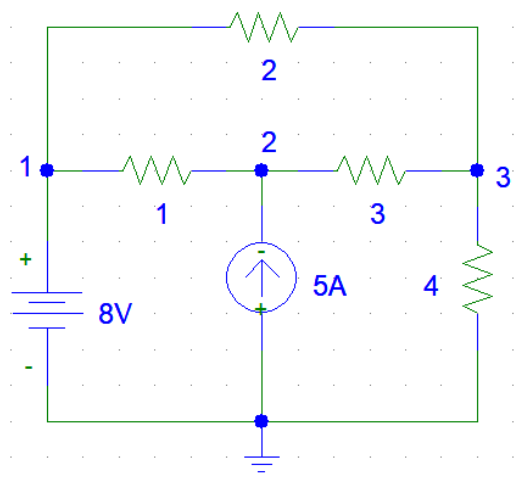




$$\frac{V_2 - 8}{1} + \frac{V_2 - V_3}{3} = 5$$

$$\frac{V_3 - 8}{2} + \frac{V_3}{4} + \frac{V_3 - V_2}{3} = 0$$

$$V_2 \left[1 + \frac{1}{3} \right] + \frac{V_3}{3} = 5$$

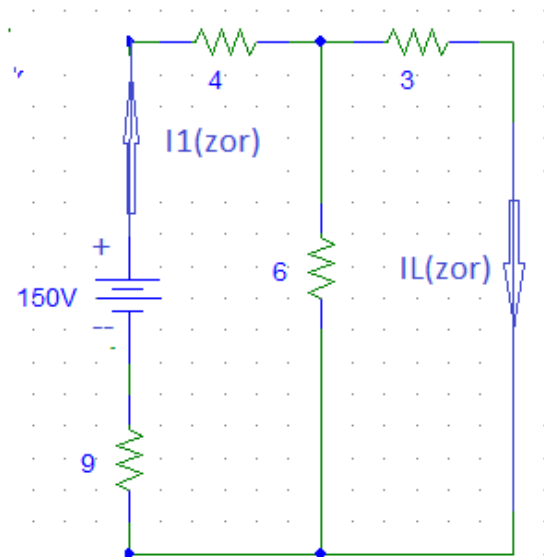
$$\frac{V_2}{3} + V_3 \left[\frac{1}{2} + \frac{1}{4} + \frac{1}{3} \right] = 0$$

$$\frac{4V_2}{3} - \frac{V_3}{3} = 0$$

$$-\frac{V_2}{3} + \frac{13}{12}V_3 = 0$$

$$V_2 = \frac{\begin{vmatrix} 13 & -\frac{1}{3} \\ 0 & \frac{13}{12} \end{vmatrix}}{\begin{vmatrix} \frac{4}{3} & -\frac{1}{3} \\ -\frac{1}{3} & \frac{13}{12} \end{vmatrix}} = \frac{\frac{169}{12}}{\frac{52}{36} - \frac{1}{9}} = \frac{\frac{169}{12}}{\frac{48}{36}} = \frac{169}{12} \cdot \frac{36}{48} = \frac{169}{16}$$

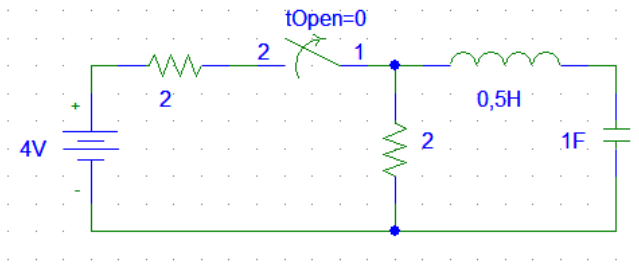
$$V_3 = \frac{\begin{vmatrix} \frac{4}{3} & 13 \\ -\frac{1}{3} & 0 \end{vmatrix}}{\begin{vmatrix} \frac{4}{3} & -\frac{1}{3} \\ -\frac{1}{3} & \frac{13}{12} \end{vmatrix}} = \frac{\frac{13}{3}}{\frac{52}{36} - \frac{1}{9}} = \frac{\frac{13}{3}}{\frac{48}{36}} = \frac{13}{3} \cdot \frac{36}{48} = \frac{13}{4}$$



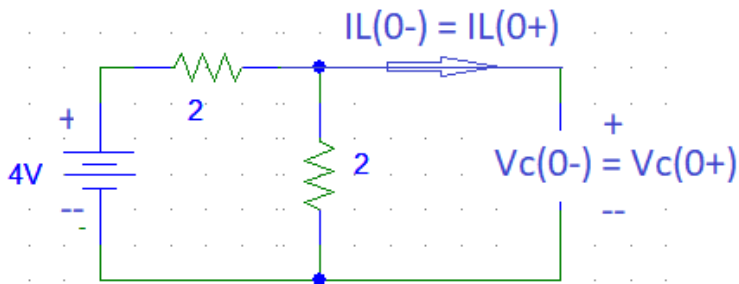
$$\begin{vmatrix} 9 + 4 + 6 & -6 \\ -6 & 6 + 3 \end{vmatrix} \begin{vmatrix} I1 \\ IL \end{vmatrix} = \begin{vmatrix} 150 \\ 0 \end{vmatrix}$$

$$I_{1\text{zor}} = \frac{\begin{vmatrix} 150 & -6 \\ 0 & 9 \end{vmatrix}}{\begin{vmatrix} 19 & -6 \\ -6 & 9 \end{vmatrix}} = \frac{150 \times 9 - (0 \times (-6))}{19 \times 9 - ((-6) \times (-6))} = \frac{1350}{171 - 36} = 10A$$

$$I_{L\text{zor}} = \frac{\begin{vmatrix} 19 & 150 \\ -6 & 0 \end{vmatrix}}{\begin{vmatrix} 19 & -6 \\ -6 & 9 \end{vmatrix}} = \frac{19 \times 0 - (150 \times (-6))}{19 \times 9 - ((-6) \times (-6))} = \frac{900}{171 - 36} = 6,66A$$

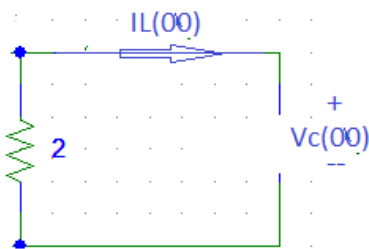


Anahtar uzun süre kapalı kaldıktan sonra $t = 0$ anında açılıyor. $t \geq 0$ için $I_L(t)$ ve $V_L(t)$ 'yi bulunuz.

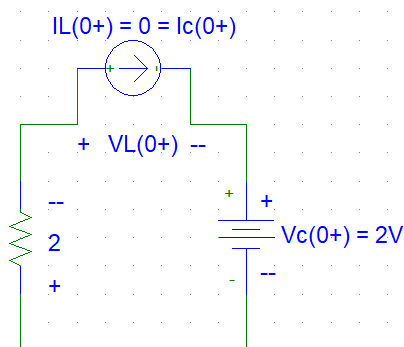


1.durum $I_L(0^-) = 0 = I_L(0^+) = I_C(0^+)$

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



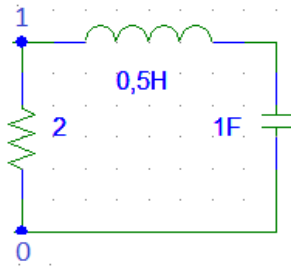
2.durum $I_L(\infty) = 0 = I_L \text{ zor}$



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

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

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



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

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

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

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

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

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

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

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

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

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

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

$$t = 0 \text{ için } I_L(0^+) = 0 \quad 0 = A.1 + B.1 + 0 \quad A. + B = 0$$

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

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

$$\begin{aligned} -3,414A - 0,586.B &= -4 & A. + B &= 0 \\ & & +3,414A + 3,414.B &= 0 \end{aligned}$$

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

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

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

$$A. + B = 0 \quad A. - 1,414 = 0 \quad A. = 1,414$$

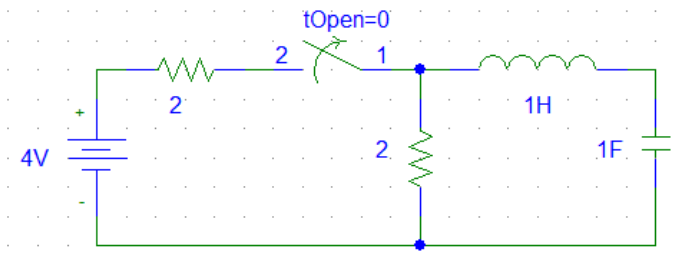
$$I_L(t) = A.e^{-3,414.t} + B.e^{-0,586.t} + I_L(\infty)$$

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

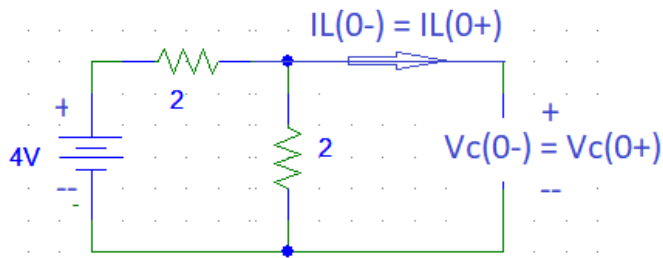
$$V_L(t) = L.\frac{d_{iL}}{dt} = 0,5.((-3,414).A.e^{-3,414.t} + (-0,586).B.e^{-0,586.t})$$

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

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

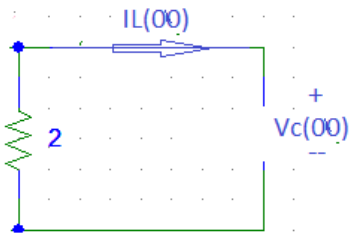


Anahtar uzun süre kapalı kaldıktan sonra $t = 0$ anında açılıyor. $t \geq 0$ için $I_L(t)$ ve $V_L(t)$ 'yi bulunuz.

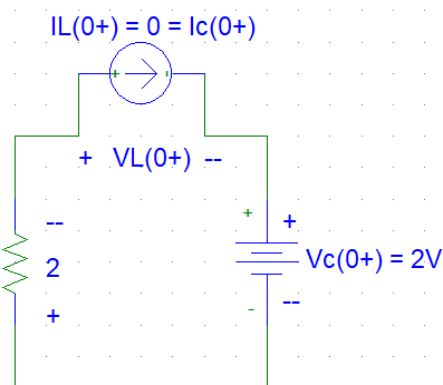


1.durum $I_L(0^-) = 0 = I_L(0^+) = I_C(0^+)$

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



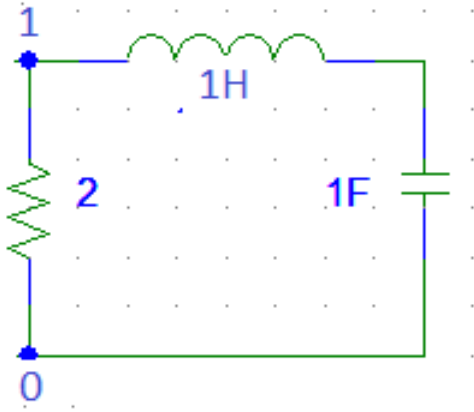
2.durum $I_L(\infty) = 0 = I_{Lzor}$



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

$$V_L(0^+) = -2 \times I_L(0^+) - V_c(0^+) \quad V_L(0^+) = -2 \times 0 - 2 \quad V_L(0^+) = -2$$

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



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

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

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

$$r^2 + 1 + 2 \cdot r = 0 \quad r^2 + 2 \cdot r + 1 = 0$$

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

$$r_1, r_2 = \frac{-b \mp \sqrt{b^2 - 4 \cdot a \cdot c}}{2 \cdot a} \quad r_1, r_2 = \frac{-2 \mp \sqrt{2^2 - 4 \cdot 1}}{2 \cdot 1} = \frac{-2 \mp \sqrt{4 - 2}}{2} = -1$$

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

$$I_L(t) = A \cdot e^{r_1 \cdot t} + B \cdot t \cdot e^{r_2 \cdot t} + I_L(\infty) \quad \text{k\"okler katlı}$$

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

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

$$t = 0 \text{ için } I_L(0^+) = 0$$

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

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

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

$$t = 0 \text{ için } V_L(0^+) = -2$$

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

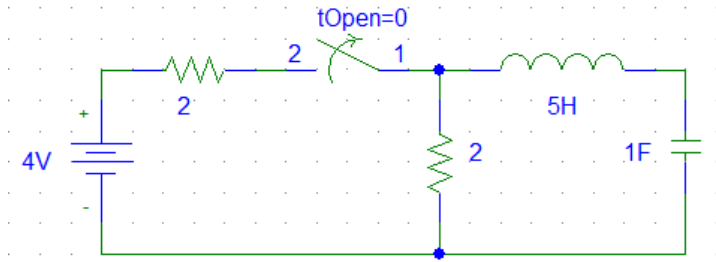
$$-2 = 1.(0 + B - 0)$$

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

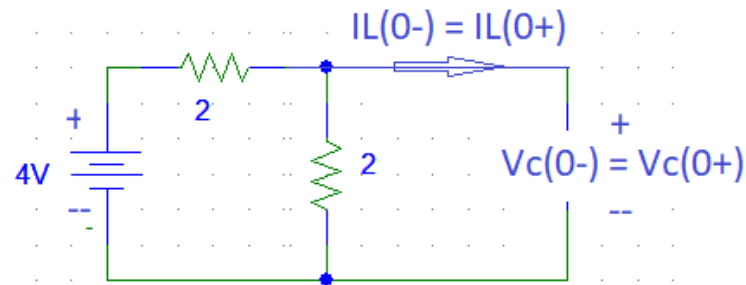
$$I_L(t) = A.e^{-1.t} + B.t.e^{-1.t}$$

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

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

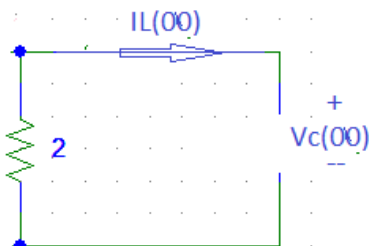


Anahtar uzun süre kapalı kaldıktan sonra $t = 0$ anında açılıyor. $t \geq 0$ için $I_L(t)$ ve $V_L(t)$ 'yi bulunuz.

