanmış}$ şeklinde önerilir.



1.durum $V_c(0^-) = 10V = V_c(0^+)$



2.durum $V_c(\infty) = \frac{10}{(80+80)} x80 = 5V = V_c zor$



2. durum Zaman sabiti $\tau = R_{eş}xC$ $R_{eş}$ => (2. durumda kondansatörden görülen eşdeğer direnç, gerilim kaynağı varsa kısa devre, akım kaynağı varsa açık devre yapılarak bulunur.)

$$R_{eş} = \frac{80x80}{80+80} = 40\Omega$$

$$\tau = R_{eş}xC = 40x0{,}05 = 2$$

$$r = -\frac{1}{\tau} \qquad \tau = -\frac{1}{r}$$

$$\frac{1}{80} + \frac{1}{80} + \frac{1}{\frac{1}{0{,}05.r}} = 0$$

$$\frac{\frac{1}{80}}{1} + \frac{\frac{1}{80}}{1} + \frac{0{,}05.r}{\frac{1}{80}} = 0$$

$$1 + 1 + 0{,}05.r = 0$$

$$2 + 4.r = 0$$

$$r = -\frac{2}{4} = -\frac{1}{2}$$

$$V_C(t) = A.e^{-\frac{t}{\tau}} + V_C(\infty)$$

$$V_C(t) = A.e^{-\frac{t}{2}} + 5$$

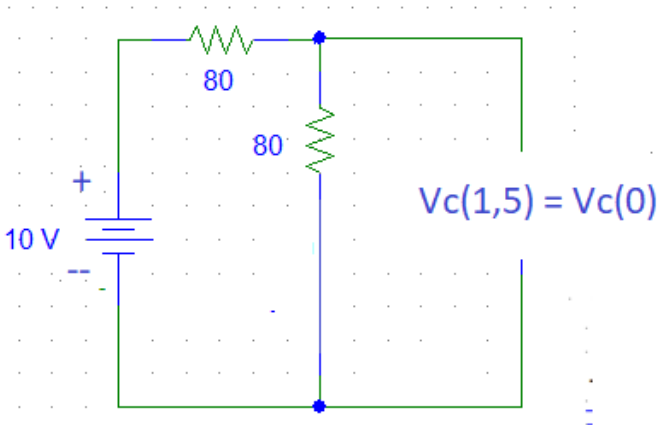
A katsayısı başlangıç şartı olan $V_C(0^+)$'dan bulunur.

t= 0 için $V_c(0^+) = 10V$

$$10 = A.1 + 5 \qquad A = 5$$

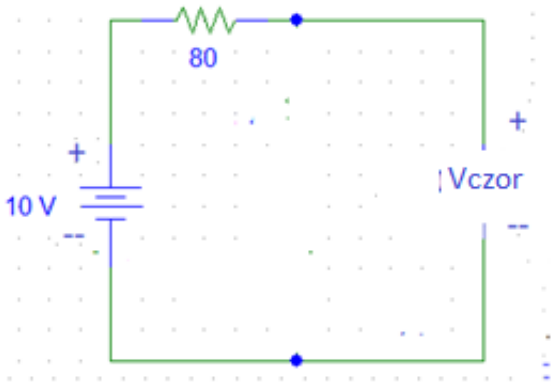
$$V_C(t) = A.e^{-\frac{t}{\tau}} + V_C(\infty)$$

$$V_C(t) = \left(5.e^{-\frac{t}{2}} + 5\right).u(t)V$$

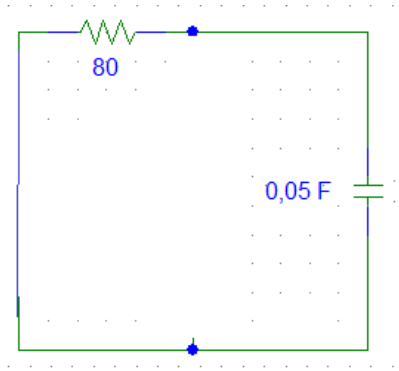


$$V_C(t) = \left(5.\mathrm{e}^{-\frac{t}{2}} + 5\right).u(t)V \qquad (0 \leq t \leq 1{,}5s)$$

$$V_C(1{,}5) = \left(5.\mathrm{e}^{-\frac{1{,}5}{2}} + 5\right) = 7{,}36V = V_c(0+)$$



$$Vc(\infty) = 10V = V_c zor$$



2.durum Zaman sabiti $\tau = R_{eş}xC$ $R_{eş}$ => (2. durumda kondansatörden görülen eşdeğer direnç, gerilim kaynağı varsa kısa devre, akım kaynağı varsa açık devre yapılarak bulunur.)

$R_{eş} = 80\Omega$

$\tau = R_{eş}xC = 80x0{,}05 = 4$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$\frac{1}{80} + \frac{1}{\frac{1}{0{,}05.r}} = 0$

$\frac{\frac{1}{80}}{1} + \frac{0{,}05.r}{\frac{1}{80}} = 0$

$1 + 4.r = 0$

$r = -\frac{1}{4}$

$V_C(t) = \text{A}.\, e^{-\frac{t}{\tau}} + V_C(\infty)$

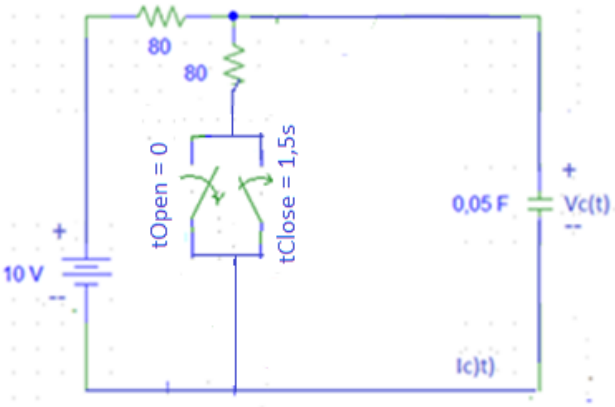
$V_C(t) = \text{A}.\, e^{-\frac{t}{4}} + 10$

A katsayısı başlangıç şartı olan $V_C(0^+)$'dan bulunur.

t= 0 için $V_c(1{,}5) = 7{,}36V$

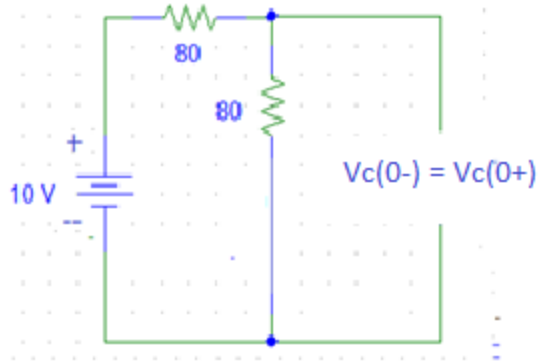
$7{,}36 = \text{A}.\, 1 + 10$ $A = -2{,}64$

$V_C(t) = \left(-2{,}64.\, e^{-\frac{(t-1{,}5)}{4}} + 10\right).u(t)V$ 1,5s ≥ t

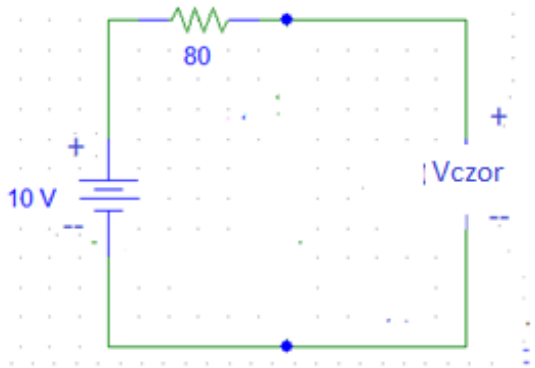


Anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. Daha sonra t=1,5s sonunda kapatılıyor. $t \geq 0$ için Vc(t) ve Ic(t)'yi bulunuz.

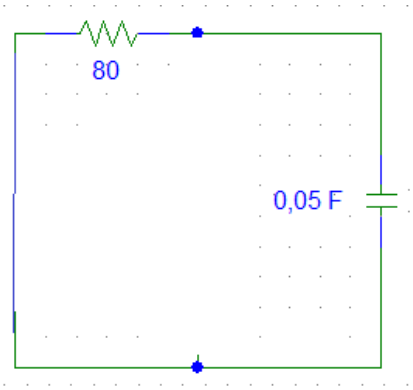
$V_c\,(t) = V_{cöz} + V_{czorlanmış}$ şeklinde önerilir.



1.durum $V_c(0^-) = \frac{10}{(80+80)} x80 = 5V = V_c(0^+)$



2.durum $V_c(\infty) = 10V = V_c zor$



2.durum Zaman sabiti $\tau = R_{eş}xC$ $R_{eş}$ => (2. durumda kondansatörden görülen eşdeğer direnç, gerilim kaynağı varsa kısa devre, akım kaynağı varsa açık devre yapılarak bulunur.)

$R_{eş} = 80\Omega$

$\tau = R_{eş}xC = 80x0{,}05 = 4$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$\frac{1}{80} + \frac{1}{\frac{1}{0{,}05.r}} = 0$

$\frac{\frac{1}{80}}{1} + \frac{0{,}05.r}{\frac{1}{80}} = 0$

$1 + 4.r = 0$

$r = -\frac{1}{4}$

$V_C(t) = A.e^{-\frac{t}{\tau}} + V_C(\infty)$

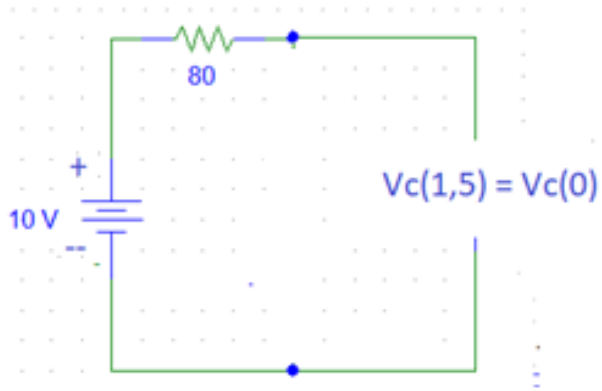
$V_C(t) = A.e^{-\frac{t}{2}} + 10$

A katsayısı başlangıç şartı olan $V_C(0^+)$'dan bulunur.

t= 0 için $V_c(0^+) = 5V$

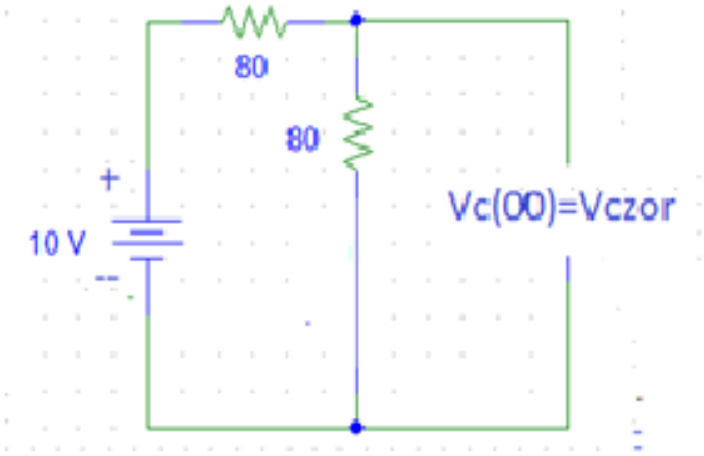
$5 = A.1 + 10$ $A = -5$

$V_C(t) = A.e^{-\frac{t}{\tau}} + V_C(\infty)$ $V_C(t) = \left(-5.e^{-\frac{t}{4}} + 10\right).u(t)V$

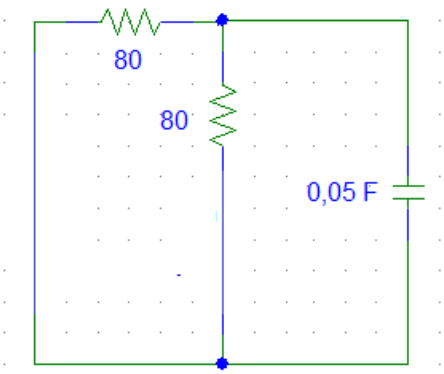


$$V_C(t) = \left(-5.\mathrm{e}^{-\frac{t}{4}} + 5\right).u(t)V \qquad (0 \leq t \leq 1{,}5s)$$

$$V_C(1{,}5) = \left(-5.\mathrm{e}^{-\frac{1{,}5}{4}} + 5\right) = 1{,}56V = V_c(0+)$$



2.durum $V_c(\infty) = \frac{10}{(80+80)} x80 = 5V = V_c zor$



2. durum Zaman sabiti $\tau = R_{eş}xC$ $R_{eş}$ => (2. durumda kondansatörden görülen eşdeğer direnç, gerilim kaynağı varsa kısa devre, akım kaynağı varsa açık devre yapılarak bulunur.)

$$R_{eş} = \frac{80x80}{80+80} = 40\Omega$$

$$\tau = R_{eş}xC = 40x0{,}05 = 2$$

$$r = -\frac{1}{\tau} \qquad \tau = -\frac{1}{r}$$

$$\frac{1}{80} + \frac{1}{80} + \frac{1}{\frac{1}{0{,}05.r}} = 0$$

$$\frac{1}{80} + \frac{1}{80} + \frac{0{,}05.r}{\frac{1}{80}} = 0$$

$$1 + 1 + 0{,}05.r = 0$$

$$2 + 4.r = 0$$

$$r = -\frac{2}{4} = -\frac{1}{2}$$

$$V_C(t) = \text{A}.\, e^{-\frac{t}{\tau}} + V_C(\infty)$$

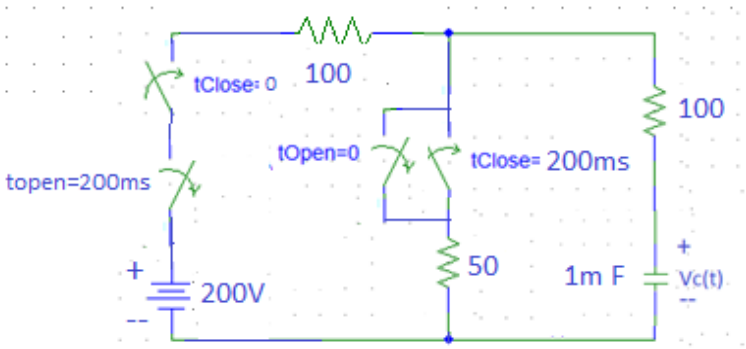
$$V_C(t) = \text{A}.\, e^{-\frac{t}{2}} + 5$$

A katsayısı başlangıç şartı olan $V_C(0^+)$'dan bulunur.

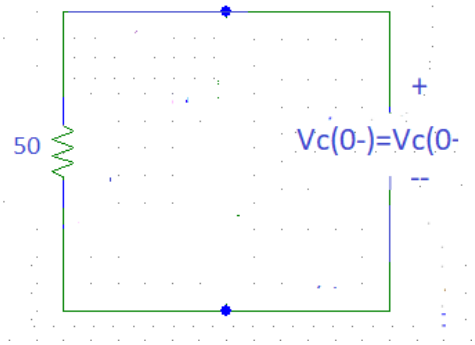
t= 0 için $V_c(1{,}5) = 1{,}56V$

$$1{,}56 = \text{A}.\, 1 + 5 \qquad A = -3{,}44$$

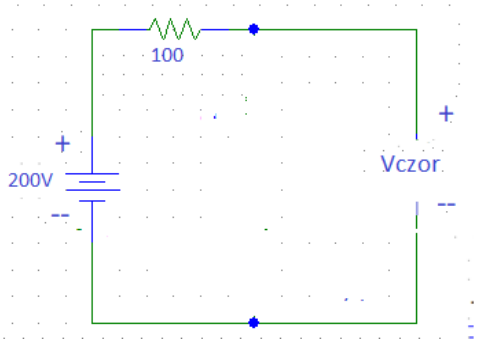
$$V_C(t) = \left(-3{,}44.\, e^{-\frac{(t-1{,}5)}{2}} + 10\right).u(t)V \qquad 1{,}5\text{s} \geq \text{t}$$



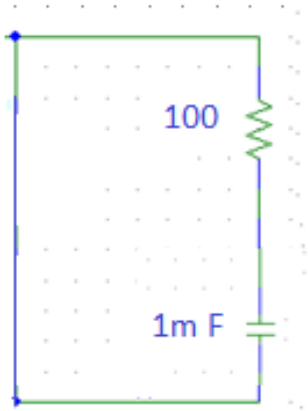
50 Ohm üstündeki anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. 100 Ohm'un altındaki anahtar ise t=0 anında kapatılıyor. 200 V'un üstündeki anahtar 200ms sonra açılıyor. 50 Ohm'un üstündeki anahtar ise 200ms sonra kapatılıyor. $t \geq 0$ için Vc(t) ve Ic(t)'yi bulunuz. $V_c(t) = V_{cöz} + V_{czorlanmış}$ şeklinde önerilir. açık kaldıktan sonra



1.durum $V_c(0^-) = 0V = V_c(0^+)$



2.durum $V_c(\infty) = 200 = V_czor$



2. durum Zaman sabiti $\tau = R_{eş}xC$ $R_{eş}$ => (2. durumda kondansatörden görülen eşdeğer direnç, gerilim kaynağı varsa kısa devre, akım kaynağı varsa açık devre yapılarak bulunur.)

$R_{eş} = 100\Omega$

$\tau = R_{eş}xC = 100x0{,}001 = 0{,}1$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$\frac{1}{100} + \frac{1}{\frac{1}{0{,}001.r}} = 0$

$\frac{1}{\frac{100}{1}} + \frac{0{,}001.r}{\frac{1}{100}} = 0$

$1 + 0{,}1.r = 0$

$r = -\frac{1}{0{,}1}$

$V_C(t) = A.e^{-\frac{t}{\tau}} + V_C(\infty)$

$V_C(t) = A.e^{-\frac{t}{0{,}1}} + 5$

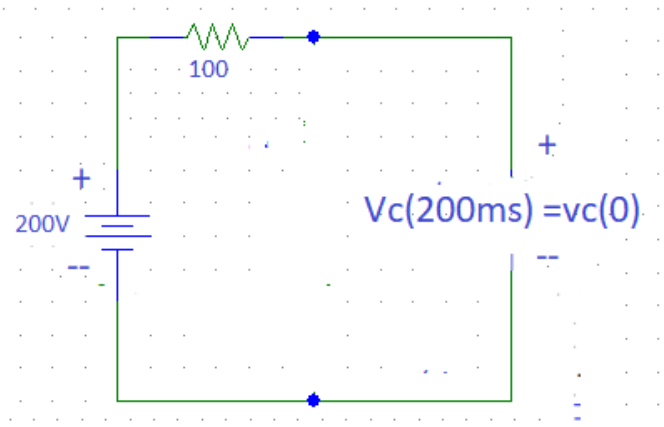
A katsayısı başlangıç şartı olan $V_C(0^+)$'dan bulunur.

t= 0 için $V_c(0^+) = 0V$

$0 = A.1 + 200$ $A = -200$

$V_C(t) = A.e^{-\frac{t}{\tau}} + V_C(\infty)$

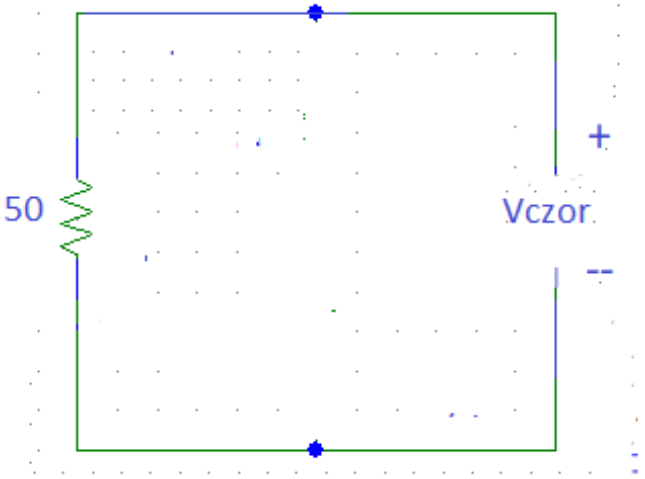
$V_C(t) = \left(-200.e^{-\frac{t}{0{,}1}} + 200\right).u(t)V$



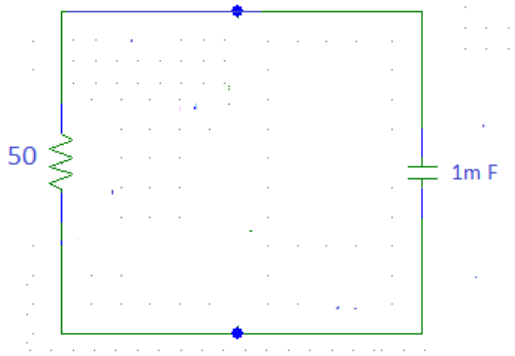
$$V_C(t) = \left(-200.\mathrm{e}^{-\frac{t}{0,1}} + 200\right).u(t)V(0 \leq t \leq 200ms)$$

$$V_C(200m) = \left(-200.\mathrm{e}^{-\frac{0,2}{0,1}} + 200\right).u(t)V = 199,86V$$

$$V_c(0+) = 199,86V$$



$$Vc(\infty) = V = V_c zor$$



2.durum Zaman sabiti $\tau = R_{eş}xC$ $R_{eş}$ => (2. durumda kondansatörden görülen eşdeğer direnç, gerilim kaynağı varsa kısa devre, akım kaynağı varsa açık devre yapılarak bulunur.)

$R_{eş} = 50\Omega$

$\tau = R_{eş}xC = 50x0{,}001 = 0{,}05$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$\frac{1}{50} + \frac{1}{\frac{1}{0{,}001.r}} = 0$

$\frac{1}{50} + \frac{0{,}001.r}{\frac{1}{50}} = 0$

$1 + 0{,}05.r = 0$

$r = -\frac{1}{0{,}05}$

$V_C(t) = A.e^{-\frac{t}{\tau}} + V_C(\infty)$

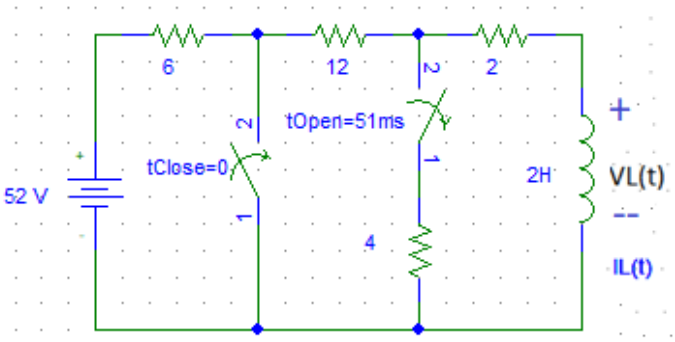
$V_C(t) = \left(-.e^{-\frac{t}{0{,}05}} + 0\right).u(t)V$

A katsayısı başlangıç şartı olan $V_C(0^+)$'dan bulunur.

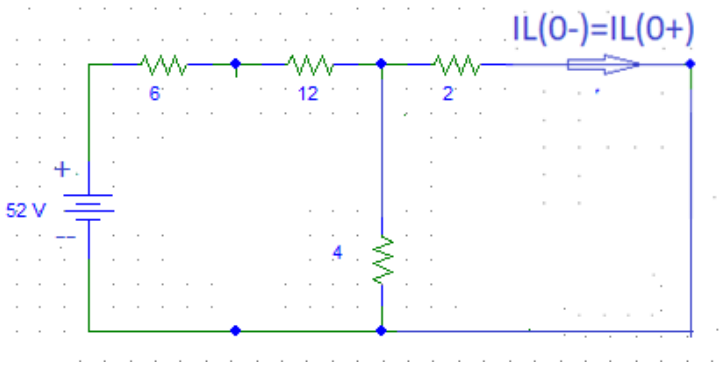
t= 0 için $V_c(200) = 199{,}86V$

$199{,}86 = A.1 + 0$ $A = 199{,}86$

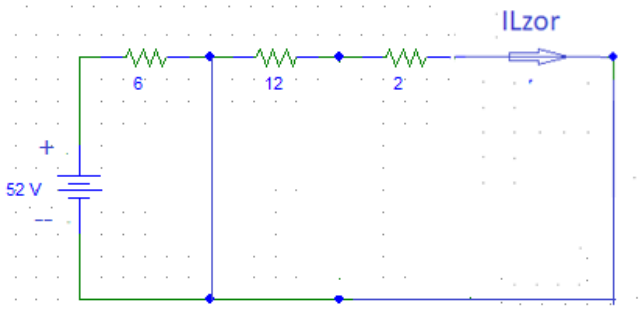
$V_C(t) = V_C(t) = \left(-199{,}86.e^{-\frac{(t-0{,}2)}{0{,}05}} + 200\right).u(t)V$ $t \geq 200$ms



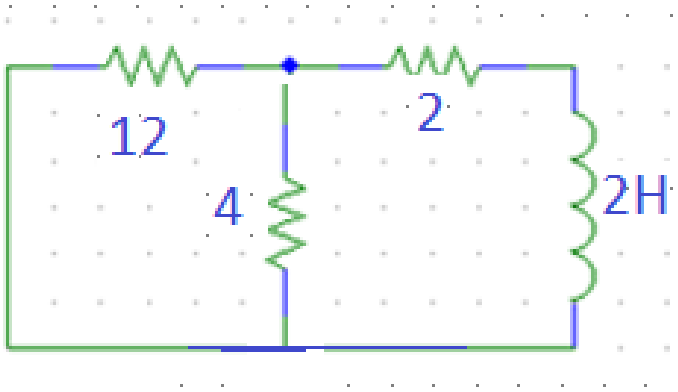
Anahtar uzun süre açık kaldıktan sonra t = 0 anında kapatılıyor. Daha sonra 4 Ohm'daki anahtar 51ms sonunda açılıyor. $t \geq 0$ için IL(t) ve VL(t)'yi bulunuz.