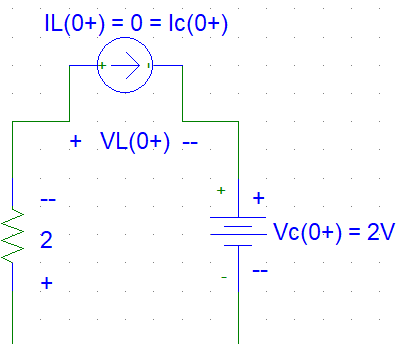


1.durum $I_L(0^-) = 0 = I_L(0^+) = I_C(0^+)$

$$V_C(0^-) = \frac{4}{(2+2)} \times 2 = 2V = V_C(0^+)$$



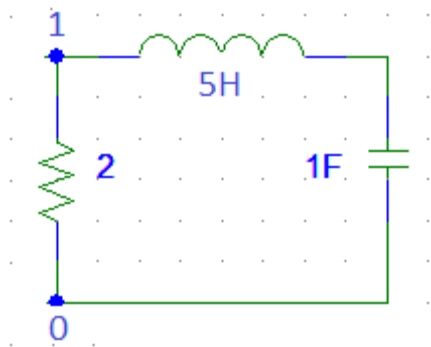
2.durum $I_L(\infty) = 0 = I_L \text{ zor}$



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

$$V_L(0^+) = -2 \times I_L(0^+) - V_C(0^+) \quad V_L(0^+) = -2 \times 0 - 2 \quad V_L(0^+) = -2$$

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



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

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

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

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

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

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

$$r_1 = -0,2 + j.0,4 \quad r_2 = -0,2 - j.0,4$$

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

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

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

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

$$t = 0 \text{ için } I_L(0^+) = 0 \quad 0 = 1(A. 1 + 0) + 0 \quad A = 0$$

$$V_L(t) = L. \frac{d_i L}{dt} = 5. \frac{d_i L}{dt} (e^{-0,2.t}(A. \cos 0,4t + B. \sin 0,4t))$$

$$V_L(t) = L. \frac{d_i L}{dt} = 5. \frac{d_i L}{dt} (e^{-0,2.t}(A. \cos 0,4t + e^{-0,2.t}. (B. \sin 0,4t).))$$

$$V_L(t) = 5. (-0,2. e^{-0,2.t}. (A. \cos 0,4t) - 0,4. A. \sin 0,4t. e^{-0,2.t} + -0,2. e^{-0,2.t}. (B. \sin 0,4t) + (0,4. B. \cos 0,4t). e^{-0,2.t}))$$

$$t = 0 \text{ için } V_L(0^+) = -2$$

$$-2 = 5. (-0,2.1. A. 1 - 0,4.0.0.1 - 0,2.1. B. 0 + 0,4. B.1.1)$$

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

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

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

$$I_L(t) = e^{-0,2.t}(0. \cos 0,4t - 1. \sin 0,4t) + 0$$

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

$$V_L(t) = L. \frac{d_i L}{dt} = 5. \frac{d_i L}{dt} (e^{-0,2.t}(-1. \sin 0,4t))$$

$$V_L(t) = 5. (-0,2e^{-0,2.t}(-1. \sin 0,4t) - 1.0,4. \cos 0,4t). e^{-0,2.t}$$

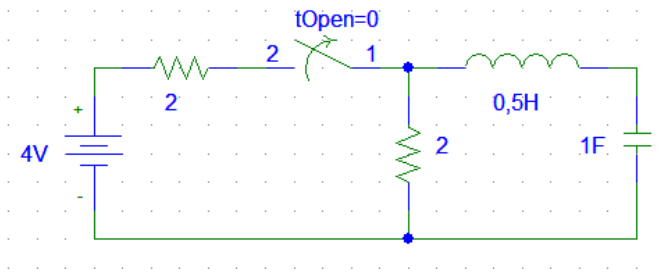
$$V_L(t) = e^{-0,2.t}. \sin 0,4t - 2. \cos 0,4t. e^{-0,2.t}$$

$$V_L(t) = L. \frac{d_i L}{dt} = 5. \frac{d_i L}{dt} (e^{-0,2.t}(A. \cos 0,4t + B. \sin 0,4t))$$

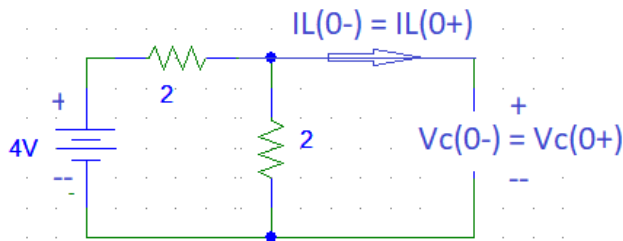
$$V_L(t) = 5. (-0,2. e^{-0,2.t}. (A. \cos 0,4t) - 0,4. A. \sin 0,4t. e^{-0,2.t} - 0,2. e^{-0,2.t}. (B. \sin 0,4t) + (0,4. B. \cos 0,4t). e^{-0,2.t}))$$

$$V_L(t) = 5. (-0,2. e^{-0,2.t}. (0. \cos 0,4t) - 0,4.0. \sin 0,4t. e^{-0,2.t} - 0,2. e^{-0,2.t}. ((-1). \sin 0,4t) + (0,4. (-1). \cos 0,4t). e^{-0,2.t}))$$

$$V_L(t) = e^{-0,2.t}. \sin 0,4t - 2. \cos 0,4t. e^{-0,2.t}$$

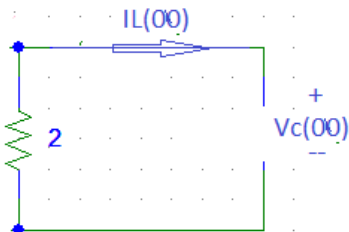


Anahtar uzun süre kapalı kaldıktan sonra $t = 0$ anında açılıyor. $t \geq 0$ için $V_c(t)$ ve $I_c(t)$ 'yi bulunuz.

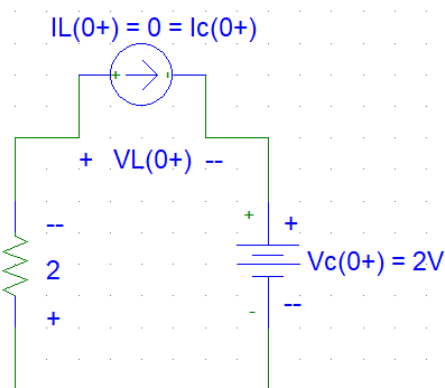


1.durum $V_c(0^-) = \frac{4}{(2+2)} \times 2 = 2V = V_c(0^+)$

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



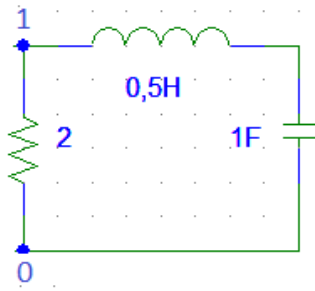
2.durum $V_c(\infty) = 0V = V_{c\text{zor}}$



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

$$V_L(0^+) = -2 \times I_L(0^+) - V_c(0^+) \quad V_L(0^+) = -2 \times 0 - 2 \quad V_L(0^+) = -2$$

$$I_c(0^+) = 0$$



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

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

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

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

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

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

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

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

$$V_c(t) = A. e^{r_1.t} + B. t. e^{r_2.t} + V_c(\infty)$$

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

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

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

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

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

$$-3,414A - 0,586. B = 0$$

$$A. + B = 2$$

$$+3,414A + 3,414. B = 6,828$$

$$-3,414A - 0,586. B = 0$$

$$+3,414A + 3,414. B = 6,828$$

$$2,828. B = 6,828$$

$$B = \frac{6,828}{2,828} = 2,414$$

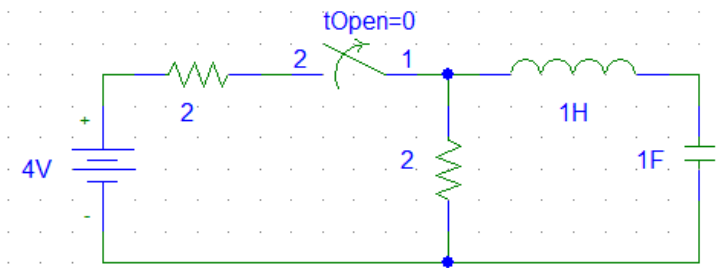
$$A. + B = 2 \quad A + 2,414 = 2 \quad A. = -0,414$$

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

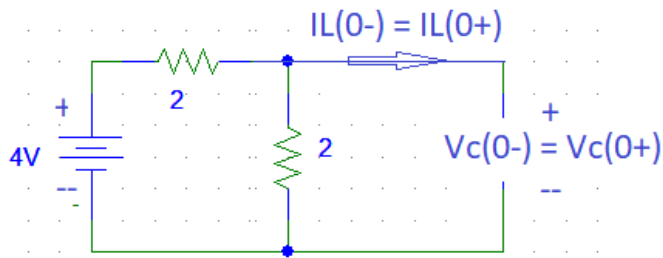
$$V_c(t) = -0,414. e^{-3,414.t} + 2,414. e^{-0,586.t}$$

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

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

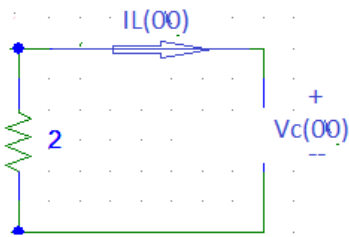


Anahtar uzun süre kapalı kaldıktan sonra $t = 0$ anında açılıyor. $t \geq 0$ için $V_c(t)$ ve $I_c(t)$ 'yi bulunuz.

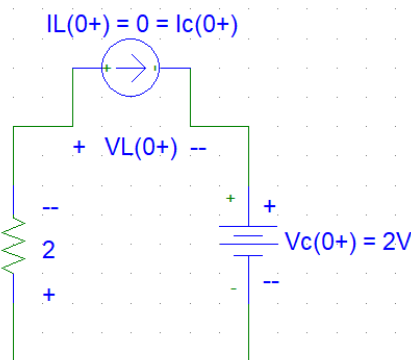


1.durum $V_c(0^-) = \frac{4}{(2+2)} \times 2 = 2V = V_c(0^+)$

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



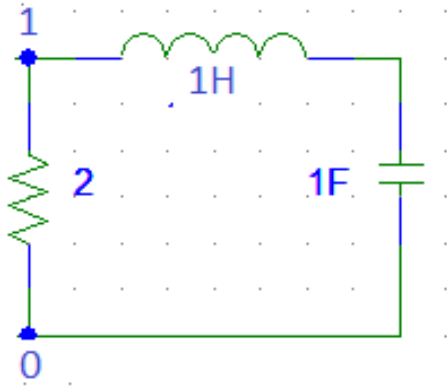
2.durum $V_c(\infty) = 0V = V_{c\text{zor}}$



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

$$V_L(0^+) = -2 \times I_L(0^+) - V_C(0^+) \quad V_L(0^+) = -2 \times 0 - 2 \quad V_L(0^+) = -2$$

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



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

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

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

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

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

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

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

$$V_c(t) = A.e^{r_1.t} + B.e^{r_2.t} + V_c(\infty)$$

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

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

$$t = 0 \text{ için } V_c(0^+) = 2$$

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

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

$$t = 0 \text{ için } I_c(0^+) = 0$$

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

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

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

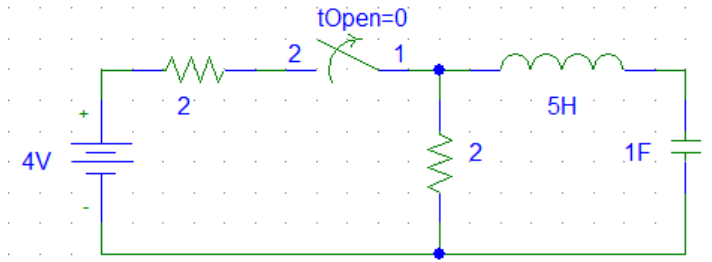
$$V_c(t) = A.e^{-1.t} + B.t.e^{-1.t} + 0$$

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

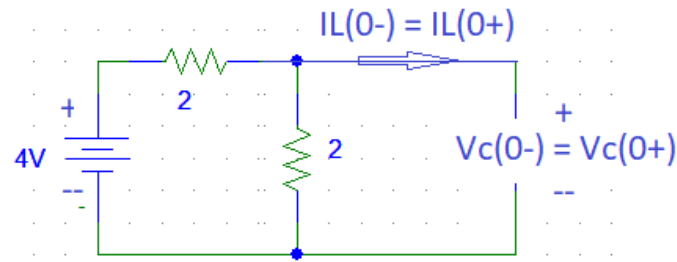
$$I_c(t) = C.\frac{d_{VC}}{dt} = 1.(-1.2.e^{-1.t} + 2.1.e^{-1.t} - 1.2.t.e^{-1.t})$$

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

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

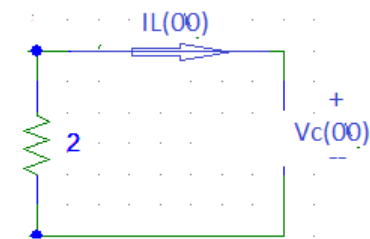


Anahtar uzun süre kapalı kaldıktan sonra $t = 0$ anında açılıyor. $t \geq 0$ için $I_L(t)$ ve $V_L(t)$ 'yi yada $V_C(t)$ ve $I_C(t)$ 'yi bulunuz.