1.durum $I_L(0^-) = \frac{52}{6+12+\frac{2x4}{2+4}} x \frac{4}{2+4} = 4{,}03 = I_L(0+)$



2.durum $I_L(\infty) = 0 = ILzor$



2.durum Zaman sabiti $\tau = L/R_{eş}$ $R_{eş}$ => (2. durumda selften görülen eşdeğer direnç, gerilim kaynağı kısa devre, akım kaynağı açık devre yapılarak bulunur.)

$$R_{eş} = \frac{12x4}{12+4} + 2 = 5\Omega$$

$$\tau = \frac{L}{Reş} = \frac{2}{5}$$

$$r = -\frac{1}{\tau} \qquad \tau = -\frac{1}{r}$$

$$\frac{1}{12} + \frac{1}{4} + \frac{1}{2+2.r} = 0$$

$$\frac{1}{\frac{12}{(2+2.r)}} + \frac{1}{\frac{4}{3(2+2.r)}} + \frac{1}{\frac{2+2.r}{12}} = 0$$

$$2 + 2.r + 6 + 6.r + 12 = 0$$

$$8.r + 20 = 0$$

$$r = -\frac{20}{8} = -\frac{5}{2}$$

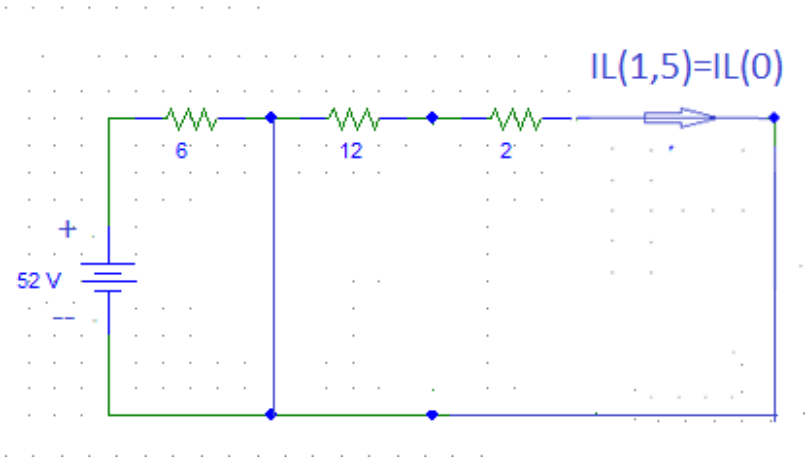
$$I_L(t) = A.\, e^{-\frac{t}{\tau}} + I_L(\infty)$$

$$I_L(t) = A.\, e^{-\frac{t}{\frac{2}{5}}} + 0$$

t = 0 için $I_L(0^+) = 4{,}03A$

$$4{,}03 = A.1 + 0 \qquad A = 4{,}03$$

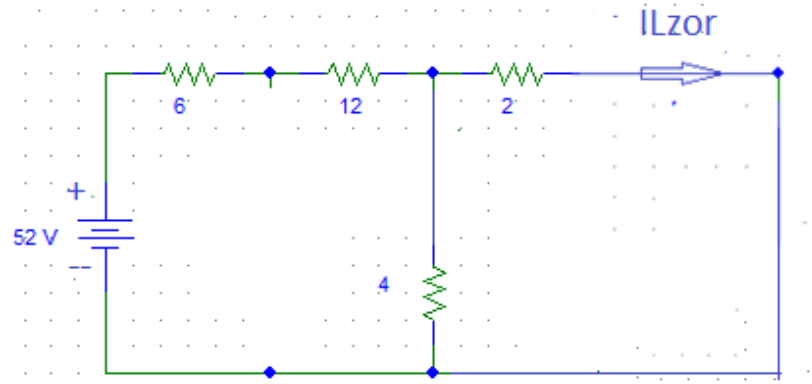
$$I_L(t) = \left(4{,}03\,.\, e^{-\frac{t}{\frac{2}{5}}}\right).u(t)A$$



$I_L(t) = \left(4{,}03 \,.\, e^{-2{,}5.t} \right).u(t)A \qquad (0 \leq t \leq 51ms)$

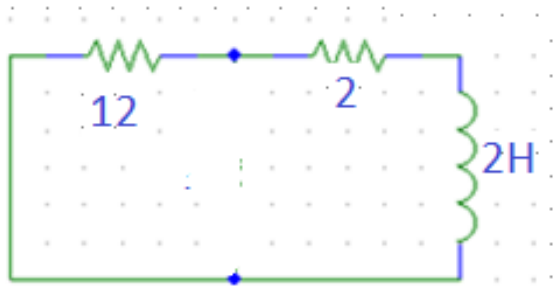
$t \geq 51ms \qquad I_L(51ms) = \left(4{,}03 \,.\, e^{-2{,}5x0{,}051} \right) = 3{,}55A$

$I_L(51ms) == 3{,}55A$



$I_L(\infty) = \frac{52}{6+12+\frac{2x4}{2+4}} x \frac{4}{2+4} = 4{,}03 = I_L(0+)$ yanlış

1.durum Zaman sabiti $\tau = L/R_{eş}$ $R_{eş}$ => (2. durumda selften görülen eşdeğer direnç, gerilim kaynağı kısa devre, akım kaynağı açık devre yapılarak bulunur.)



Zaman sabiti $\tau = L/R_{eş}$ $R_{eş}$ => (2. durumda selften görülen eşdeğer direnç, gerilim kaynağı kısa devre, akım kaynağı açık devre yapılarak bulunur.)

$R_{eş} = 12 + 2 = 6\Omega$

$\tau = \frac{L}{Reş} = \frac{2}{14}$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$\frac{1}{12+2} + \frac{1}{2.r} = 0$

$\frac{1}{14} + \frac{1}{2.r} = 0$

$2.r + 14 = 0$

$r = -\frac{14}{2}$

$I_L(\infty) = 0 = ILzor$

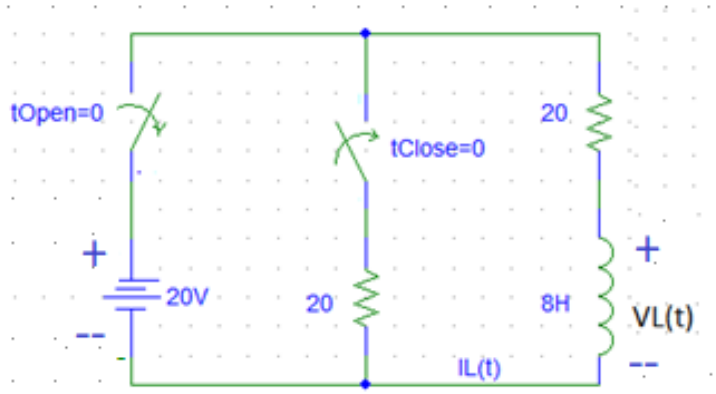
$I_L(t) = A.\, e^{-\frac{t}{\tau}} + I_L(\infty)$

$I_L(t) = \left(A \,.\, e^{-\frac{14}{2}.(t-0,051)} + 0 \right)$ $t \geq 51ms$

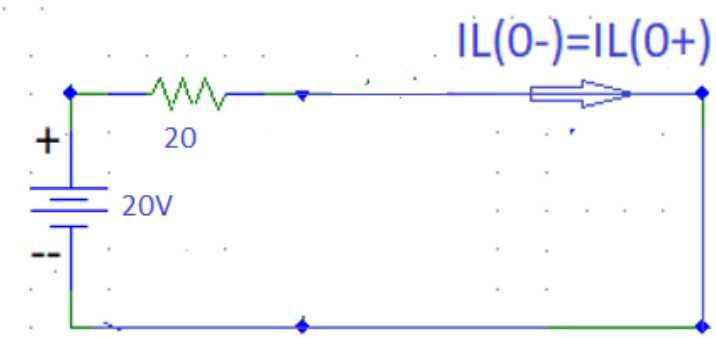
t = 0 için $I_L(0,051) = 3,55A$ $t \geq 0,051$

$3,55 = A.1 + 0$ $A = 3,55$

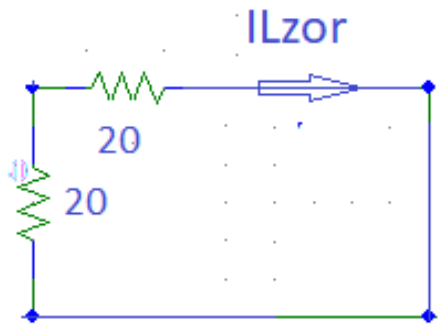
$I_L(t) = \left(3,55 \,.\, e^{-\frac{14}{2}.(t-0,051)} \right).u(t)A$



20 V'luk kaynaktaki anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. 20 Ohm'luk dirençteki anahtar ise açık kaldıktan sonra t=0 anında kapatılıyor. $t \geq 0$ için IL(t) ve VL(t)'yi bulunuz.

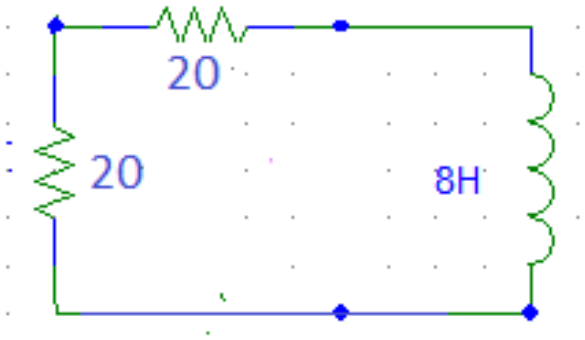


1. durum $I_L(0^-) = \frac{20}{20} = 1A = I_L(0+)$



2.durum Devrede kaynak yok. $I_L(\infty) = 0A = ILzor$

Zaman sabiti $\tau = L/R_{eş}$ $R_{eş}$ => (2. durumda selften görülen eşdeğer direnç, gerilim kaynağı kısa devre, akım kaynağı açık devre yapılarak bulunur.)



$R_{eş} = 20 + 20 = 40\Omega$

$\tau = \frac{L}{Reş} = \frac{8}{40} = \frac{1}{5}$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$\frac{1}{20+20} + \frac{1}{8.r} = 0$

$\frac{1}{40} + \frac{1}{8.r} = 0$
r 5

$r + 5 = 0$

$r = -5$

$I_L(t) = A.e^{-\frac{t}{\tau}} + I_L(\infty)$

$I_L(t) = A.e^{-\frac{t}{\frac{1}{5}}} + 0$

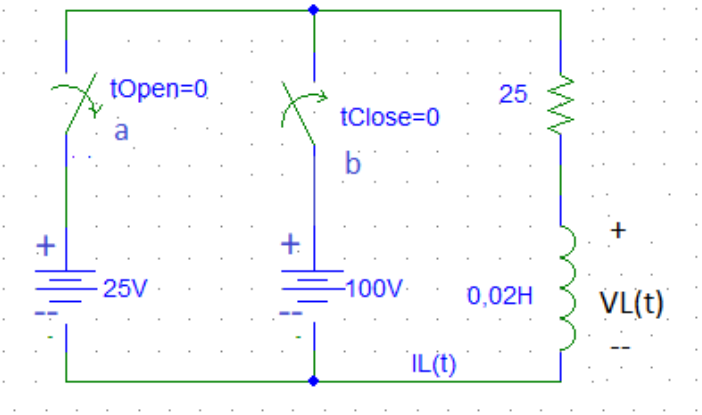
t = 0 için $I_L(0^+) = 1A$

$1 = A + 0$ $A = 1$

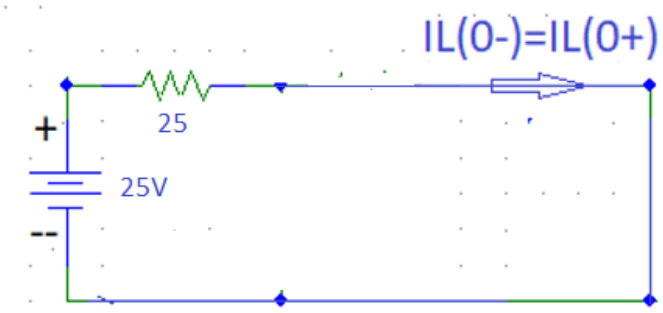
$I_L(t) = A.e^{-\frac{t}{\tau}} + I_L(\infty)$

$I_L(t) = 1\, e^{-5.t}.u(t)A$

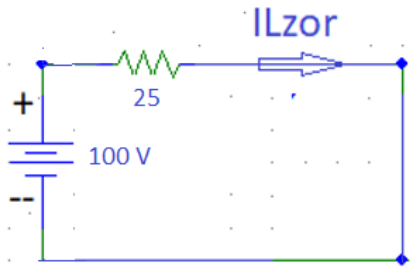
$V_L(t) = L.\frac{d_{iL}}{dt} = 8.\left((-5).(1)e^{-5.t}\right)V$



20 V'luk kaynaktaki anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. 100 V'luk kaynaktaki anahtar uzun süre anahtar ise açık kaldıktan sonra t=0 anında kapatılıyor. $t \geq 0$ için IL(t) ve VL(t)'yi bulunuz.

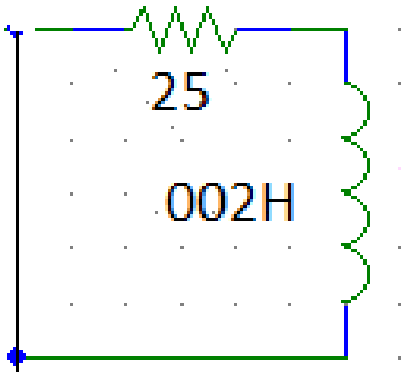


1durum $I_L(0^-) = \frac{25}{25} = 1A = I_L(0+)$



2.durum $I_L(\infty) = \frac{100}{25} = 4A = ILzor$

Zaman sabiti $\tau = L/R_{eş}$ $R_{eş}$ => (2. durumda selften görülen eşdeğer direnç, gerilim kaynağı kısa devre, akım kaynağı açık devre yapılarak bulunur.)



$R_{eş} = 25\Omega$

$\tau = \frac{L}{Reş} = \frac{0,02}{25} = \frac{1}{1250}$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$\frac{1}{25} + \frac{1}{0,02.r} = 0$

$\frac{\frac{1}{25}}{r} + \frac{1}{\frac{0,02.r}{1250}} = 0$

$r + 1250 = 0$

$r = -1250$

$I_L(t) = A.e^{-\frac{t}{\tau}} + I_L(\infty)$

$I_L(t) = A.e^{-\frac{t}{\frac{1}{1250}}} + 4$

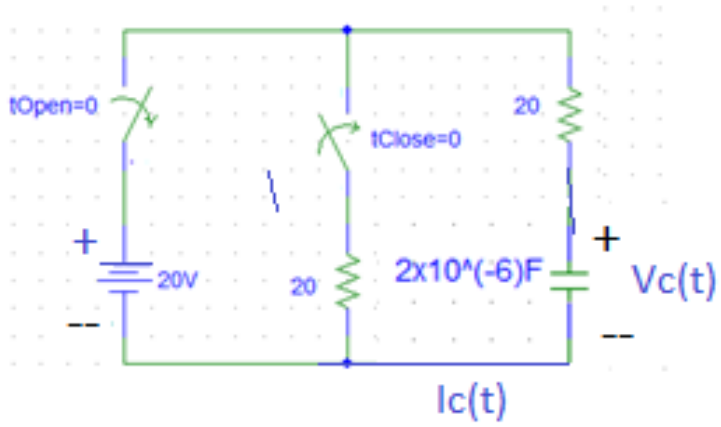
t = 0 için $I_L(0^+) = 1A$

$1 = A + 4$ $A = -3$

$I_L(t) = A.e^{-\frac{t}{\tau}} + I_L(\infty)$

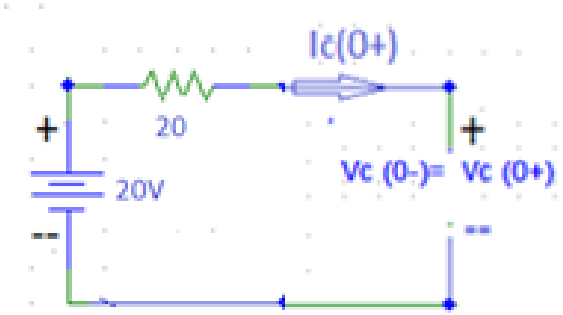
$I_L(t) = (-3.e^{-1250.t} + 4).u(t)A$

$V_L(t) = L.\frac{d_{iL}}{dt} = 0,02.\left((-1250).(-3).e^{-1250.t}\right)V$

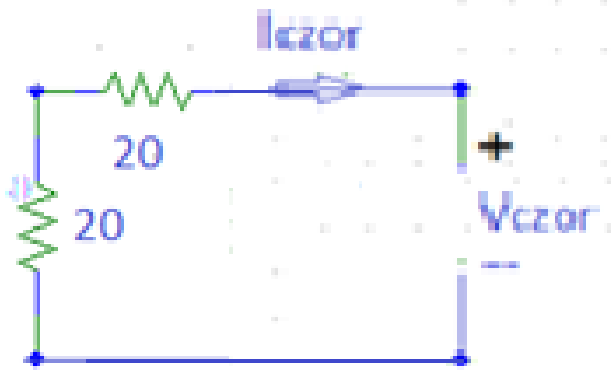


20 V'luk kaynaktaki anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. 20 Ohm'luk dirençteki anahtar ise açık kaldıktan sonra t=0 anında kapatılıyor.. $t \geq 0$ için Vc(t) ve Ic(t)'yi bulunuz.

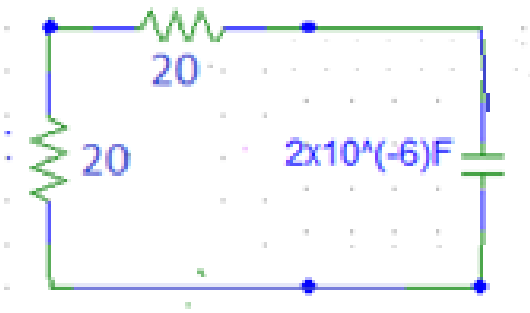
$V_c(t) = V_{cöz} + V_{czorlanmış}$ şeklinde önerilir.



1.durum $V_c(0^-) = 20V = V_c(0^+)$



2.durum kaynak yok $V_c(\infty) = 0 = V_c zor$



2.durum Zaman sabiti $\tau = R_{eş}xC$ $R_{eş}$ => (2. durumda kondansatörden görülen eşdeğer direnç, gerilim kaynağı varsa kısa devre, akım kaynağı varsa açık devre yapılarak bulunur.)

$R_{eş} = 20 + 20 = 40\Omega$

$\tau = R_{eş}xC = 40x2x10^{-6} = 80x10^{-6}$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$\frac{1}{20+20} + \frac{1}{\frac{1}{0,000002.r}} = 0$

$\frac{1}{40} + \frac{0,000002.r}{\frac{1}{40}} = 0$

$1 + 0,000080.r = 0$

$r = -\frac{1}{0,000080}$

$V_C(t) = A.e^{-\frac{t}{\tau}} + V_C(\infty)$

$V_C(t) = A.e^{-\frac{t}{80x10^{-6}}} + 0$

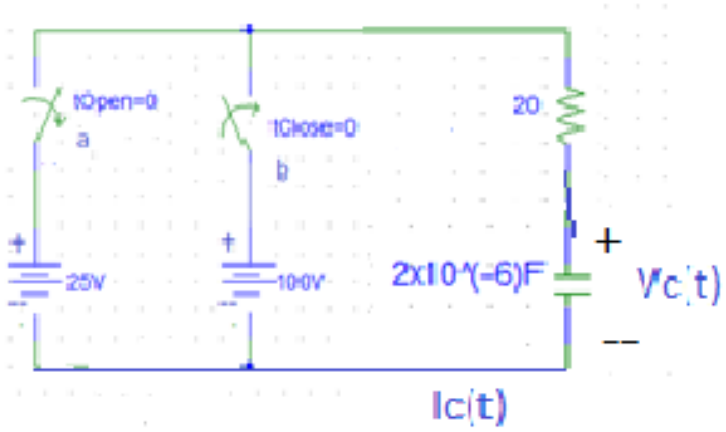
A katsayısı başlangıç şartı olan $V_C(0^+)$'dan bulunur.

t= 0 için $V_c(0^+) = 20V$

$20 = A.1 + 0$ $A = 20$

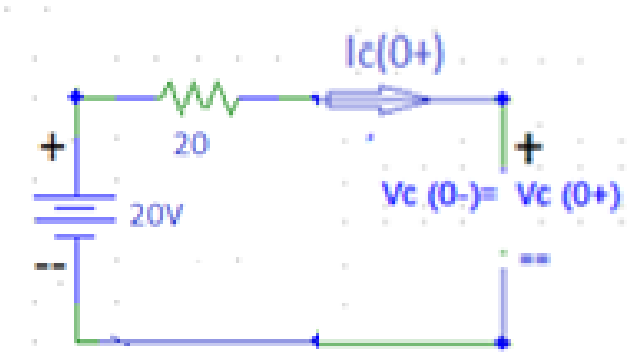
$V_C(t) = \left(20.e^{-\frac{t}{80x10^{-6}}}\right).u(t)V$

$I_C(t) = C.\frac{d_{VC}}{dt} = 20x10^{-6}.\left(\left(-\frac{1}{80x10^{-6}}\right).(20).e^{-\frac{t}{80x10^{-6}}}\right)A$

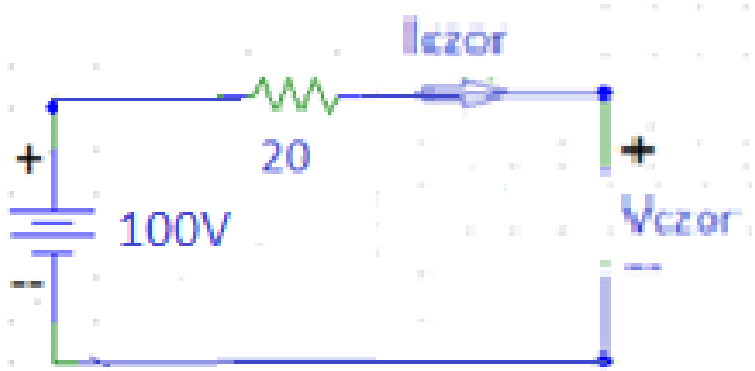


20 V'luk kaynaktaki anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. 100 V'luk kaynaktaki anahtar uzun süre anahtar ise açık kaldıktan sonra t=0 anında kapatılıyor. $t \geq 0$ için Vc(t) ve Ic(t)'yi bulunuz.

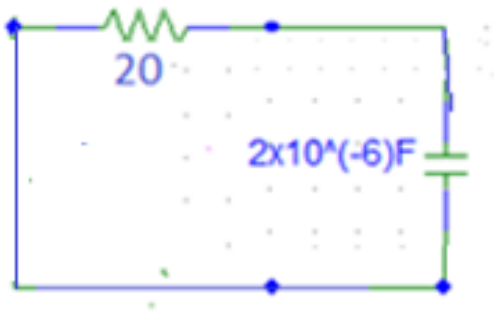
$V_c(t) = V_{cöz} + V_{czorlanmış}$ şeklinde önerilir.



1.durum $V_c(0^-) = 20V = V_c(0^+)$



2.durum $V_c(\infty) = 100 = V_c zor$



2.durum Zaman sabiti $\tau = R_{eş}xC$ $R_{eş}$ => (2. durumda kondansatörden görülen eşdeğer direnç, gerilim kaynağı varsa kısa devre, akım kaynağı varsa açık devre yapılarak bulunur.)

$R_{eş} = 20\Omega$

$\tau = R_{eş}xC = 20x2x10^{-6} = 40x10^{-6}$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$\frac{1}{20} + \frac{1}{\frac{1}{0,000002.r}} = 0$

$\frac{\frac{1}{20}}{1} + \frac{0,000002.r}{\frac{1}{20}} = 0$

$1 + 0,000040.r = 0$

$r = -\frac{1}{0,000040}$

$V_C(t) = A.e^{-\frac{t}{\tau}} + V_C(\infty)$

$V_C(t) = A.e^{-\frac{t}{40x10^{-6}}} + 100$

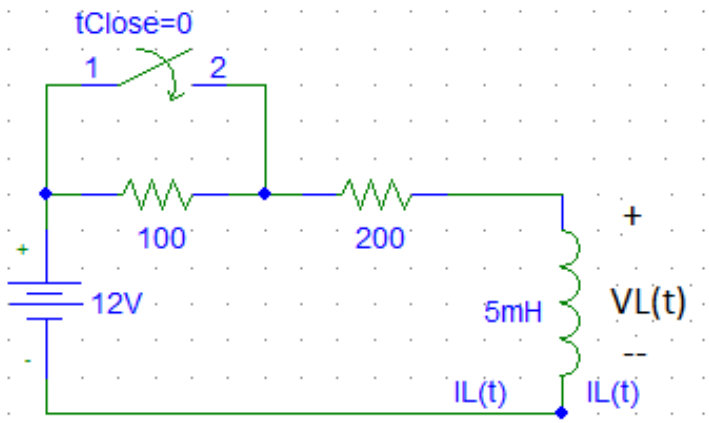
A katsayısı başlangıç şartı olan $V_C(0^+)$'dan bulunur.

t= 0 için $V_c(0^+) = 20V$

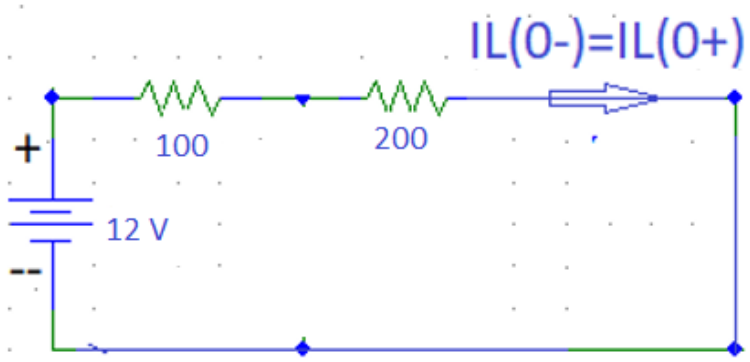
$20 = A.1 + 100$ $A = -80$

$V_C(t) = \left(-80.e^{-\frac{t}{40x10^{-6}}} + 100\right).u(t)V$

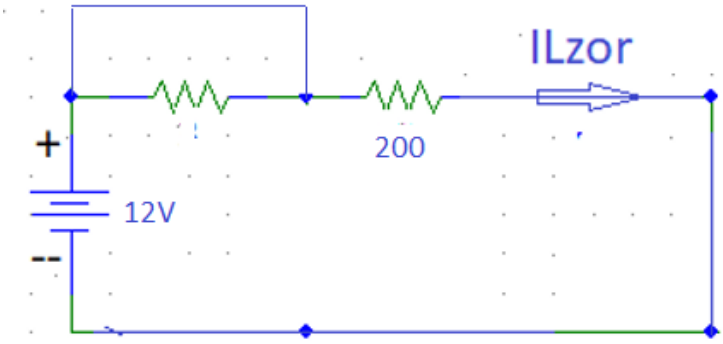
$I_C(t) = C.\frac{d_{VC}}{dt} = 20x10^{-6}.\left(\left(-\frac{1}{40x10^{-6}}\right).(-80).e^{-\frac{t}{40x10^{-6}}}\right)A$



Anahtar uzun süre açık kaldıktan sonra t = 0 anında kapatılıyor. $t \geq 0$ için IL(t) ve VL(t)'yi bulunuz.

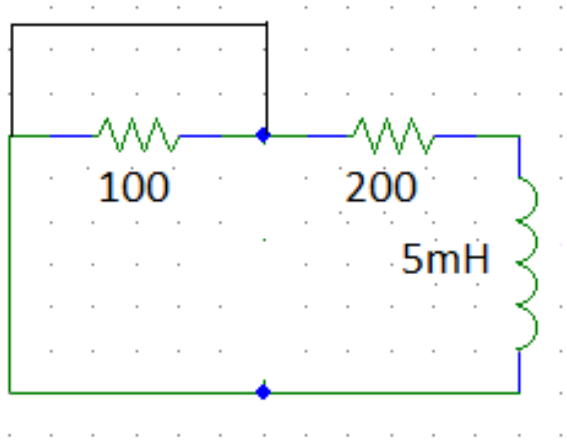


1.durum $I_L(0^-) = \frac{12}{100+200} = 0{,}04A = I_L(0+)$



2.durum $I_L(\infty) = \frac{12}{200} = 0{,}06A = ILzor$

Zaman sabiti $\tau = L/R_{eş}$ $R_{eş}$ => (2. durumda selften görülen eşdeğer direnç, gerilim kaynağı kısa devre, akım kaynağı açık devre yapılarak bulunur.)