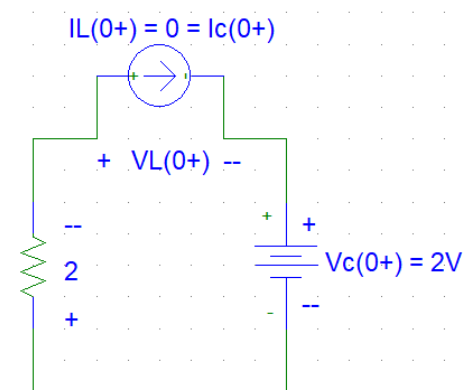


1.durum $V_C(0^-) = \frac{4}{(2+2)} \times 2 = 2V = V_C(0^+)$

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



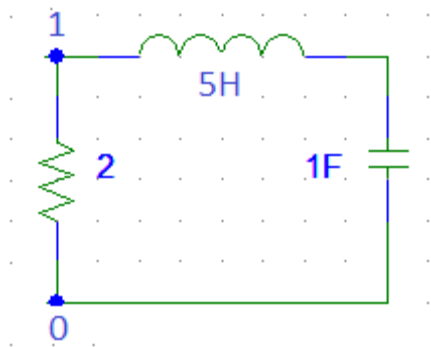
2.durum $V_C(\infty) = 0V = V_{Czor}$



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

$$V_L(0^+) = -2 \times I_L(0^+) - V_C(0^+) \quad V_L(0^+) = -2 \times 0 - 2 \quad V_L(0^+) = -2$$

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



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

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

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

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

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

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

$$r_1 = -0,2 + j.0,4 \quad r_2 = -0,2 - j.0,4$$

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

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

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

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

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

$$I_c(t) = C. \frac{dV_c}{dt} = 1. \frac{dV_c}{dt} (e^{-0,2.t}(A. \cos 0,4t) + e^{-0,2.t}(B. \sin 0,4t))$$

$$I_c(t) = 1. (-0,2. e^{-0,2.t}. (A. \cos 0,4t) - 0,4. A. \sin 0,4t. e^{-0,2.t} + -0,2. e^{-0,2.t}. (B. \sin 0,4t) + (0,4. B. \cos 0,4t). e^{-0,2.t}))$$

$$t = 0 \text{ için } I_c(0^+) = 0$$

$$0 = 1. (-0,2.1.2.1 - 0,4.2.0.1 - 0,2.1. B. 0 + 0,4. B.1.1)$$

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

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

$$V_c(t) = e^{-0,2.t}(2. \cos 0,4t + 1. \sin 0,4t) + 0$$

$$V_c(t) = e^{-0,2.t}. 2. \cos 0,4t + e^{-0,2.t}. \sin 0,4t$$

$$I_c(t) = 1. (-0,2. e^{-0,2.t}. (2. \cos 0,4t) - 0,4.2. \sin 0,4t. e^{-0,2.t} - 0,02. e^{-0,2.t}. (1. \sin 0,4t) + (0,4.1. \cos 0,4t). e^{-0,2.t}))$$

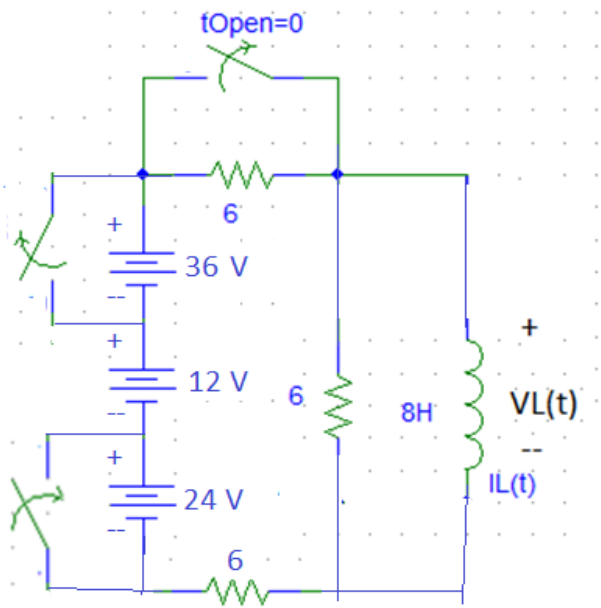
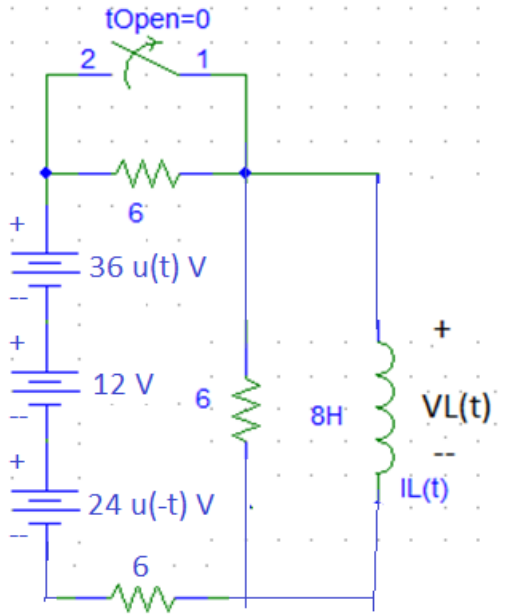
$$I_c(t) = C. \frac{dV_c}{dt} = 1. \frac{dV_c}{dt} (e^{-0,2.t} A. \cos 0,4t + e^{-0,2.t} B. \sin 0,4t)$$

$$I_c(t) = 1. (-0,2. e^{-0,2.t}. (A. \cos 0,4t) - 0,4. A. \sin 0,4t. e^{-0,2.t} - 0,2. e^{-0,2.t}. (B. \sin 0,4t) + (0,4. B. \cos 0,4t). e^{-0,2.t}))$$

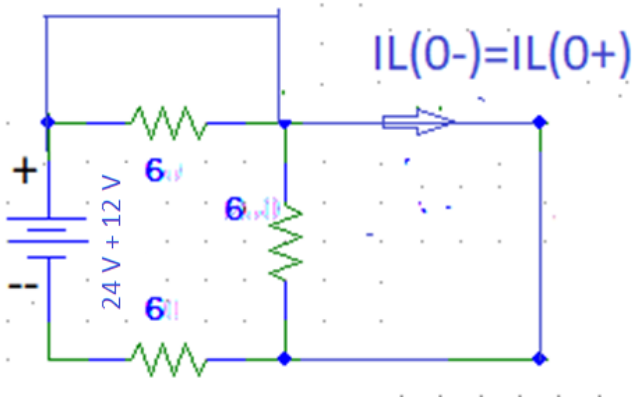
$$I_c(t) = 1. (-0,2. e^{-0,2.t}. (2. \cos 0,4t) - 0,4.2. \sin 0,4t. e^{-0,2.t} - 0,2. e^{-0,2.t}. (1. \sin 0,4t) + (0,4.1. \cos 0,4t). e^{-0,2.t}))$$

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

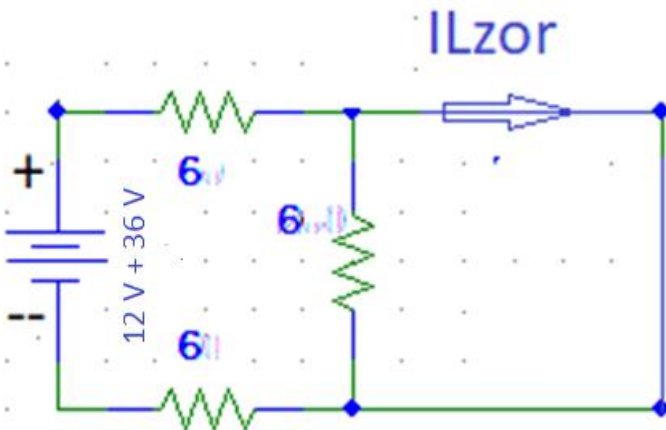
$$I_c(t) = -1. \sin 0,4t. e^{-0,2.t}$$



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

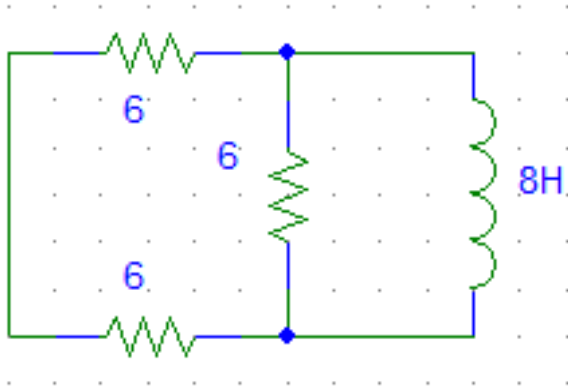


1.durum $I_L(0^-) = \frac{36}{6} = 6A = I_L(0^+)$ 6 Ohm kısa devre



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

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



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

$$\tau = \frac{L}{R_{eş}} = \frac{8}{4} = 2$$

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

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

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

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

$$18.r + 9 = 0$$

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

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

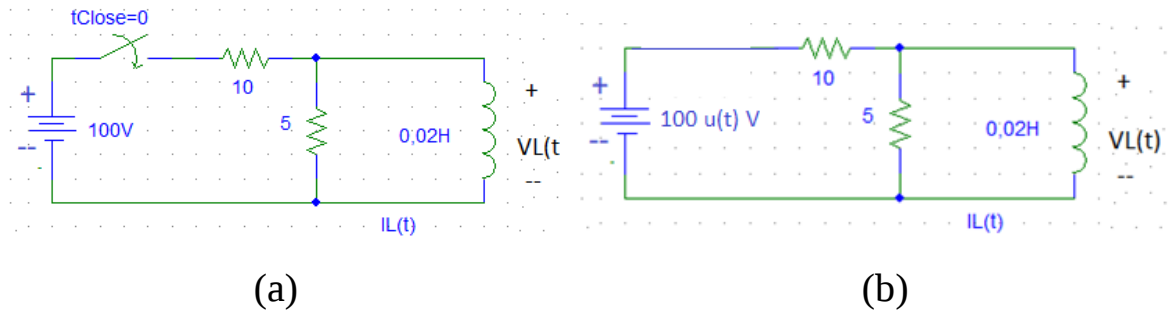
$$I_L(t) = A \cdot e^{-\frac{t}{2}} + 3$$

$$t = 0 \text{ için } I_L(0^+) = 6A$$

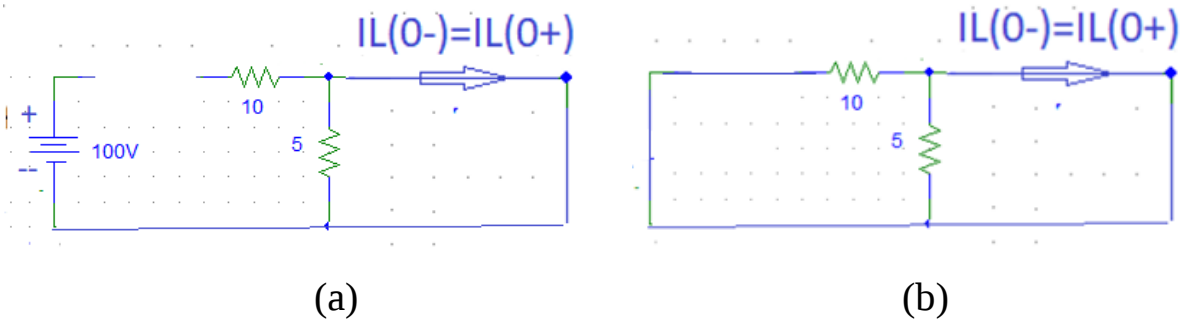
$$6 = A \cdot 1 + 3 \quad A = 3$$

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

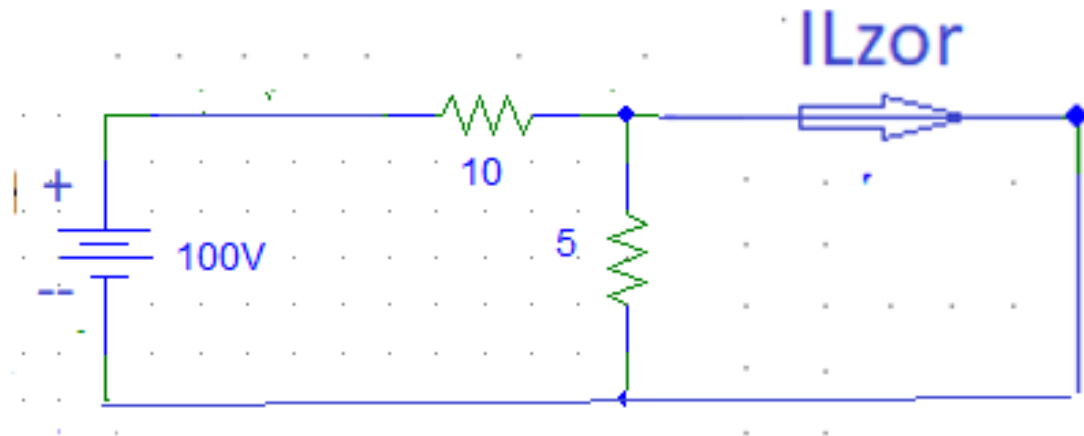
$$V_L(t) = L \cdot \frac{d i_L}{dt} = 8 \cdot \left((-0.5) \cdot 3 \cdot e^{-\frac{t}{2}} \right) = -12 \cdot e^{-\frac{t}{2}} V$$



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

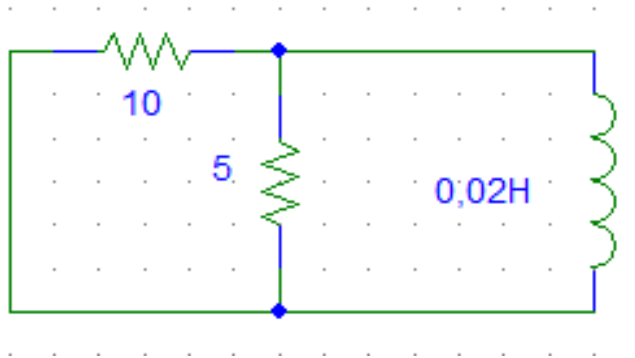


1.durum kaynak yok $I_L(0^-) = 0A = I_L(0^+)$



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

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



$$R_{eş} = \frac{10 \times 5}{10 + 5} = \frac{50}{15} \Omega \quad \tau = \frac{L}{R_{eş}} = \frac{0,02}{\frac{50}{15}} = \frac{0,3}{50} = \frac{1}{166,66}$$