$R_{eş} = 200\Omega$

$$\tau = \frac{L}{Reş} = \frac{5m}{200} = \frac{1}{40000}$$

$$r = -\frac{1}{\tau} \qquad \tau = -\frac{1}{r}$$

$$\frac{1}{200} + \frac{1}{0{,}005.r} = 0$$

$$\frac{\frac{1}{200}}{r} + \frac{1}{\frac{0{,}005.r}{40000}} = 0$$

$$r + 40000 = 0$$

$$r = -40000$$

$$I_L(t) = A.e^{-\frac{t}{\tau}} + I_L(\infty)$$

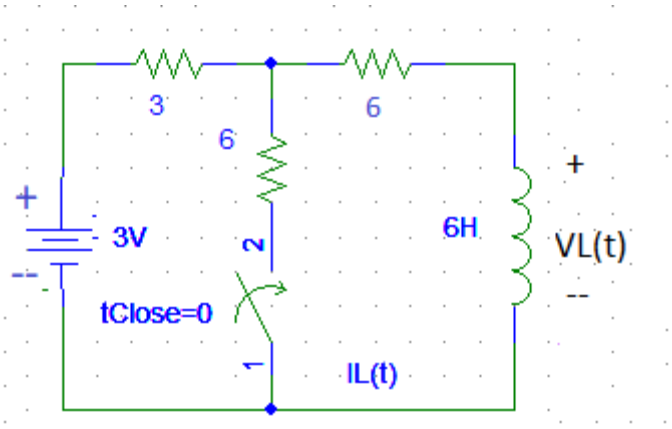
$$I_L(t) = A.e^{-\frac{t}{\frac{1}{40000}}} + 0{,}06$$

t = 0 için $I_L(0^+) = 0{,}04A$

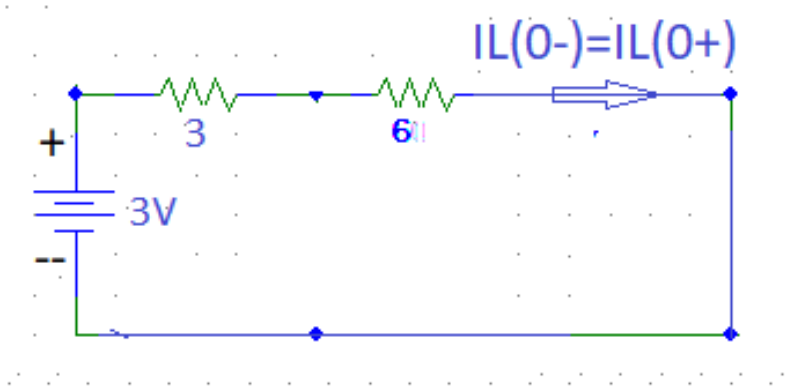
$$0{,}04 = A.1 + 0{,}06 \qquad A = -0{,}02$$

$$I_L(t) = \left(-0{,}02.e^{-\frac{t}{\frac{1}{40000}}} + 0{,}06\right).u(t)A$$

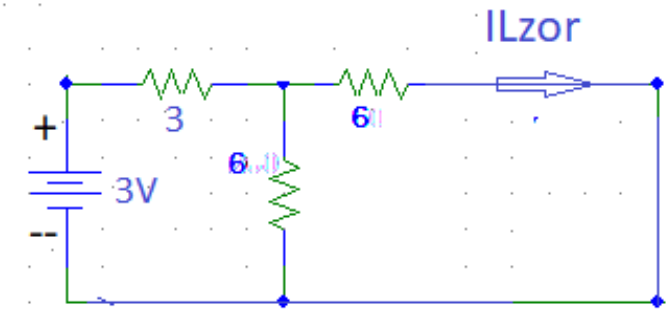
$$V_L(t) = L.\frac{d_{iL}}{dt} = 0{,}005.\left((-40000)\left(-0{,}02.e^{-40000.t}\right)\right) V$$



Anahtar uzun süre açık kaldıktan sonra t = 0 anında kapatılıyor. $t \geq 0$ için IL(t) ve VL(t)'yi bulunuz.

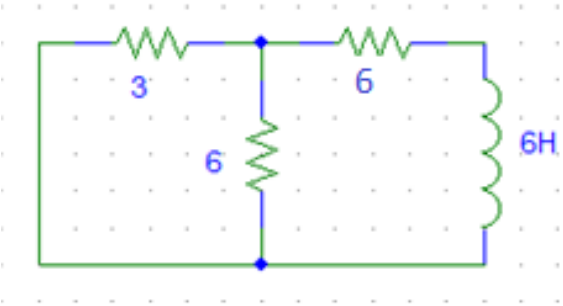


1.durum $I_L(0^-) = \frac{3}{3+6} = \frac{1}{3}A = I_L(0+)$



2.durum $I_L(\infty) = \frac{3}{3+\frac{6X6}{6+6}} x \frac{6}{6+6} = 0{,}25A = ILzor$

Zaman sabiti $\tau = L/R_{eş}$ $R_{eş}$ => (2. durumda selften görülen eşdeğer direnç, gerilim kaynağı kısa devre, akım kaynağı açık devre yapılarak bulunur.)



$$R_{eş} = \frac{3x6}{3+6} + 6 = 8\Omega$$

$$\tau = \frac{L}{Reş} = \frac{6}{8} = \frac{3}{4}$$

$$r = -\frac{1}{\tau} \qquad \tau = -\frac{1}{r}$$

$$\frac{1}{3} + \frac{1}{6} + \frac{1}{6+6.r} = 0$$

$$\frac{\frac{1}{3}}{2.(6+6.r)} + \frac{\frac{1}{6}}{(6+6.r)} + \frac{\frac{1}{6+6.r}}{6} = 0$$

$$12 + 12.r + 6 + 6.r + 6 = 0$$

$$18.r + 24 = 0$$

$$r = -\frac{24}{18} = -\frac{4}{3}$$

$$I_L(t) = A.e^{-\frac{t}{\tau}} + I_L(\infty)$$

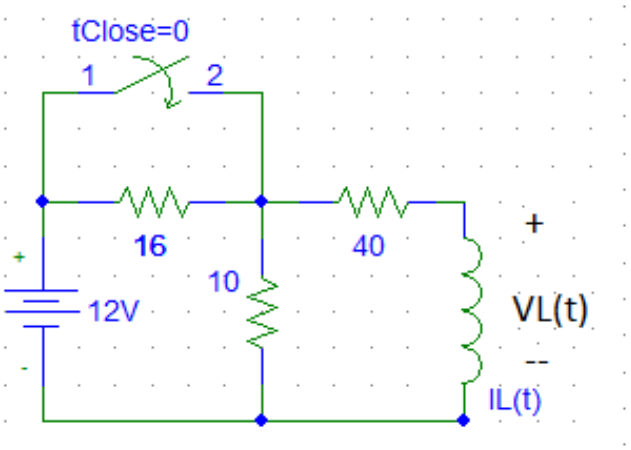
$$I_L(t) = A.e^{-\frac{t}{\frac{3}{4}}} + 0{,}25$$

t = 0 için $I_L(0^+) = \frac{1}{3}A$

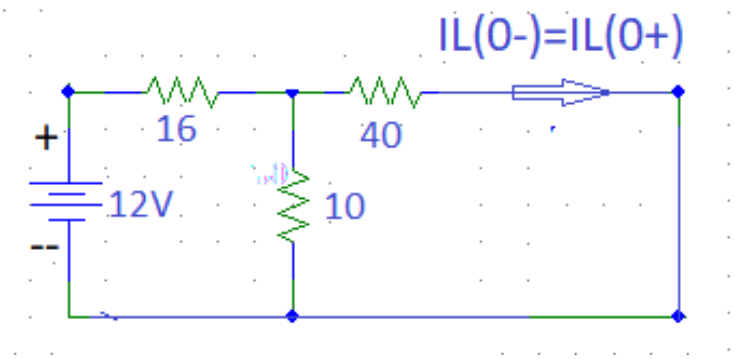
$$0{,}333 = A.1 + 0{,}25 \qquad A = \frac{1}{12}$$

$$I_L(t) = \left(\frac{1}{12}.e^{-\frac{t}{\frac{3}{4}}} + 0{,}25\right).u(t)A$$

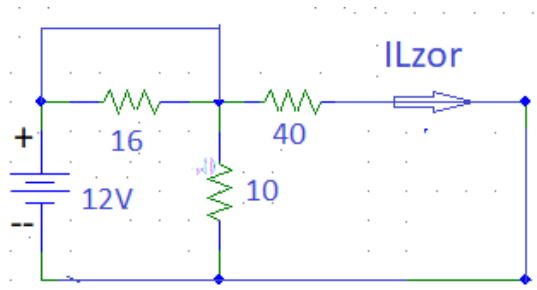
$$V_L(t) = L.\frac{d_{iL}}{dt} = 6.\left(\left(-\frac{4}{3}\right).\frac{1}{12}.e^{-\frac{t}{\frac{3}{4}}}\right) \quad V$$



Anahtar uzun süre açık kaldıktan sonra t = 0 anında kapatılıyor. $t \geq 0$ için IL(t) ve VL(t)'yi bulunuz.



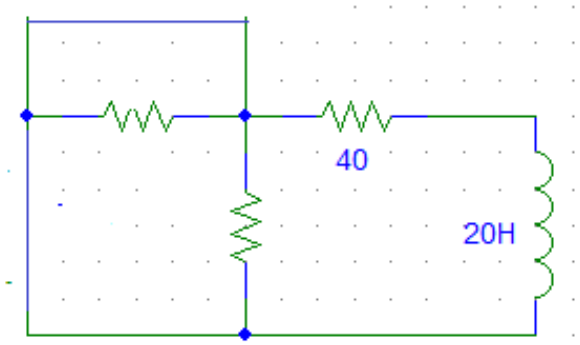
1.durum $I_L(0^-) = \frac{12}{16+\frac{10x40}{10+40}} x \frac{10}{10+40} = 0{,}1A = I_{L1}(0+)$



2.durum $I_L(\infty) = \frac{12}{\frac{10x40}{10+40}} x \frac{10}{10+40} = 0{,}3A = ILzor$

$R_{eş} = \frac{(9+4)x6}{(9+4)+6} + 3 = 7{,}1\Omega$

Zaman sabiti $\tau = L/R_{eş}$ $R_{eş}$ => (2. durumda selften görülen eşdeğer direnç, gerilim kaynağı kısa devre, akım kaynağı açık devre yapılarak bulunur.)



$R_{eş} = 40\Omega$ 16 Ohm ve 10 Ohm kısa devre

$\tau = \frac{L}{Reş} = \frac{20}{40} = \frac{1}{2}$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$\frac{1}{40} + \frac{1}{20.r} = 0$

$\frac{1}{40} + + \frac{1}{20.r} = 0$
$2.r$ 4

$2.r + 4 = 0$

$r = -\frac{4}{2} = -\frac{1}{2}$

$I_L(t) = A.e^{-\frac{t}{\tau}} + I_L(\infty)$

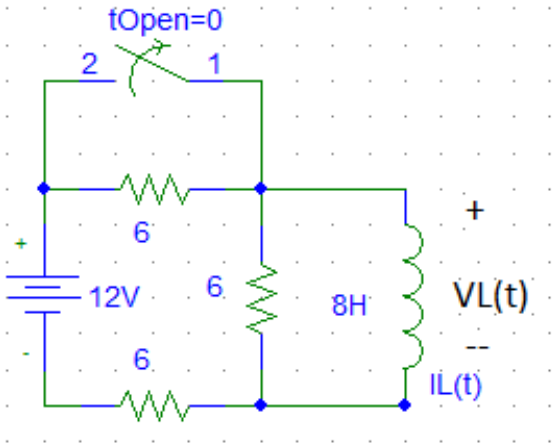
$I_L(t) = A.e^{-\frac{t}{\frac{1}{2}}} + 0{,}3$

t = 0 için $I_L(0^+) = 0{,}1A$

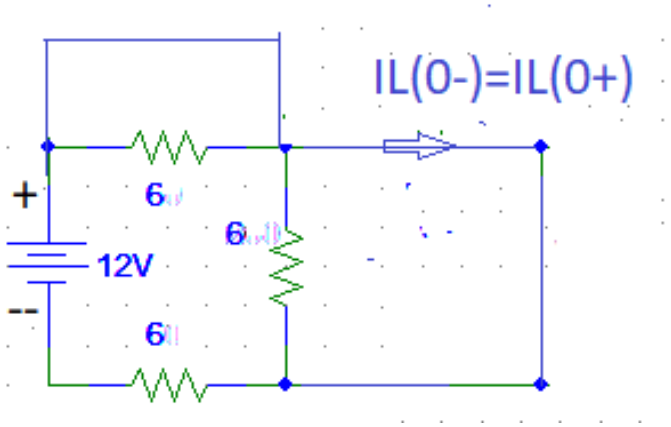
$0{,}1 = A.1 + 0{,}3$ $A = -0{,}2$

$I_L(t) = \left(-0{,}2.e^{-\frac{t}{\frac{1}{2}}} + 0{,}3\right).u(t)A$

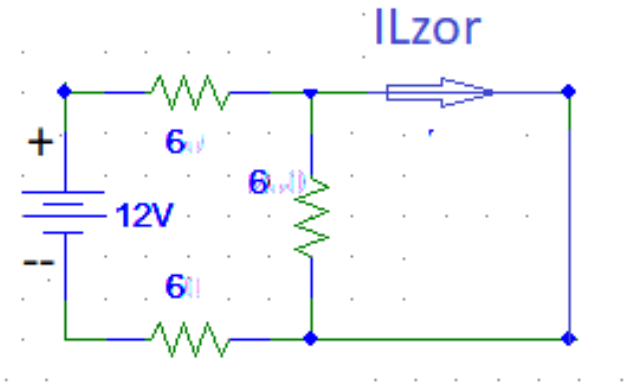
$$V_L(t) = L.\frac{d_{\mathrm{iL}}}{\mathrm{dt}} = 20.\left((-2).\left(-0{,}2.\,\mathrm{e}^{-\frac{t}{\frac{1}{2}}}\right)\right)V$$



Anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. $t \geq 0$ için IL(t) ve VL(t)'yi bulunuz.

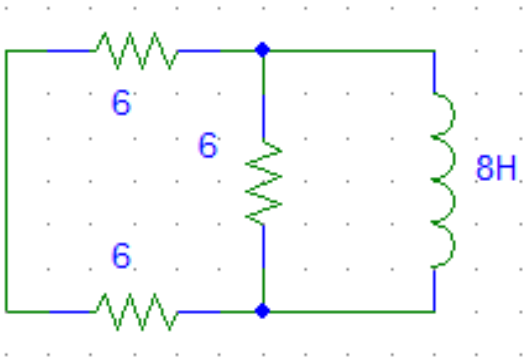


1.durum $I_{\mathrm{L}}(0^{-}) = \frac{12}{6} = 2A = I_{\mathrm{L}}(0+)$ 6 Ohm kısa devre



2.durum $I_L(\infty) = \frac{12}{6+6} = 1A = ILzor$ 6 Ohm kısa devre

Zaman sabiti $\tau = L/R_{eş}$ $R_{eş}$ => (2. durumda selften görülen eşdeğer direnç, gerilim kaynağı kısa devre, akım kaynağı açık devre yapılarak bulunur.)



$R_{eş} = \frac{6x(6+6)}{6+(6+6)} = 4\Omega$

$\tau = \frac{L}{Reş} = \frac{8}{4} = 2$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$\frac{1}{6+6} + \frac{1}{6} + \frac{1}{8.r} = 0$

$\frac{1}{12} + \frac{1}{6} + \frac{1}{8.r} = 0$
$6.r \quad 12.r \quad 9$

$6.r + 12.r + 9 = 0$

$18.r + 9 = 0$

$$r = -\frac{1}{2}$$

$$I_L(t) = \text{A}.\,e^{-\frac{t}{\tau}} + I_L(\infty)$$

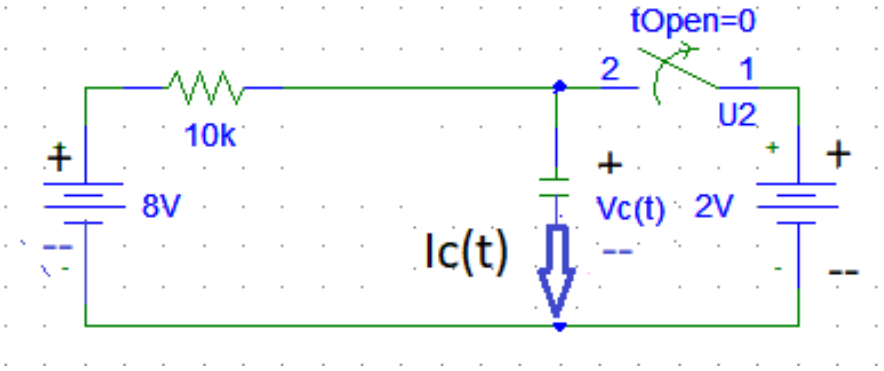
$$I_L(t) = \text{A}.\,e^{-\frac{t}{2}} + 1$$

t = 0 için $I_L(0^+) = 2A$

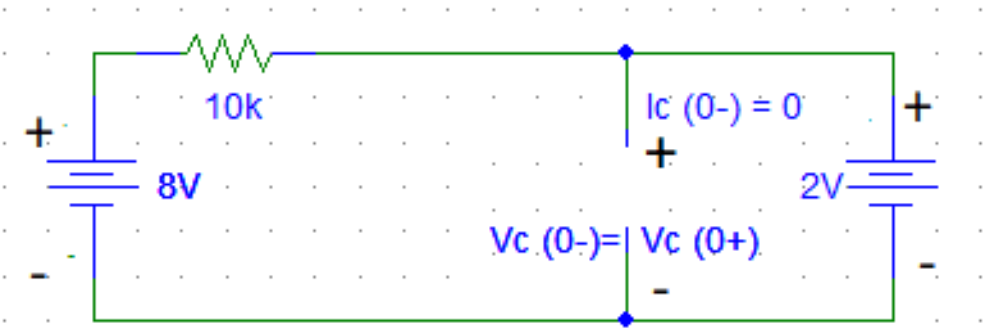
$$2 = \text{A}.1 + 1 \qquad A = 1$$

$$I_L(t) = \left(1.e^{-\frac{t}{2}} + 1\right).u(t)$$

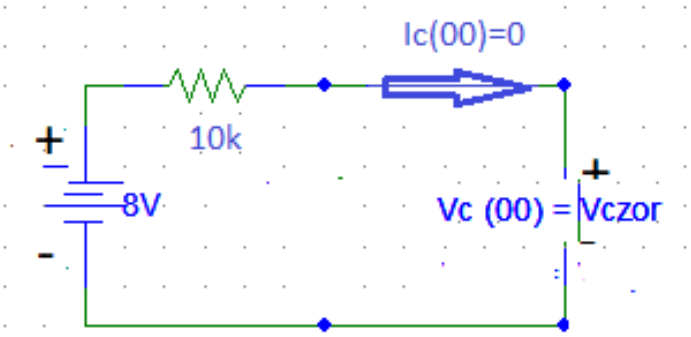
$$V_L(t) = L.\frac{d_{\text{iL}}}{\text{dt}} = 8.\left((-0.5).1.e^{-\frac{t}{2}}\right) = -4.e^{-\frac{t}{2}}V$$



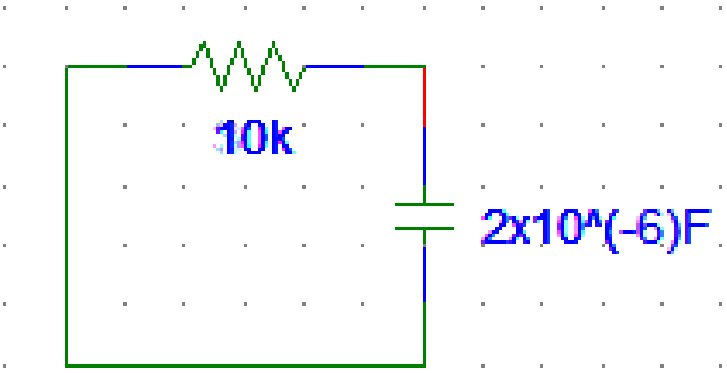
Anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. $t \geq 0$ için Vc(t) ve Ic(t)'yi bulunuz. $V_c(t) = V_{cöz} + V_{czorlanmış}$ şeklinde önerilir.



1.durum $V_c(0^-) = 2V = V_c(0^+)$



2.durum $V_c(\infty) = 8V = V_c zor$



2.durum Zaman sabiti τ = $R_{eş}$xC $R_{eş}$ => (2. durumda kondansatörden görülen eşdeğer direnç, gerilim kaynağı varsa kısa devre, akım kaynağı varsa açık devre yapılarak bulunur.)

$R_{eş} = 10^4\Omega$

$\tau = R_{eş}xC = 10.10^3x2x10^{-6} = 0{,}02$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$$\frac{1}{10000} + \frac{1}{\frac{1}{0{,}000002.r}} = 0$$

$$\frac{\frac{1}{10000}}{1} + \frac{0{,}000002.r}{\frac{1}{10000}} = 0$$

$$1 + 0{,}02.r = 0$$

$$r = -\frac{1}{0{,}02}$$

$V_C(t) = A.e^{-\frac{t}{\tau}} + V_C(\infty)$

$V_C(t) = A.e^{-\frac{t}{0,02}} + 8$

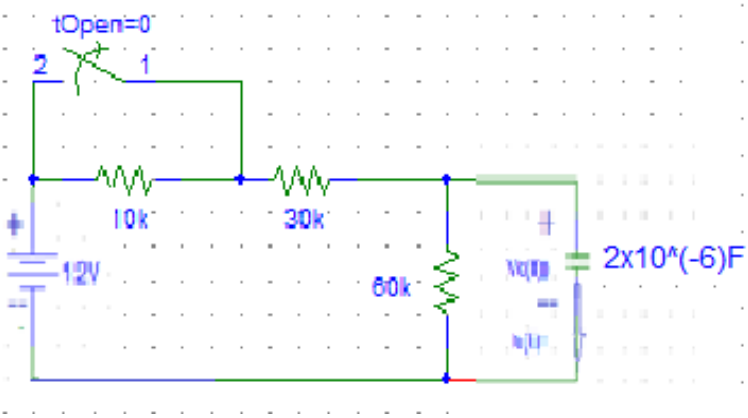
A katsayısı başlangıç şartı olan $V_C(0^+)$'dan bulunur.

t = 0 için $V_c(0^+) = 2V$

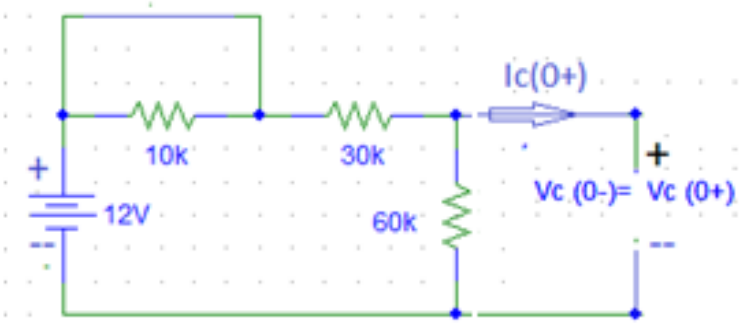
$2 = A.1 + 8 \qquad A = -6$

$V_C(t) = \left(-6.e^{-\frac{t}{0,02}} + 8\right).u(t)V$

$I_C(t) = C.\frac{d_{VC}}{dt} = 2x10^{-6}.\left((-\frac{1}{0,02}).(-6).e^{-\frac{t}{0,02}}\right)A$

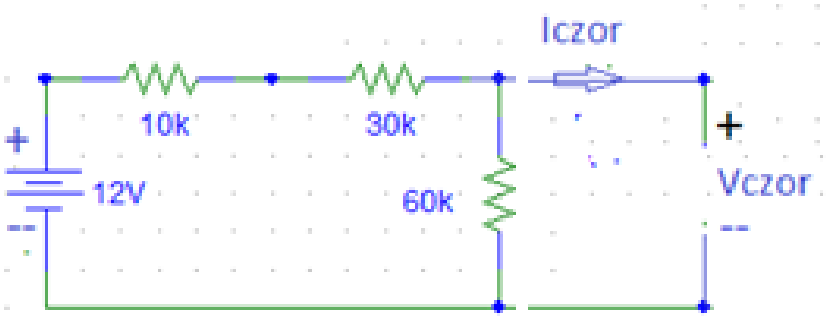


Anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. t ≥ 0 için Vc(t) ve Ic(t)'yi bulunuz. $V_c(t) = V_{cöz} + V_{czorlanmış}$ şeklinde önerilir.



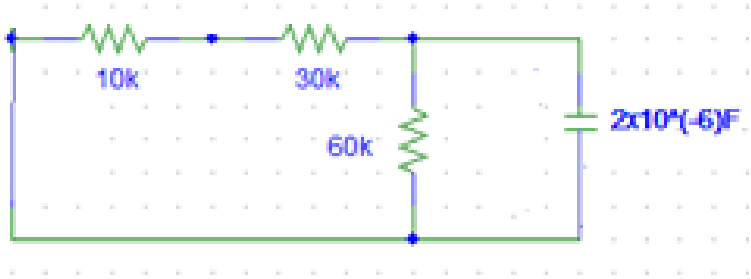
1.durum $I(0^-) = \frac{12}{(30+60).10^3} = 0,133mA$

$V_c(0^-) = 0,133.10^{-3}x60.10^3 = 8V = V_c(0^+)$



2.durum $I(\infty) = \frac{12}{(10+30+60).10^3} = 0{,}2mA$

$V_c(\infty) = 0{,}12.10^{-3}x60.10^3 = 7{,}2V = V_czor$



2.durum Zaman sabiti $\tau = R_{eş}xC$ $R_{eş}$ => (2. durumda kondansatörden görülen eşdeğer direnç, gerilim kaynağı varsa kısa devre, akım kaynağı varsa açık devre yapılarak bulunur.)