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

$$\frac{1}{10} + \frac{1}{5} + \frac{1}{0,02 \cdot r} = 0 \quad \frac{1}{\frac{10}{5 \cdot r}} + \frac{1}{\frac{5}{10 \cdot r}} + \frac{1}{\frac{0,02 \cdot r}{2500}} = 0$$

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

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

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

$$t = 0 \text{ için } I_L(0^+) = 0A$$

$$0 = A \cdot 1 + 10 \quad A = -10$$

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

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

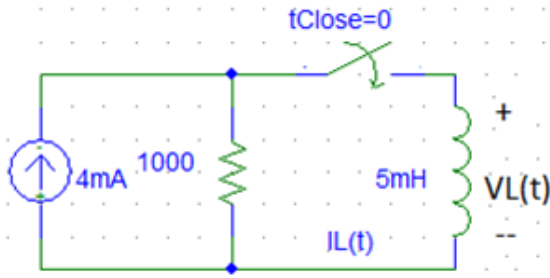
$$V_L(t) = 33,333 \cdot e^{-166,67 \cdot t}$$

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

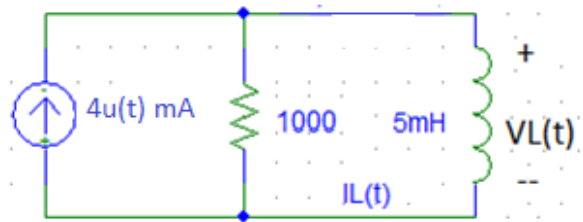
$$-100 + 10 \cdot I_{10}(t) + V_L(t) = 0 \quad I_{10}(t) = \frac{100 - V_L(t)}{10}$$

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

$$I_{10}(t) = 10 - 3,3333 \cdot e^{-166,67 \cdot t}$$

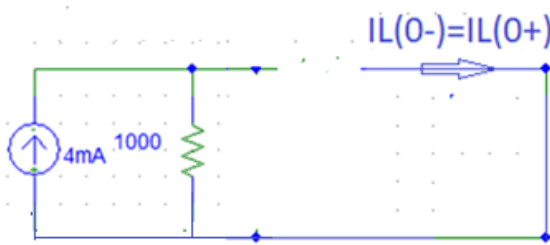


(a)

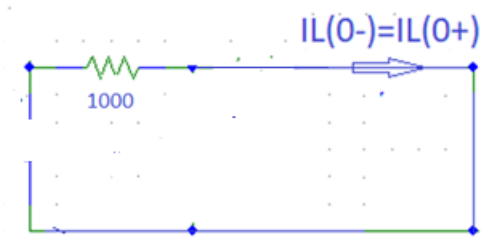


(b)

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

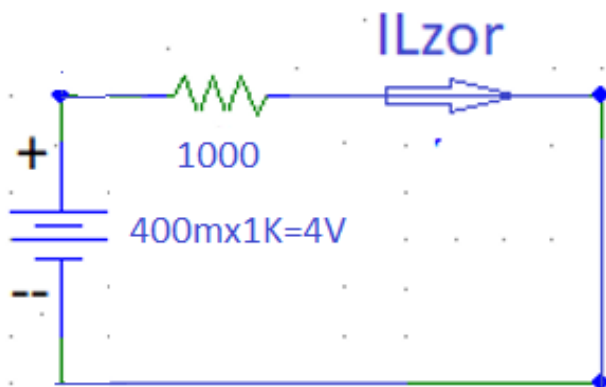


(a)



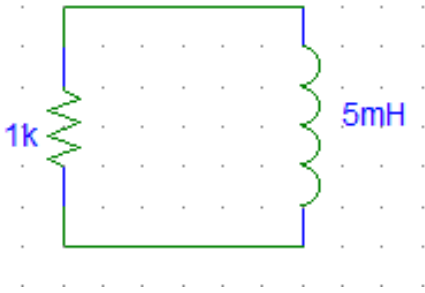
(b)

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



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

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



$$R_{eş} = 1000\Omega$$

$$\tau = \frac{L}{R_{eş}} = \frac{5\text{mH}}{1000} = \frac{1}{2 \times 10^5}$$

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

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

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

$$5 \cdot r + 10 \cdot r + 2500 = 0$$

$$0,005 \cdot r + 1000 = 0$$

$$r = -\frac{1000}{0,005} = -200000 = -2 \times 10^5$$

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

$$I_L(t) = A \cdot e^{-\frac{t}{\frac{1}{2 \times 10^5}}} + 0,004$$

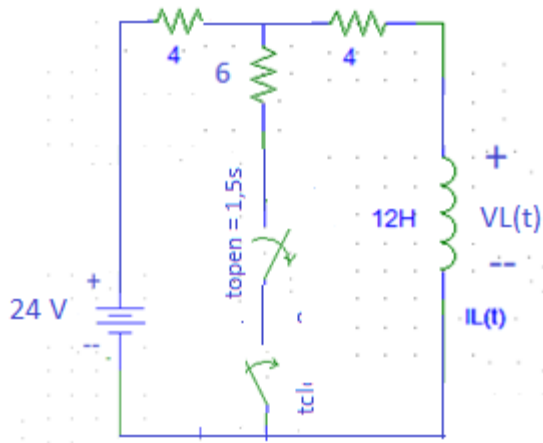
$$t=0 \text{ için } I_L(0^+) = 0A$$

$$0 = A + 0,004 \quad A = -0,004$$

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

$$I_L(t) = \left(-0,004 \cdot e^{-\frac{t}{\frac{1}{2 \times 10^5}}} + 0,004 \right) \cdot u(t)A$$

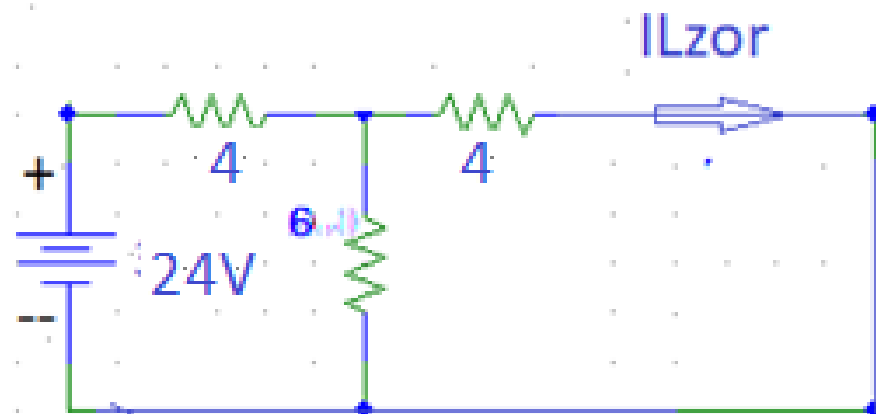
$$V_L(t) = L \cdot \frac{d i_L}{dt} = 0,005 \cdot \left((-0,004) \cdot (-2 \times 10^5) \cdot e^{-2 \times 10^5 t} \right) V$$



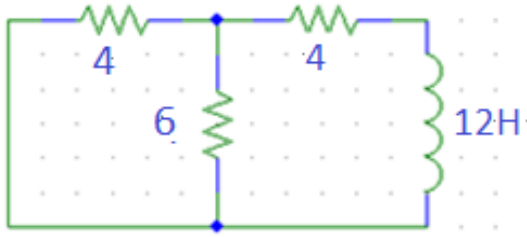
Anahtar uzun süre açık kaldıktan sonra $t = 0$ anında kapatılıyor. Daha sonra $t = 1,5s$ sonunda açılıyor. $t \geq 0$ için $I_L(t)$ ve $V_L(t)$ 'yi bulunuz.



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



2.durum $I_L(\infty) = \frac{24}{\frac{4 \times 6}{4+6} + 4} \times \frac{6}{4+6} = 2,25A = I_{Lzor}$



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

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

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

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

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

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

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

$$60.r + 32 = 0$$

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

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

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

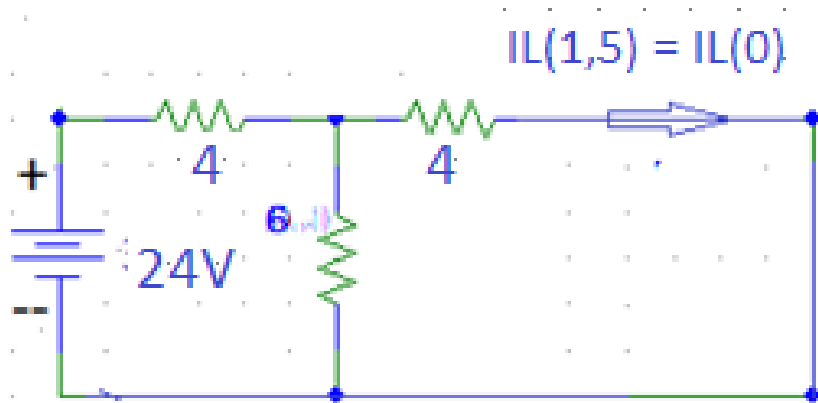
$$t=0 \text{ için } I_L(0^+) = 3A$$

$$3 = A \cdot 1 + 2,25 \quad A = 0,75$$

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

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

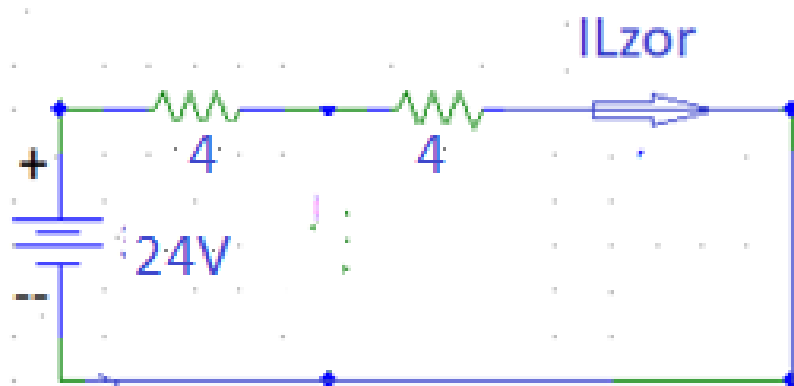
$$I_L(t) = \left(0,75 \cdot e^{-\frac{6,4.t}{12}} + 2,25 \right) \cdot u(t)A$$



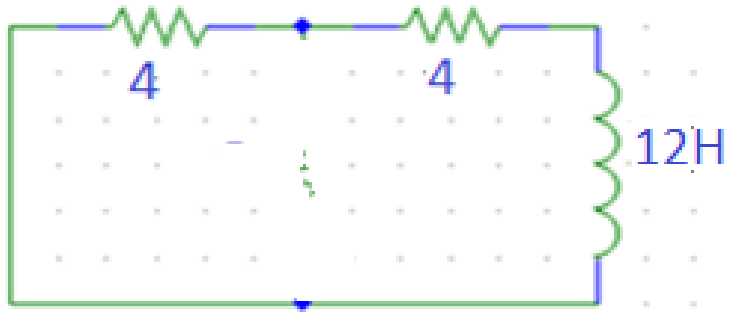
$$I_L(t) = \left(0,75 \cdot e^{-\frac{6,4 \cdot t}{12}} + 2,25 \right) \cdot u(t) A \quad (0 \leq t \leq 1,5s)$$

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

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



$$I_L(\infty) = \frac{24}{4 + 4} = 3 A = ILzor$$



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

$$R_{eş} = 4 + 4 = 8\Omega$$

$$\tau = \frac{L}{R_{eş}} = \frac{12}{8}$$

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

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

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

$$12.r + 8 = 0$$

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

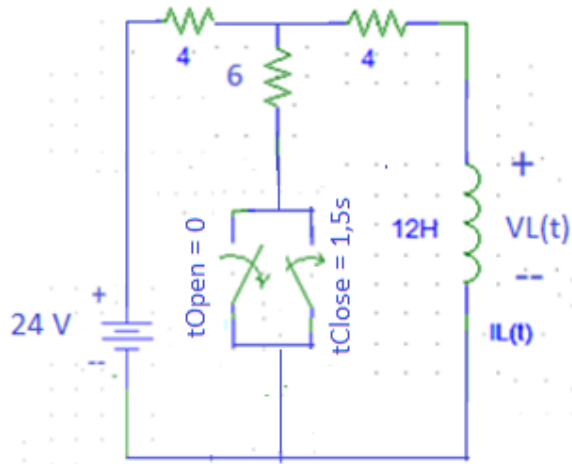
$$I_L(t) = A \cdot e^{-\frac{t}{\tau}} + I_L(\infty)$$

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

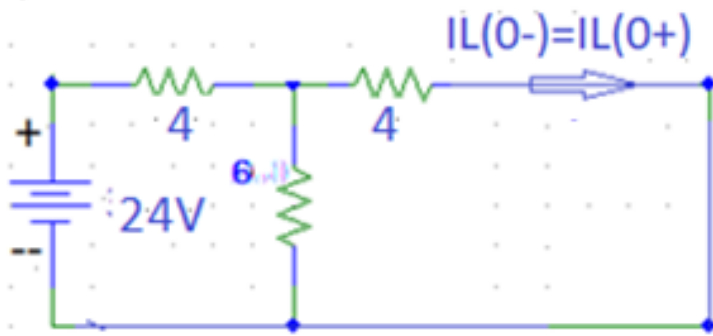
$$t = 0 \text{ için } I_L(1,5) = 2,59A \quad t \geq 1,5$$

$$2,4 = A \cdot 1 + 3 \quad A = -0,6$$

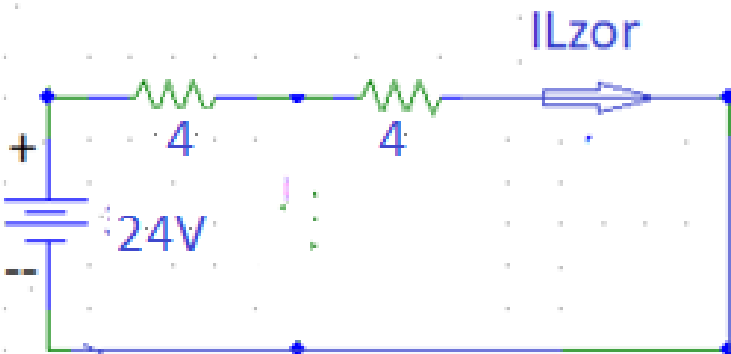
$$I_L(t) = \left(-0,41 \cdot e^{-\frac{8}{12} \cdot (t-1,5)} + 3 \right) \cdot u(t)A \quad 1,5s \geq t$$



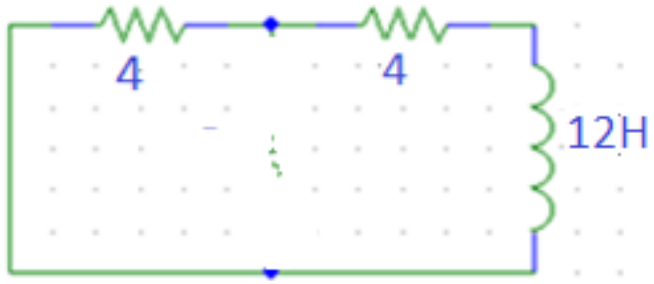
Anahtar uzun süre kapalı kaldıktan sonra $t = 0$ anında açılıyor. Daha sonra $t = 1,5s$ sonunda kapatılıyor. $t \geq 0$ için $I_L(t)$ ve $V_L(t)$ 'yi bulunuz.