$R_{eş} = \frac{60.10^3x(10.10^3+30.10^3)}{60.10^3+(10.10^3+30.10^3)} = 24.10^3\Omega$

$\tau = R_{eş}xC = 24.10^3x2x10^{-6} = 48.1010^{-3} = 0{,}048$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$$\frac{1}{10000+30000} + \frac{1}{60000} + \frac{1}{\frac{1}{0{,}000002.r}} = 0$$

$$\frac{1}{\frac{40000}{3}} + \frac{1}{\frac{60000}{2}} + \frac{0{,}000002.r}{\frac{1}{120000}} = 0$$

$3 + 2 + 0{,}24.r = 0$

$5 + 0{,}24.r = 0$

$r = -\frac{5}{0{,}24} = -\frac{1}{0{,}048}$

$V_C(t) = A.e^{-\frac{t}{\tau}} + V_C(\infty)$

$V_C(t) = A.e^{-\frac{t}{0,048}} + 7,2$

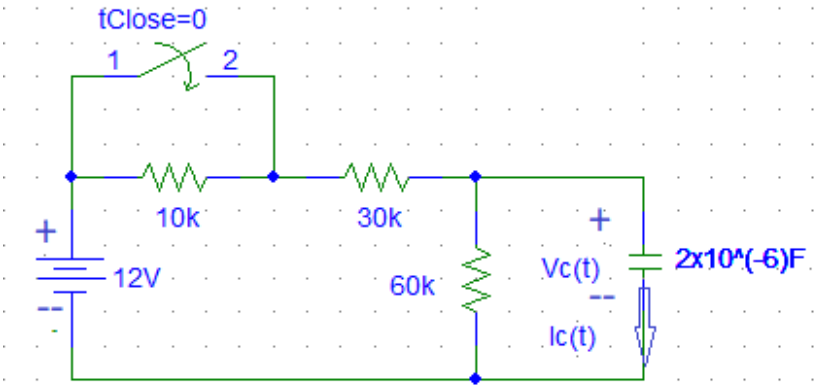
A katsayısı başlangıç şartı olan $V_C(0^+)$'dan bulunur.

t= 0 için $V_c(0^+) = 8V$

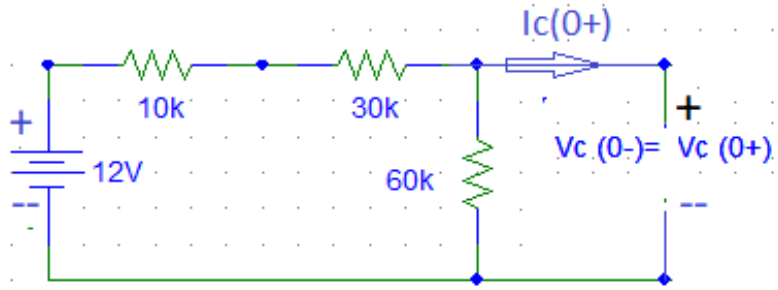
$8 = A.1 + 7,2 \qquad A = 0,8$

$V_C(t) = \left(0,8.e^{-\frac{t}{0,048}} + 7,2\right).u(t)V$

$I_C(t) = C.\frac{d_{VC}}{dt} = 2x10^{-6}.\left(\left(-\frac{1}{0,048}\right).(0,8)\,e^{-\frac{t}{0,048}}\right)A$

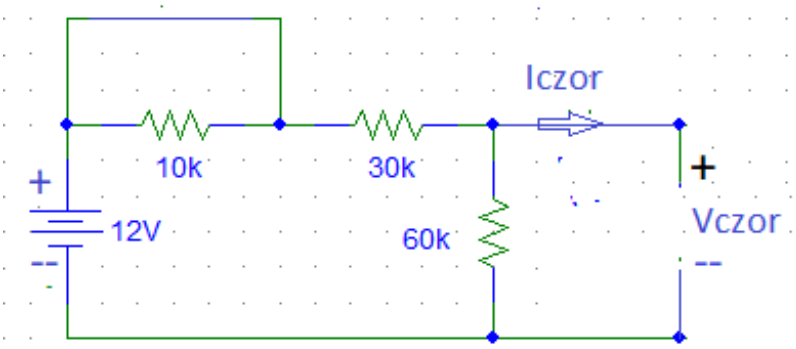


Anahtar uzun süre açık kaldıktan sonra t = 0 anında kapatılıyor. t ≥ 0 için Vc(t) ve Ic(t)'yi bulunuz. $V_c(t) = V_{cöz} + V_{czorlanmış}$ şeklinde önerilir.



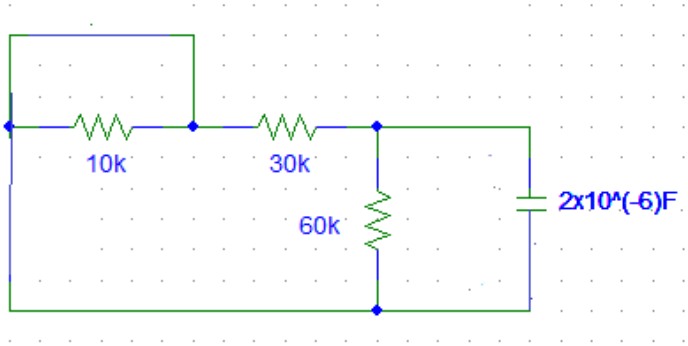
1.durum $I(0^-) = \frac{12}{(10+30+60).10^3} = 0,12mA$

$V_c(0^-) = 0,12.10^{-3}x60.10^3 = 7,2V = V_c(0^+)$



2.durum $I(\infty) = \frac{12}{(30+60).10^3} = 0{,}133mA$

$V_c(\infty) = 0{,}133.10^{-3}x60.10^3 = 8V = V_czor$



2.durum Zaman sabiti $\tau = R_{eş}xC$ $R_{eş}$ => (2. durumda kondansatörden görülen eşdeğer direnç, gerilim kaynağı varsa kısa devre, akım kaynağı varsa açık devre yapılarak bulunur.)

$R_{eş} = \frac{60.10^3 x 30.10^3}{60.10^3+30.10^3} = 20.10^3\Omega$

$\tau = R_{eş}xC = 20.10^3x2x10^{-6} = 40.1010^{-3} = 0{,}04$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$\frac{1}{30000} + \frac{1}{60000} + \frac{1}{\frac{1}{0{,}000002.r}} = 0$

$\frac{1}{\frac{30000}{4}} + \frac{1}{\frac{60000}{2}} + \frac{0{,}000002.r}{\frac{1}{120000}} = 0$

$4 + 2 + 0{,}24.r = 0$

$6 + 0{,}24.r = 0$

$r = -\frac{6}{0{,}24} = -\frac{1}{0{,}04}$

$V_C(t) = A.e^{-\frac{t}{\tau}} + V_C(\infty)$

$V_C(t) = A.e^{-\frac{t}{0,04}} + 8$

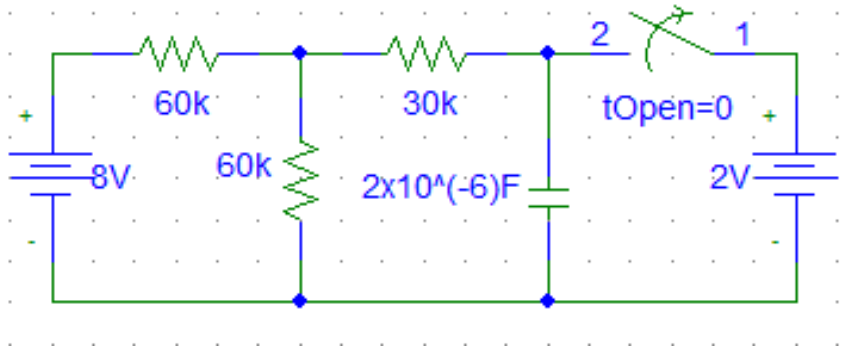
A katsayısı başlangıç şartı olan $V_C(0^+)$'dan bulunur.

t= 0 için $V_c(0^+) = 7,2V$

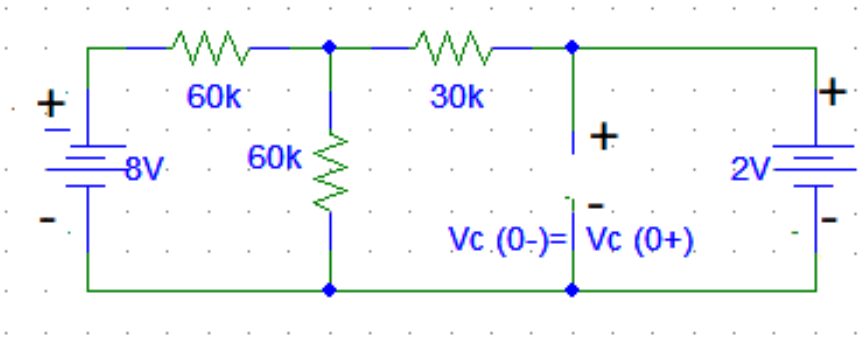
$7,2 = A.1 + 8 \qquad A = -0,8$

$V_C(t) = \left(-0,8.e^{-\frac{t}{0,04}} + 8\right).u(t)V$

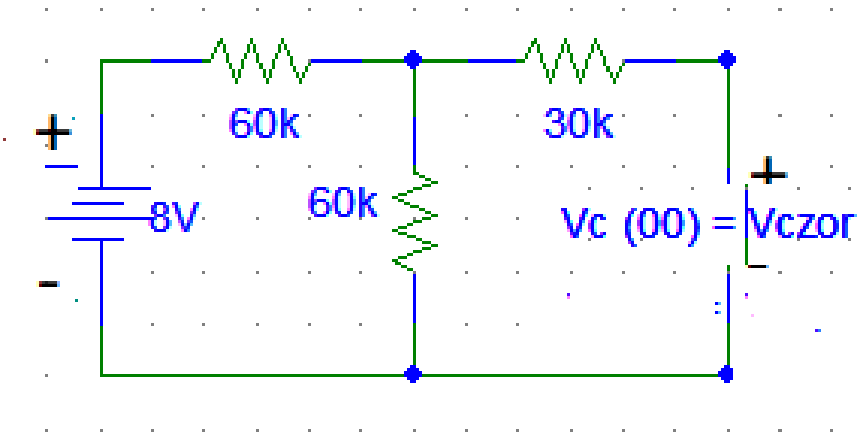
$I_C(t) = C.\frac{d_{VC}}{dt} = 2x10^{-6}.\left(\left(-\frac{1}{0,04}\right).(-0,8).e^{-\frac{t}{0,04}}\right)A$



Anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. t ≥ 0 için Vc(t) ve Ic(t)'yi bulunuz. $V_c(t) = V_{cöz} + V_{czorlanmış}$ şeklinde önerilir.

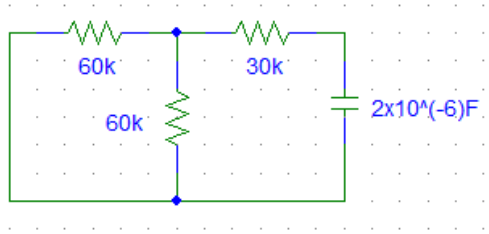


1.durum $V_c(0^-) = 2V = V_c(0^+)$



2.durum $I(\infty) = \frac{8}{(60+60).10^3} = 0{,}066mA$

$V_c(\infty) = 0{,}066.10^{-3}x60.10^{3=}4V = V_c zor$



2.durum Zaman sabiti τ = $R_{eş}$xC $R_{eş}$ => (2. durumda kondansatörden görülen eşdeğer direnç, gerilim kaynağı varsa kısa devre, akım kaynağı varsa açık devre yapılarak bulunur.)

$R_{eş} = \frac{60.10^3 x 60.10^3}{60.10^3+60.10^3} + 30.10^3 = 60.10^3\Omega$

$\tau = R_{eş}xC = 60.10^3x2x10^{-6} = 0{,}12$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$\frac{1}{60000} + \frac{1}{60000} + \frac{1}{30000+\frac{1}{0{,}000002.r}} = 0$

$\frac{2}{60000} + \frac{0{,}000002}{0{,}06.r+1} = 0$

$\frac{\frac{2}{60000}}{0{,}06.r+1} + \frac{0{,}000002.r}{\frac{0{,}06r+1}{60000}} = 0$

$0{,}12.r + 2 + 0{,}12.r = 0$

$2 + 0{,}24.r = 0$

$r = -\frac{2}{0,24} = -\frac{1}{0,12}$

$V_C(t) = A.e^{-\frac{t}{\tau}} + V_C(\infty)$

$V_C(t) = A.e^{-\frac{t}{0,12}} + 4$

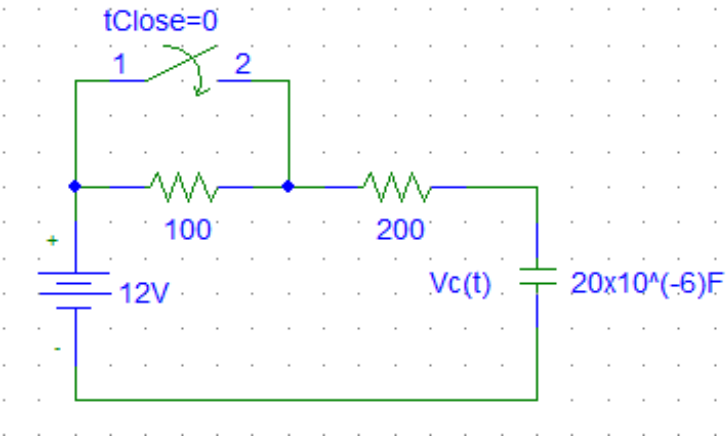
A katsayısı başlangıç şartı olan $V_C(0^+)$'dan bulunur.

t= 0 için $V_c(0^+) = 2V$

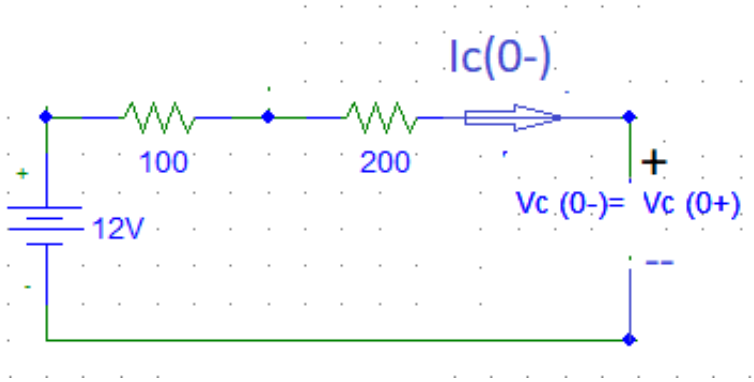
$2 = A.1 + 4 \qquad A = -2$

$V_C(t) = \left(-2.e^{-\frac{t}{0,12}} + 4\right).u(t)V$

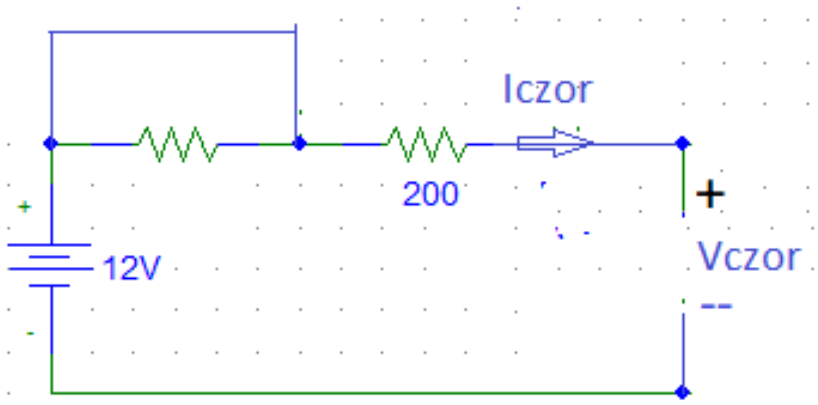
$I_C(t) = C.\frac{d_{VC}}{dt} = 2x10^{-6}.\left(\left(-\frac{1}{0,12}\right).(-2).e^{-\frac{t}{0,12}}\right)A$



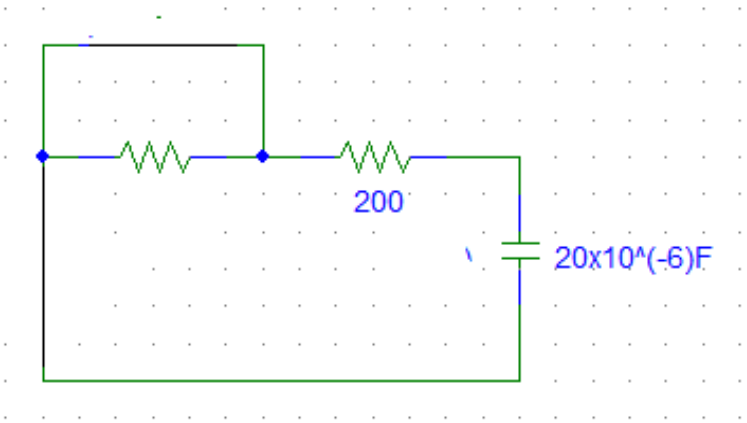
Anahtar uzun süre açık kaldıktan sonra t = 0 anında kapatılıyor. t ≥ 0 için Vc(t) ve Ic(t)'yi bulunuz. $V_c(t) = V_{cöz} + V_{czorlanmış}$ şeklinde önerilir.



1.durum $V_c(0^-) = 12V = V_c(0^+)$



2.durum $V_c(\infty) = 12V = V_c zor$



2.durum Zaman sabiti $\tau = R_{eş}xC$ $R_{eş}$ => (2. durumda kondansatörden görülen eşdeğer direnç, gerilim kaynağı varsa kısa devre, akım kaynağı varsa açık devre yapılarak bulunur.)

$R_{eş} = 200\Omega$

$\tau = R_{eş}xC = 200x20x10^{-6} = 0{,}004$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$\frac{1}{200} + \frac{1}{\frac{1}{0{,}00002.r}} = 0$

$$\frac{1}{200} + \frac{0{,}00002.r}{\frac{1}{200}} = 0$$

$$1 + 0{,}004.r = 0$$

$$r = -\frac{1}{0{,}004}$$

$$V_C(t) = \text{A.}\, e^{-\frac{t}{\tau}} + V_C(\infty)$$

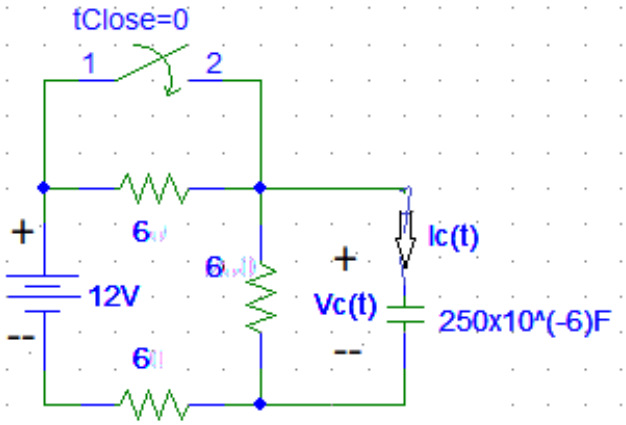
$$V_C(t) = \text{A.}\, e^{-\frac{t}{0{,}04}} + 12$$

A katsayısı başlangıç şartı olan $V_C(0^+)$'dan bulunur.

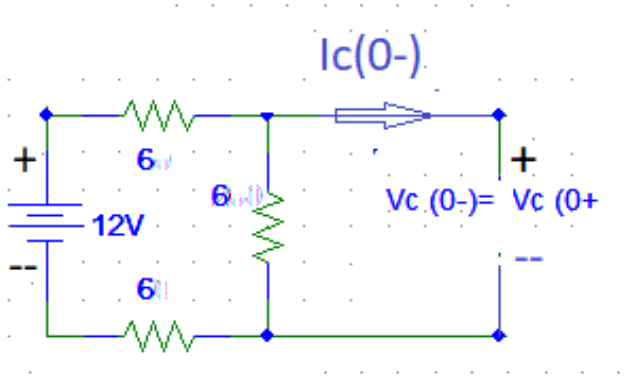
t= 0 için $V_c(0^+) = 12V$

$$12 = \text{A.}\, 1 + 12 \qquad A = 0$$

$$V_C(t) = 12V$$

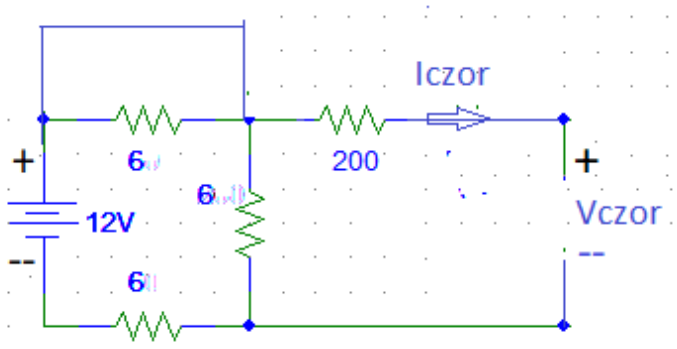


Anahtar uzun süre açık kaldıktan sonra t = 0 anında kapatılıyor. t ≥ 0 için Vc(t) ve Ic(t)'yi bulunuz. $V_c(t) = V_{cöz} + V_{czorlanmış}$ şeklinde önerilir.

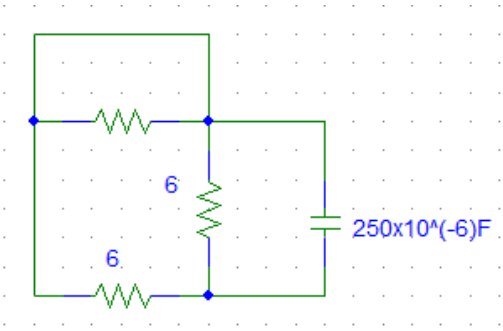


1.durum $I_6(0^-) = \frac{12}{(6+6+6)} = 0{,}666A$

$V_c(0^-) = 0{,}666x6 = 4 = V_c(0^+)$



2.durum $I_6(\infty) = \frac{12}{(6+6)} = 1A$ $V_c(\infty) = 1x6 = 6V = V_czor$



2.durum Zaman sabiti $\tau = R_{eş}xC$ $R_{eş}$ => (2. durumda kondansatörden görülen eşdeğer direnç, gerilim kaynağı varsa kısa devre, akım kaynağı varsa açık devre yapılarak bulunur.)

$R_{eş} = \frac{6x6}{6+6} = 3\Omega$

$\tau = R_{eş}xC = 3x250x10^{-6} = 0{,}00075$

$r = -\frac{1}{\tau}$ $\tau = -\frac{1}{r}$

$\frac{1}{6} + \frac{1}{6} + \frac{1}{\frac{1}{0{,}000350.r}} = 0$

$\frac{1}{3} + \frac{0{,}000250.r}{\frac{1}{3}} = 0$

$1 + 0.00075.r = 0$

$r = -\frac{1}{0{,}00075}$

$$V_C(t) = \text{A}.\,\text{e}^{-\frac{t}{0{,}75.10^{-3}}} + V_C(\infty)$$

$$V_C(t) = \text{A}.\,\text{e}^{-\frac{t}{4}} + 6$$

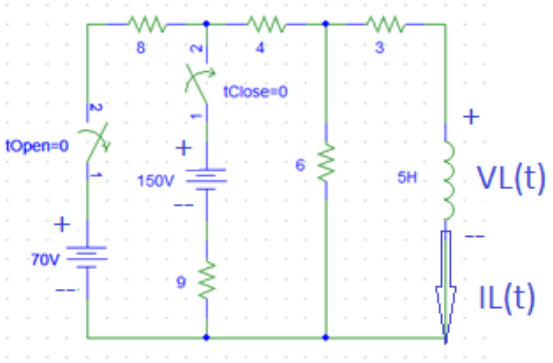
A katsayısı başlangıç şartı olan $V_C(0^+)$'dan bulunur.

t= 0 için $V_c(0^+) = 4V$

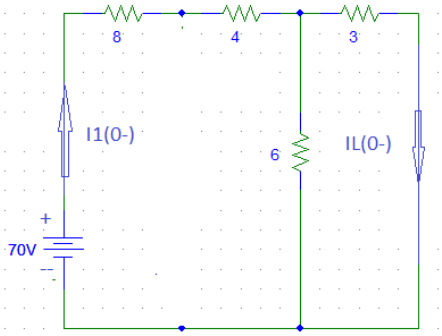
$$4 = \text{A}.1 + 6 \qquad A = -2$$

$$V_C(t) = \left(-2.e^{-\frac{t}{0{,}75.10^{-3}}} + 6\right).u(t)V$$

$$I_C(t) = C.\frac{d_{\text{VC}}}{\text{dt}} = 250x10^{-6}.\left(\left(-\frac{1}{0{,}75.10^{-3}}\right).(-2).e^{-\frac{t}{0{,}75.10^{-3}}}\right)A$$

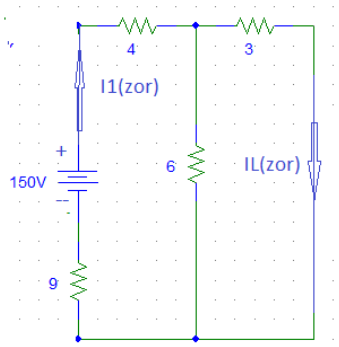


70 V'luk kaynaktaki anahtar uzun süre kapalı kaldıktan sonra t = 0 anında açılıyor. 150 V'luk kaynaktaki anahtar uzun süre anahtar ise açık kaldıktan sonra t=0 anında kapatılıyor. t ≥ 0 için IL(t) ve VL(t)'yi bulunuz.



1durum $\begin{vmatrix} 8+4+6 & -6 \\ -6 & 6+3 \end{vmatrix} \begin{vmatrix} I1(0-) \\ IL(0-) \end{vmatrix} = \begin{vmatrix} 70 \\ 0 \end{vmatrix}$

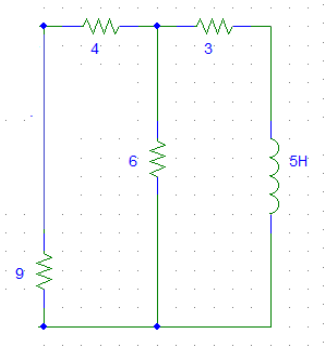
$$I_{\text{L}}(0^-) = \frac{\begin{vmatrix} 18 & 70 \\ -6 & 0 \end{vmatrix}}{\begin{vmatrix} 18 & -6 \\ -6 & 9 \end{vmatrix}} 1 = \frac{18x0-(70x(-6))}{18x9-((-6)(-6))} = \frac{420}{162-36} = 3{,}33 = I_{\text{L}}(0+)$$



2.durum $\begin{vmatrix} 9+4+6 & -6 \\ -6 & 6+3 \end{vmatrix} \begin{vmatrix} I1zor \\ ILzor \end{vmatrix} = \begin{vmatrix} 150 \\ 0 \end{vmatrix}$

$$I_{\mathrm{L}}(\infty) = \frac{\begin{vmatrix} 19 & 150 \\ -6 & 0 \end{vmatrix}}{\begin{vmatrix} 19 & -6 \\ -6 & 9 \end{vmatrix}} 1 = \frac{19x0-(150x(-6))}{19x9-((-6)(-6))} = \frac{900}{171-36} = 6{,}66 = ILzor$$

Zaman sabiti $\tau = \mathrm{L}/\mathrm{R}_{\mathrm{eş}}$ $\mathrm{R}_{\mathrm{eş}}$ => (2. durumda selften görülen eşdeğer direnç, gerilim kaynağı kısa devre, akım kaynağı açık devre yapılarak bulunur.)



$$R_{\mathrm{eş}} = \frac{(9+4)x6}{(9+4)+6} + 3 = 7{,}1\Omega$$

$$\tau = \frac{\mathrm{L}}{\mathrm{Reş}} = \frac{5}{7{,}1} = \frac{5}{7{,}1}$$

$$r = -\frac{1}{\tau} \qquad \tau = -\frac{1}{\mathrm{r}}$$

$$\frac{1}{4+9} + \frac{1}{6} + \frac{1}{3+5.r} = 0$$

$$\frac{1}{13} + \frac{1}{6} + \frac{1}{3+5.r} = 0$$

$$\frac{6.(3+5.r)}{78} \quad \frac{13.(3+5.r)}{78}$$

$$18 + 30.r + 39 + 65.r + 78 = 0$$

$$95.r + 135 = 0$$

$r = -1{,}42$

$I_L(t) = \text{A}.\, e^{-\frac{t}{\tau}} + I_L(\infty)$

$I_L(t) = \text{A}.\, e^{-\frac{t}{\frac{5}{7{,}1}}} + 6{,}66$

t = 0 için $I_L(0^+) = 3{,}33A$

$3{,}33 = \text{A} + 6{,}66 \qquad \text{A} = -3{,}33$

$I_L(t) = \text{A}.\, e^{-\frac{t}{\tau}} + I_L(\infty)$

$I_L(t) = \left(-3{,}33.\, e^{--\frac{7{,}1}{5}.t} + 6{,}66\right).u(t)A$

$V_L(t) = L.\frac{d_{\text{iL}}}{\text{dt}} = 5.\left(\left(-\frac{7{,}1}{5}\right).(-3{,}33).\, e^{--\frac{7{,}1}{5}.t}\right)V$