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



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



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

$$R_{eş} = 4 + 4 = 8\Omega$$

$$\tau = \frac{L}{R_{eş}} = \frac{12}{8}$$

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

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

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

$$12.r + 8 = 0$$

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

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

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

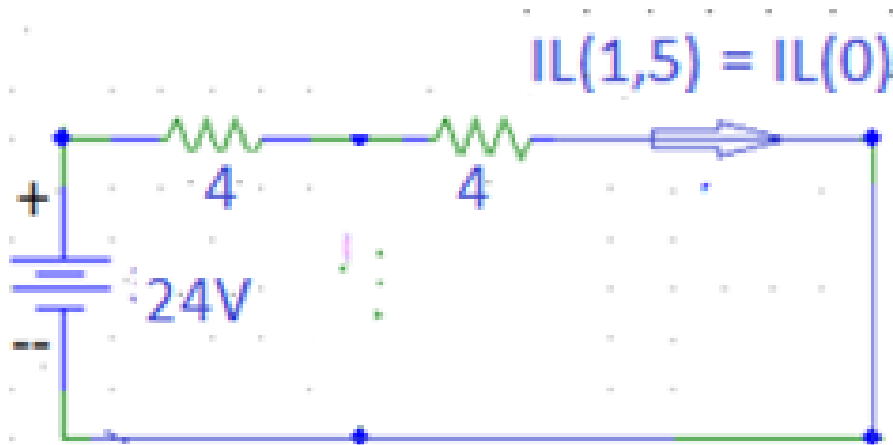
$$t=0 \text{ için } I_L(0^+) = 2,25A$$

$$2,25 = A \cdot 1 + 3 \quad A = -0,75$$

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

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

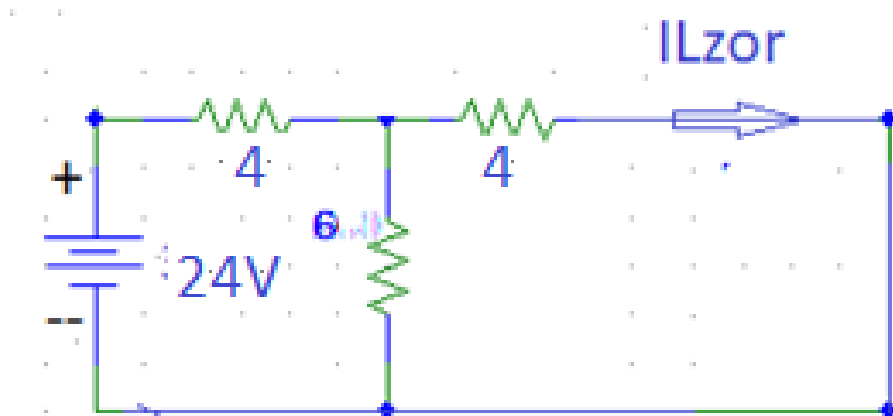
$$I_L(t) = \left(-0,75 \cdot e^{-\frac{12.t}{8}} + 2,25 \right) \cdot u(t)A$$



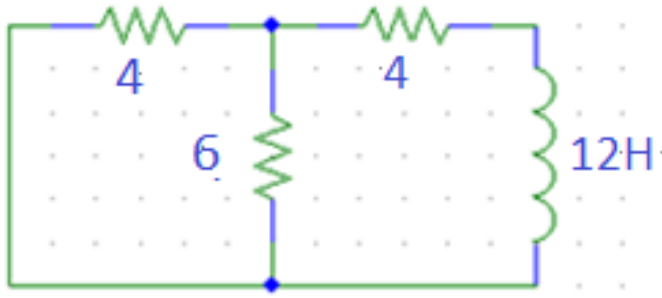
$$I_L(t) = \left(-0,75 \cdot e^{-\frac{12 \cdot t}{8}} + 2,25 \right) \cdot u(t) A \quad (0 \leq t \leq 1,5s)$$

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

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



$$2. \text{durum} \quad I_L(\infty) = \frac{24}{\frac{4 \times 6}{4+6} + 4} \times \frac{6}{4+6} = 2,25 A = I_{Lzor}$$



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

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

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

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

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

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

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

$$60.r + 32 = 0$$

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

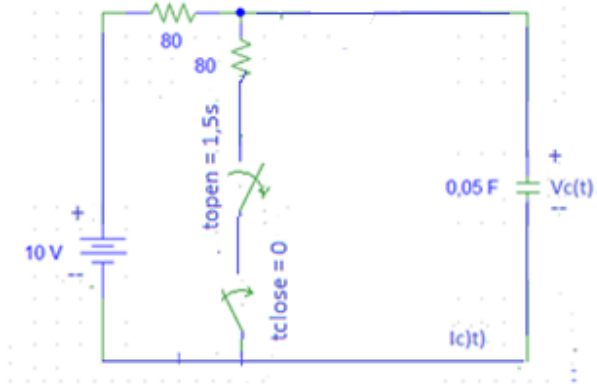
$$I_L(t) = A \cdot e^{-\frac{t}{\tau}} + I_L(\infty)$$

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

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

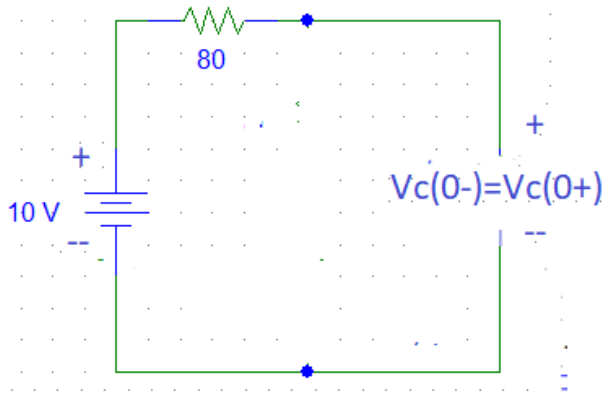
$$2,17 = A \cdot 1 + 2,25 \quad A = -0,08$$

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

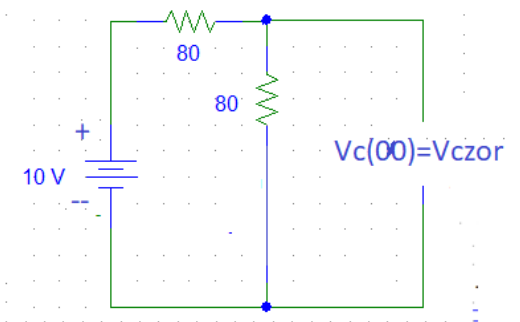


Anahtar uzun süre açık kaldıktan sonra $t = 0$ anında kapatılıyor. Daha sonra $t=1,5s$ sonunda açılıyor. $t \geq 0$ için $V_c(t)$ ve $I_c(t)$ 'yi bulunuz.

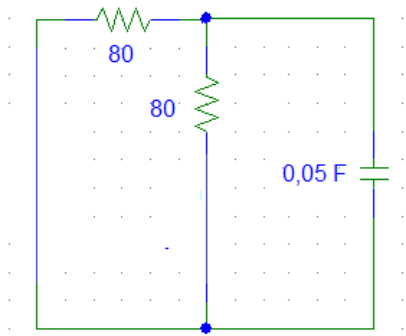
$V_c(t) = V_{c\text{öz}} + V_{c\text{zorlanmış}}$ şeklinde önerilir.



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



2.durum $V_c(\infty) = \frac{10}{(80+80)} \times 80 = 5V = V_{c\text{zor}}$



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

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

$$\tau = R_{eş} \times C = 40 \times 0,05 = 2$$

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

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

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

$$1 + 1 + 0,05 \cdot r = 0$$

$$2 + 4 \cdot r = 0$$

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

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

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

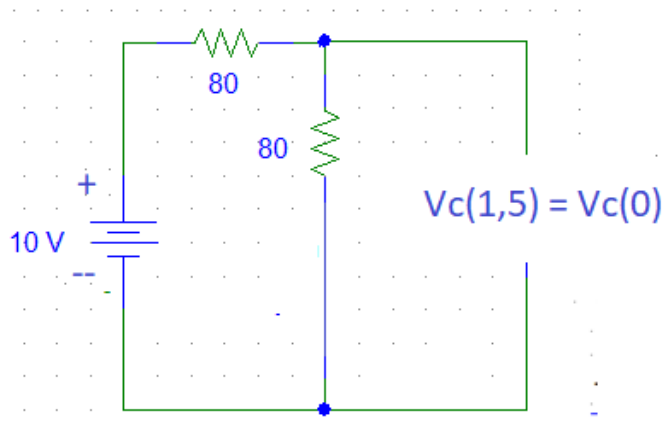
A katsayısı başlangıç şartı olan $V_C(0^+)$ 'dan bulunur.

$$t=0 \text{ için } V_C(0^+) = 10V$$

$$10 = A \cdot 1 + 5 \quad A = 5$$

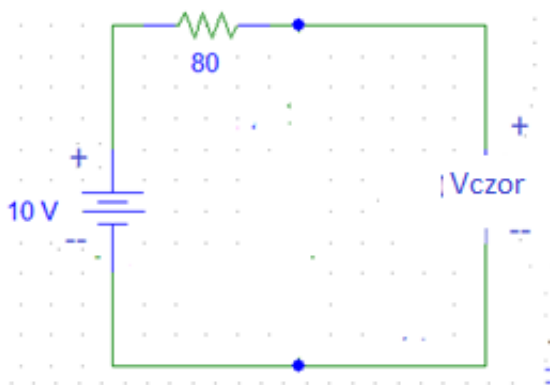
$$V_C(t) = A \cdot e^{-\frac{t}{\tau}} + V_C(\infty)$$

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

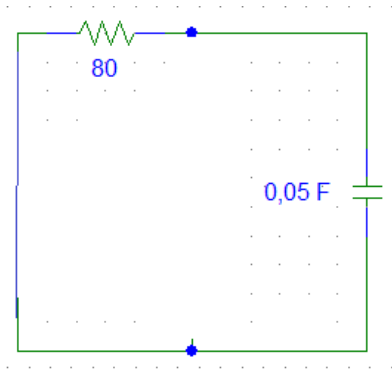


$$V_c(t) = \left(5 \cdot e^{-\frac{t}{2}} + 5\right) \cdot u(t)V \quad (0 \leq t \leq 1,5s)$$

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



$$V_c(\infty) = 10V = V_{czor}$$



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

$$R_{eş} = 80\Omega$$

$$\tau = R_{eş} \times C = 80 \times 0,05 = 4$$

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

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

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

$$1 + 4 \cdot r = 0$$

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

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

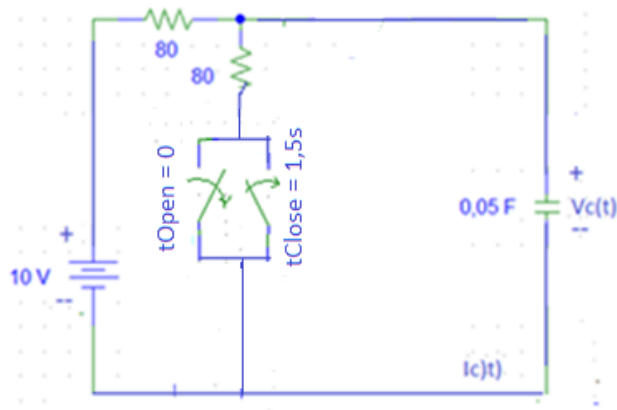
$$V_C(t) = A \cdot e^{-\frac{t}{4}} + 10$$

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

$$t=0 \text{ için } V_C(1,5) = 7,36V$$

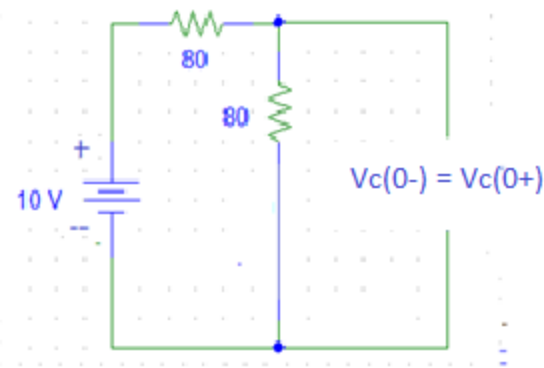
$$7,36 = A \cdot 1 + 10 \quad A = -2,64$$

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

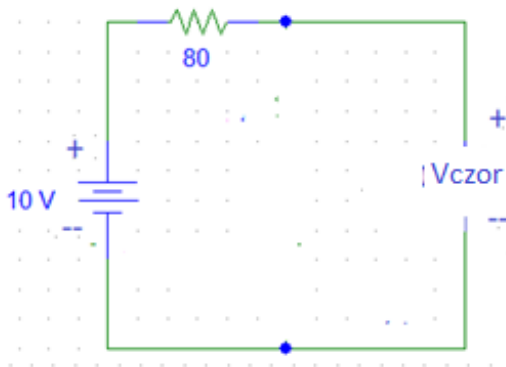


Anahtar uzun süre kapalı kaldıktan sonra $t = 0$ anında açılıyor. Daha sonra $t=1,5s$ sonunda kapatılıyor. $t \geq 0$ için $V_c(t)$ ve $I_c(t)$ 'yi bulunuz.

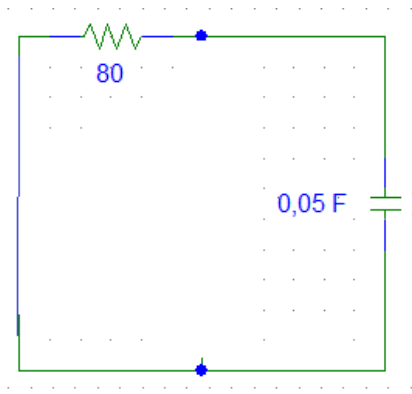
$V_c(t) = V_{\text{cöz}} + V_{\text{zorlanmış}}$ şeklinde önerilir.



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



2.durum $V_c(\infty) = 10V = V_{\text{czor}}$



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

$$R_{eş} = 80\Omega$$

$$\tau = R_{eş} \times C = 80 \times 0,05 = 4$$

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

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

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

$$1 + 4 \cdot r = 0$$

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

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

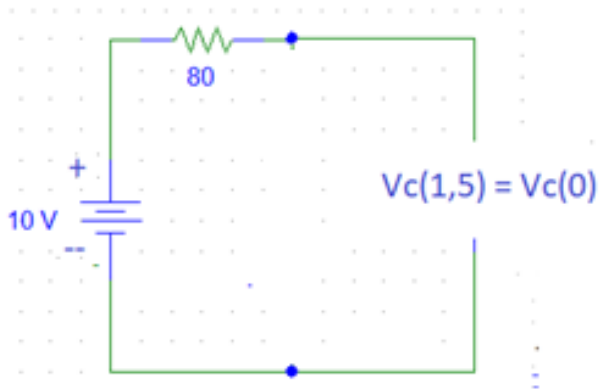
$$V_C(t) = A \cdot e^{-\frac{t}{4}} + 10$$

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

$$t=0 \text{ için } V_C(0^+) = 5V$$

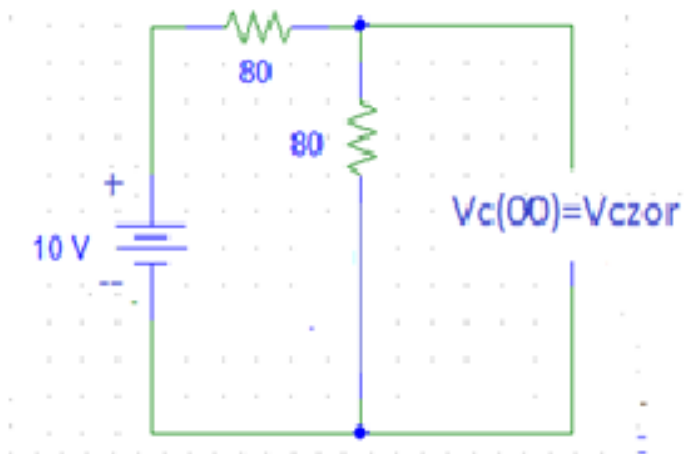
$$5 = A \cdot 1 + 10 \quad A = -5$$

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

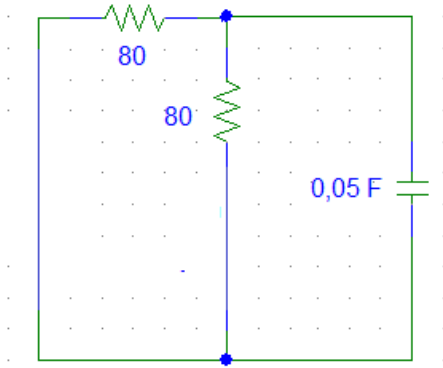


$$V_C(t) = \left(-5 \cdot e^{-\frac{t}{4}} + 5\right) \cdot u(t)V \quad (0 \leq t \leq 1,5s)$$

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



2.durum $V_C(\infty) = \frac{10}{(80+80)} \times 80 = 5V = V_{Czor}$



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

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

$$\tau = R_{eş} \times C = 40 \times 0,05 = 2$$

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

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

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

$$1 + 1 + 0,05 \cdot r = 0$$

$$2 + 4 \cdot r = 0$$

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

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

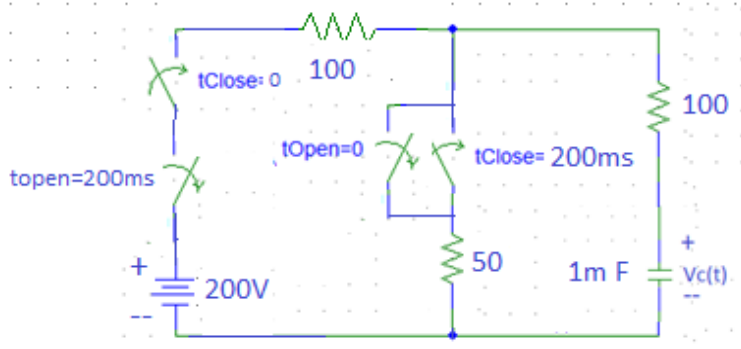
$$V_C(t) = A \cdot e^{-\frac{t}{2}} + 5$$

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

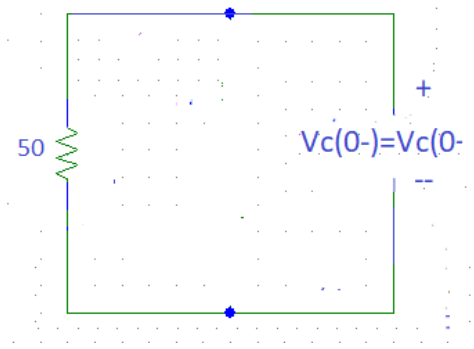
$$t=0 \text{ için } V_C(1,5) = 1,56V$$

$$1,56 = A \cdot 1 + 5 \quad A = -3,44$$

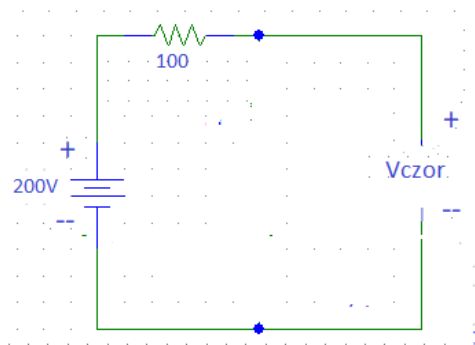
$$V_C(t) = \left(-3,44 \cdot e^{-\frac{(t-1,5)}{2}} + 10 \right) \cdot u(t)V \quad 1,5s \geq t$$



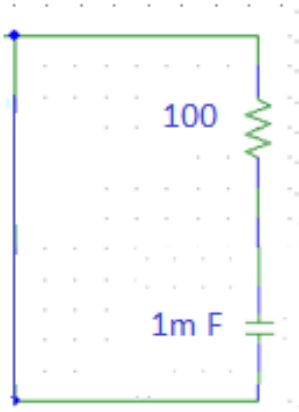
50 Ohm üstündeki anahtar uzun süre kapalı kaldıktan sonra $t = 0$ anında açılıyor. 100 Ohm'un altındaki anahtar ise $t=0$ anında kapatılıyor. 200 V'un üstündeki anahtar 200ms sonra açılıyor. 50 Ohm'un üstündeki anahtar ise 200ms sonra kapatılıyor. $t \geq 0$ için $V_c(t)$ ve $I_c(t)$ 'yi bulunuz. $V_c(t)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



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



2.durum $V_c(\infty) = 200 = V_{\text{czor}}$



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

$$R_{eş} = 100\Omega$$

$$\tau = R_{eş} \times C = 100 \times 0,001 = 0,1$$

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

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

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

$$1 + 0,1 \cdot r = 0$$

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

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

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

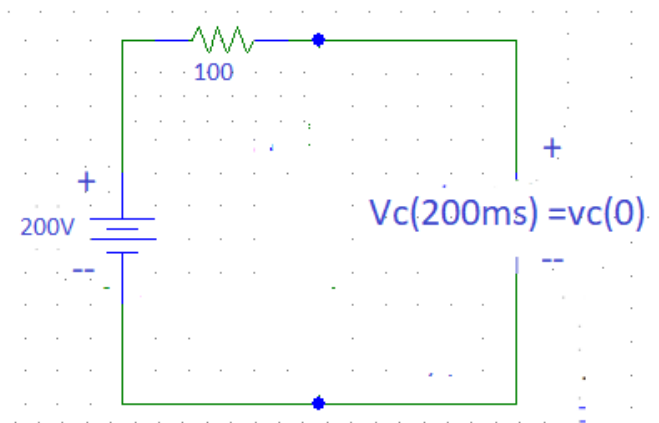
A katsayısı başlangıç şartı olan $V_C(0^+)$ 'dan bulunur.

$$t=0 \text{ için } V_C(0^+) = 0V$$

$$0 = A \cdot 1 + 200 \quad A = -200$$

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

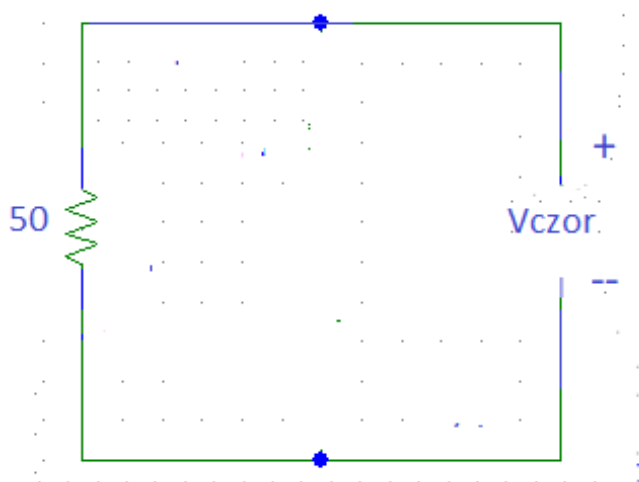
$$V_C(t) = \left(-200 \cdot e^{-\frac{t}{0,1}} + 200 \right) \cdot u(t) V$$



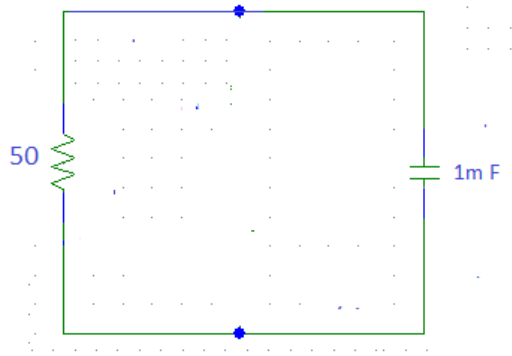
$$V_c(t) = \left(-200 \cdot e^{-\frac{t}{0,1}} + 200 \right) \cdot u(t) V \quad (0 \leq t \leq 200ms)$$

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

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



$$V_c(\infty) = V = V_{czor}$$



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

$$R_{eş} = 50\Omega$$

$$\tau = R_{eş} \times C = 50 \times 0,001 = 0,05$$

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

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

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

$$1 + 0,05 \cdot r = 0$$

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

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

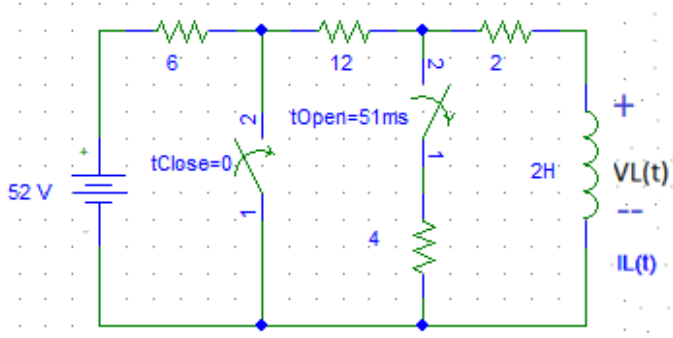
$$V_C(t) = \left(-e^{-\frac{t}{0,05}} + 0 \right) \cdot u(t) V$$

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

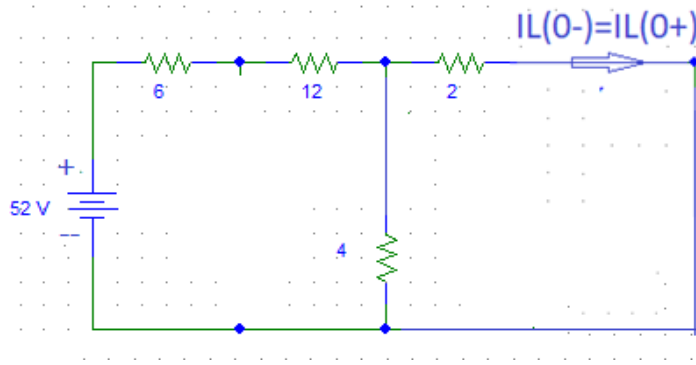
$$t=0 \text{ için } V_C(200) = 199,86V$$

$$199,86 = A \cdot 1 + 0 \quad A = 199,86$$

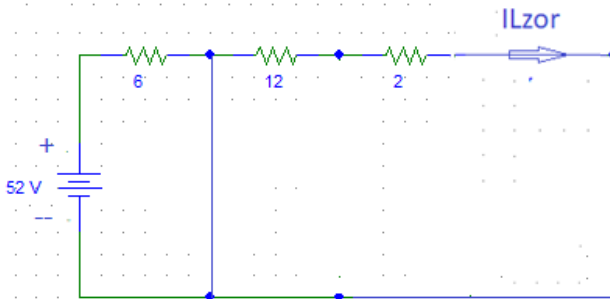
$$V_C(t) = V_C(t) = \left(-199,86 \cdot e^{-\frac{(t-0,2)}{0,05}} + 200 \right) \cdot u(t) V \quad t \geq 200ms$$



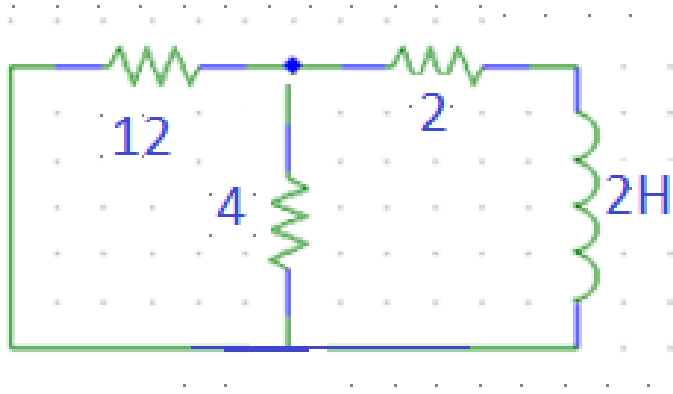
Anahtar uzun süre açık kaldıktan sonra $t = 0$ anında kapatılıyor. Daha sonra 4 Ohm'daki anahtar 51ms sonunda açılıyor. $t \geq 0$ için $IL(t)$ ve $VL(t)$ 'yi bulunuz.



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



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



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

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

$$\tau = \frac{L}{R_{eş}} = \frac{2}{5}$$

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

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

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

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

$$8.r + 20 = 0$$

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

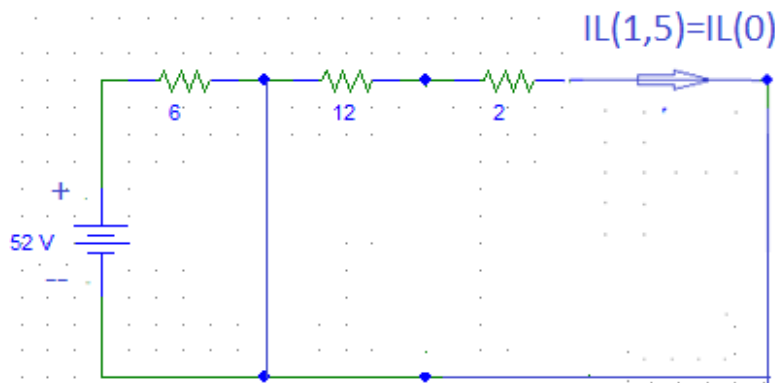
$$I_L(t) = A. e^{-\frac{t}{\tau}} + I_L(\infty)$$

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

$$t=0 \text{ için } I_L(0^+) = 4,03A$$

$$4,03 = A. 1 + 0 \quad A = 4,03$$

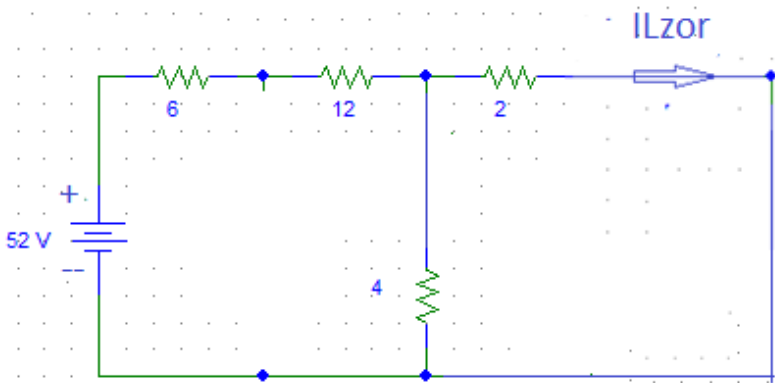
$$I_L(t) = \left(4,03 . e^{-\frac{t}{\frac{2}{5}}} \right) . u(t)A$$



$$I_L(t) = (4,03 \cdot e^{-2,5 \cdot t}) \cdot u(t) A \quad (0 \leq t \leq 51ms)$$

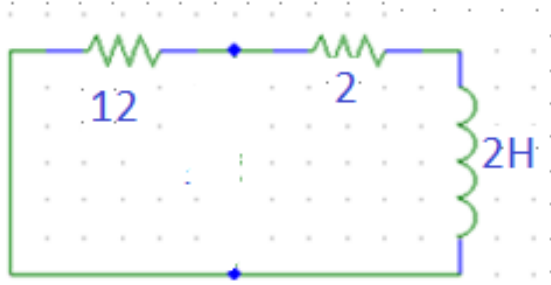
$$t \geq 51ms \quad I_L(51ms) = (4,03 \cdot e^{-2,5 \times 0,051}) = 3,55A$$

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



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

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



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

$$R_{eş} = 12 + 2 = 6\Omega$$

$$\tau = \frac{L}{R_{eş}} = \frac{2}{14}$$

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

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

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

$$2.r + 14 = 0$$

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

$$I_L(\infty) = 0 = IL_{zor}$$

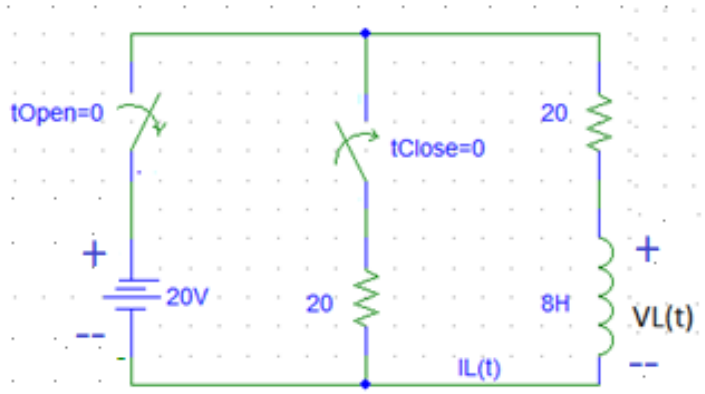
$$I_L(t) = A \cdot e^{-\frac{t}{\tau}} + I_L(\infty)$$

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

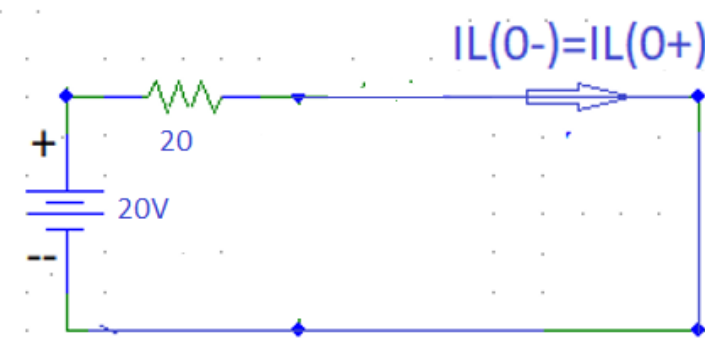
$$t = 0 \text{ için } I_L(0,051) = 3,55A \quad t \geq 0,051$$

$$3,55 = A \cdot 1 + 0 \quad A = 3,55$$

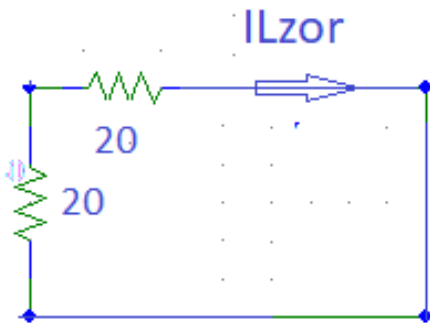
$$I_L(t) = \left(3,55 \cdot e^{-\frac{14}{2} \cdot (t-0,051)} \right) \cdot u(t)A$$



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 $I_L(t)$ ve $V_L(t)$ 'yi bulunuz.

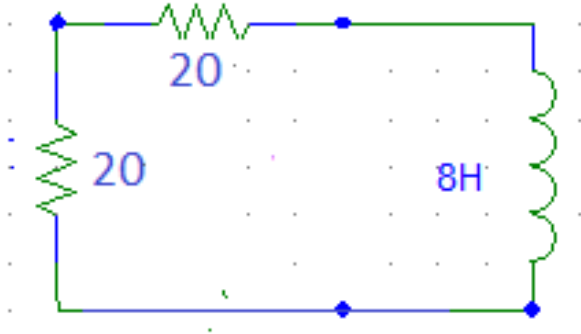


1. durum $I_L(0^-) = \frac{20}{20} = 1A = I_L(0^+)$



2.durum Devrede kaynak yok. $I_L(\infty) = 0A = I_{Lzor}$

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



$$R_{eş} = 20 + 20 = 40\Omega$$

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

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

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

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

$$r + 5 = 0$$

$$r = -5$$

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

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

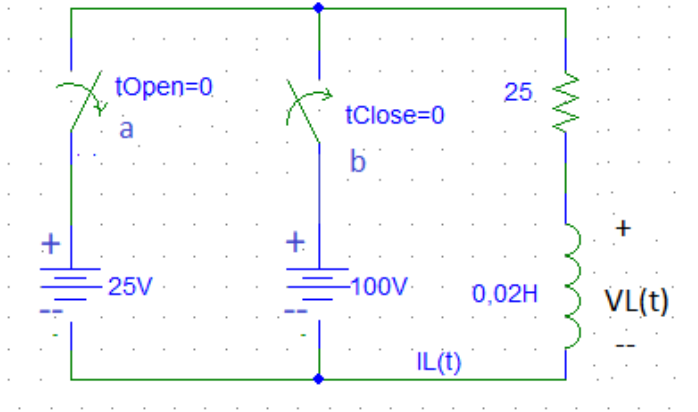
$$t=0 \text{ için } I_L(0^+) = 1A$$

$$1 = A + 0 \quad A = 1$$

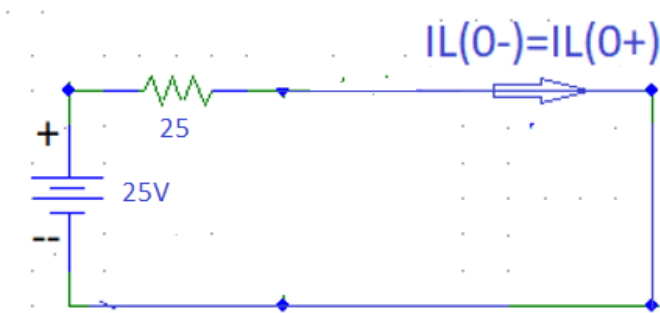
$$I_L(t) = A \cdot e^{-\frac{t}{\tau}} + I_L(\infty)$$

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

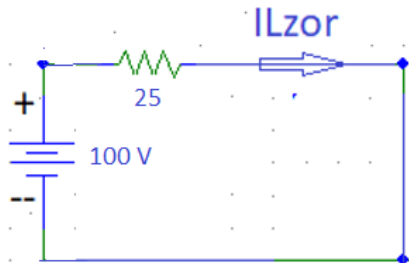
$$V_L(t) = L \cdot \frac{d_{iL}}{dt} = 8 \cdot ((-5) \cdot (1)e^{-5.t}) V$$



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 $I_L(t)$ ve $V_L(t)$ 'yi bulunuz.

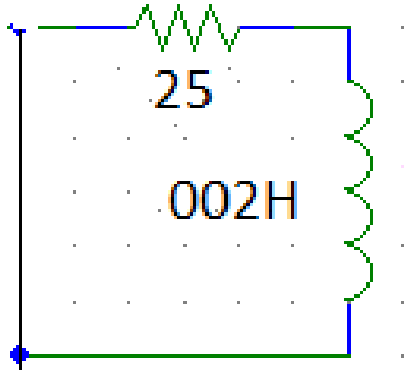


1.durum $I_L(0^-) = \frac{25}{25} = 1A = I_L(0^+)$



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

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



$$R_{eş} = 25\Omega$$

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

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

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

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

$$r + 1250 = 0$$

$$r = -1250$$

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

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

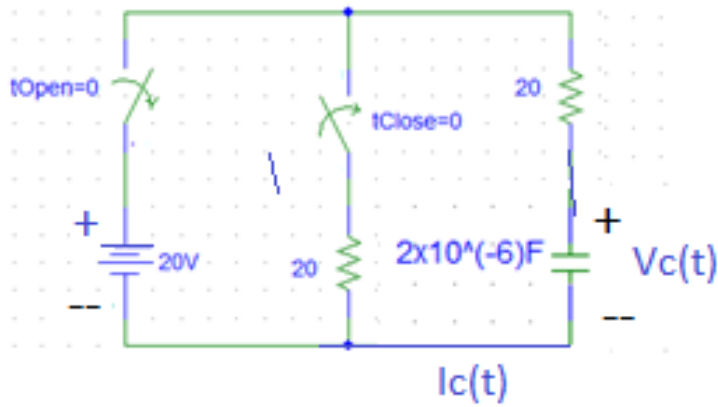
$$t = 0 \text{ için } I_L(0^+) = 1A$$

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

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

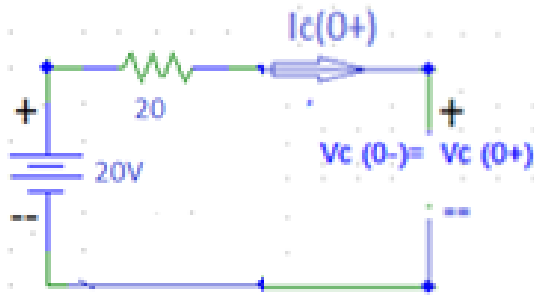
$$I_L(t) = (-3 \cdot e^{-1250 \cdot t} + 4) \cdot u(t)A$$

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

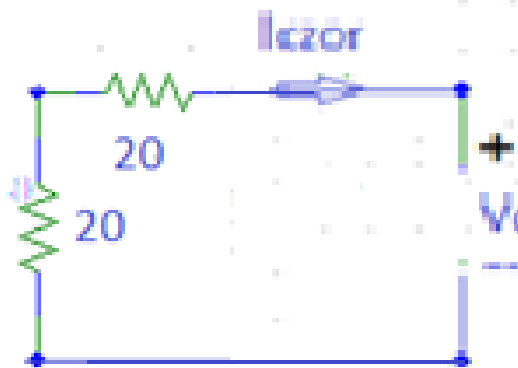


20 V'luk kaynaktaki anahtar uzun süre kapalı kaldıktan sonra $t = 0$ anında açılıyor. 20 Ohm'luk dirençteki anahtar ise açık kaldıktan sonra $t=0$ anında kapatılıyor.. $t \geq 0$ için $V_c(t)$ ve $I_c(t)$ 'yi bulunuz.

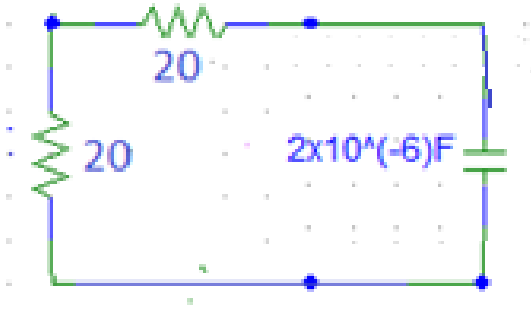
$V_c(t) = V_{\text{cöz}} + V_{\text{czorlanmış}}$ şeklinde önerilir.



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



2.durum kaynak yok $V_c(\infty) = 0 = V_{\text{czor}}$



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

$$R_{eş} = 20 + 20 = 40\Omega$$

$$\tau = R_{eş} \times C = 40 \times 2 \times 10^{-6} = 80 \times 10^{-6}$$

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

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

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

$$1 + 0,000080 \cdot r = 0$$

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

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

$$V_C(t) = A \cdot e^{-\frac{t}{80 \times 10^{-6}}} + 0$$

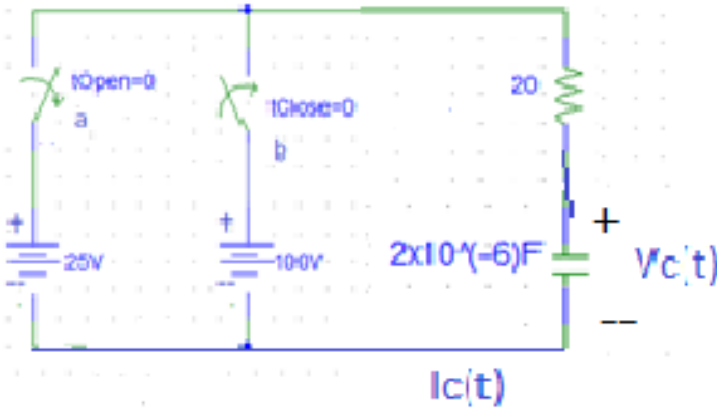
A katsayısı başlangıç şartı olan $V_C(0^+)$ 'dan bulunur.

$$t=0 \text{ için } V_C(0^+) = 20V$$

$$20 = A \cdot 1 + 0 \quad A = 20$$

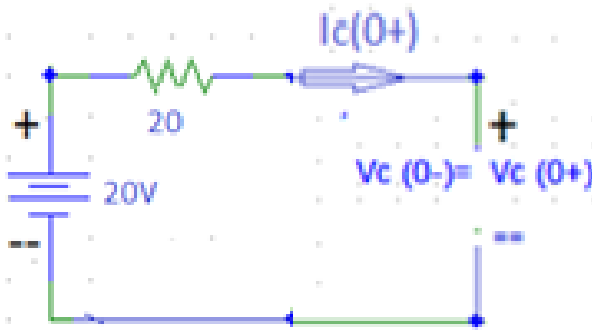
$$V_C(t) = \left(20 \cdot e^{-\frac{t}{80 \times 10^{-6}}} \right) \cdot u(t) V$$

$$I_C(t) = C \cdot \frac{dV_C}{dt} = 20 \times 10^{-6} \cdot \left(\left(-\frac{1}{80 \times 10^{-6}} \right) \cdot (20) \cdot e^{-\frac{t}{80 \times 10^{-6}}} \right) A$$



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 $V_c(t)$ ve $I_c(t)$ 'yi bulunuz.

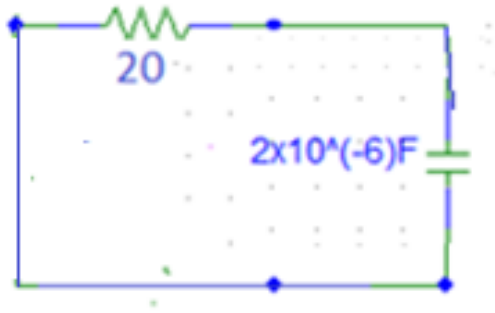
$V_c(t) = V_{\text{cöz}} + V_{\text{zorlanmış}}$ şeklinde önerilir.



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



2.durum $V_c(\infty) = 100 = V_{\text{czor}}$



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

$$R_{eş} = 20\Omega$$

$$\tau = R_{eş} \times C = 20 \times 2 \times 10^{-6} = 40 \times 10^{-6}$$

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

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

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

$$1 + 0,000040 \cdot r = 0$$

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

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

$$V_C(t) = A \cdot e^{-\frac{t}{40 \times 10^{-6}}} + 100$$

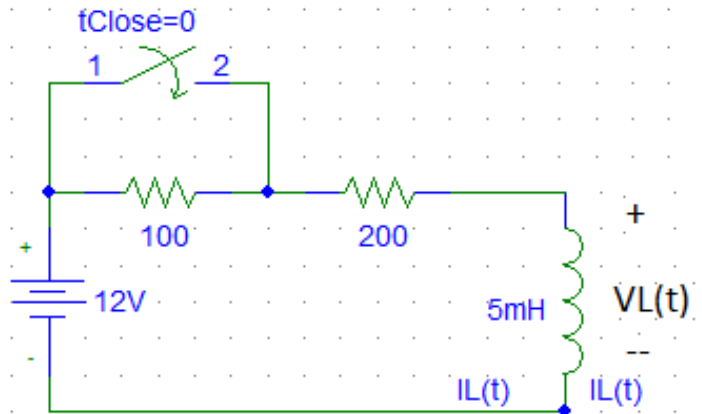
A katsayısı başlangıç şartı olan $V_C(0^+)$ 'dan bulunur.

$$t=0 \text{ için } V_C(0^+) = 20V$$

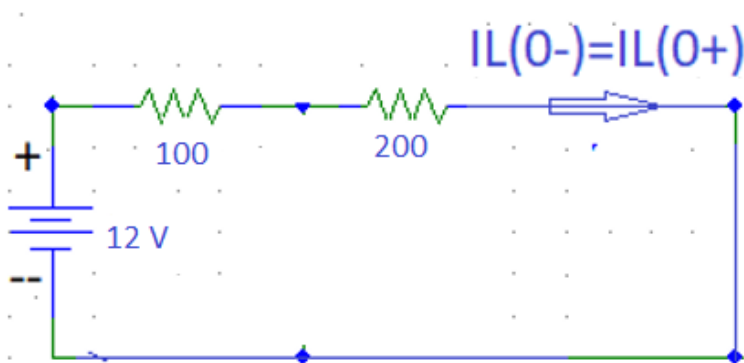
$$20 = A \cdot 1 + 100 \quad A = -80$$

$$V_C(t) = \left(-80 \cdot e^{-\frac{t}{40 \times 10^{-6}}} + 100 \right) \cdot u(t) V$$

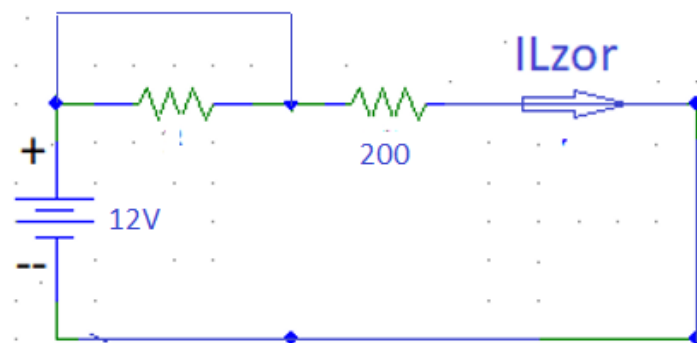
$$I_C(t) = C \cdot \frac{dV_C}{dt} = 20 \times 10^{-6} \cdot \left(\left(-\frac{1}{40 \times 10^{-6}} \right) \cdot (-80) \cdot e^{-\frac{t}{40 \times 10^{-6}}} \right) A$$



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

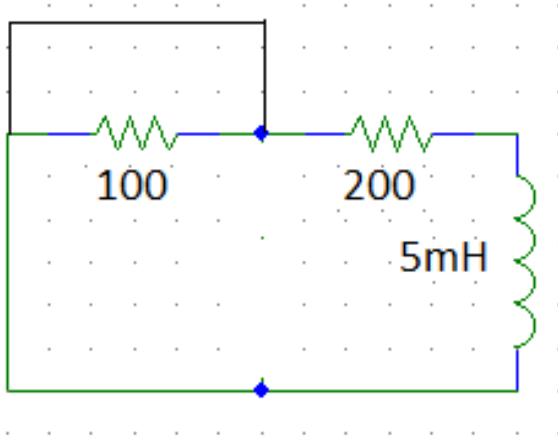


1.durum $I_L(0^-) = \frac{12}{100+200} = 0,04A = I_L(0^+)$



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

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



$$R_{eş} = 200\Omega$$

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

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

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

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

$$r + 40000 = 0$$

$$r = -40000$$

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

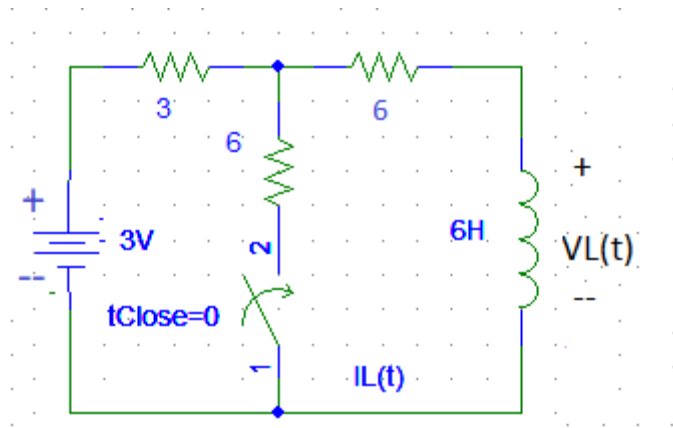
$$I_L(t) = A \cdot e^{-\frac{t}{\frac{1}{40000}}} + 0,06$$

$$t=0 \text{ için } I_L(0^+) = 0,04A$$

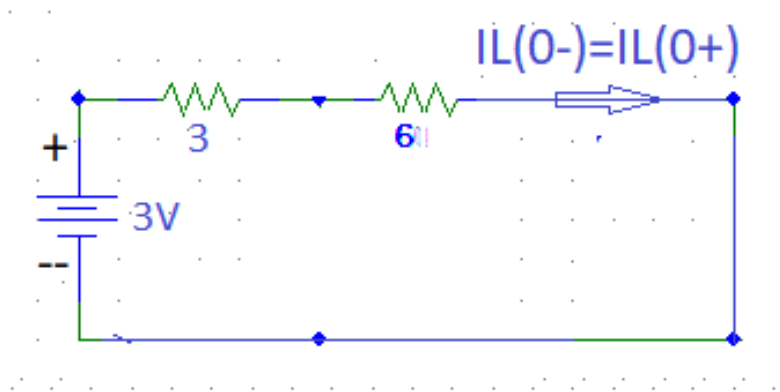
$$0,04 = A \cdot 1 + 0,06 \quad A = -0,02$$

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

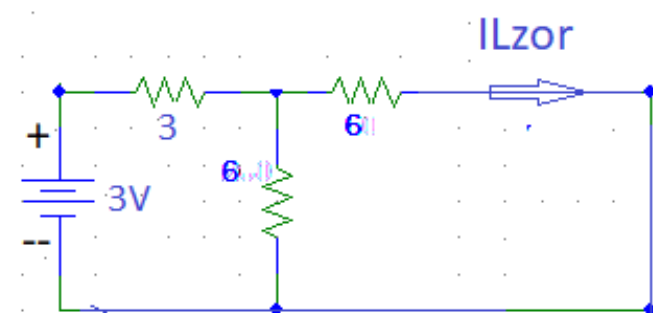
$$V_L(t) = L \cdot \frac{d_{iL}}{dt} = 0,005 \cdot \left((-40000)(-0,02 \cdot e^{-40000 \cdot t}) \right) V$$



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

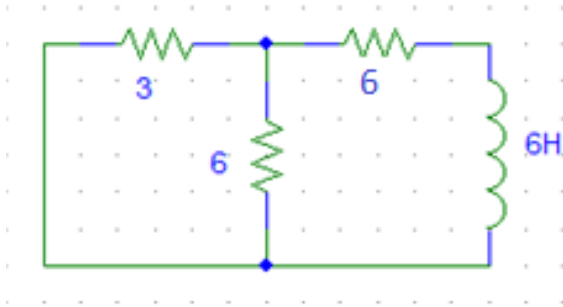


1.durum $I_L(0^-) = \frac{3}{3+6} = \frac{1}{3} A = I_L(0^+)$



2.durum $I_L(\infty) = \frac{3}{3+\frac{6 \times 6}{6+6}} \times \frac{6}{6+6} = 0,25 A = I_{Lzor}$

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



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

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

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

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

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

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

$$18.r + 24 = 0$$

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

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

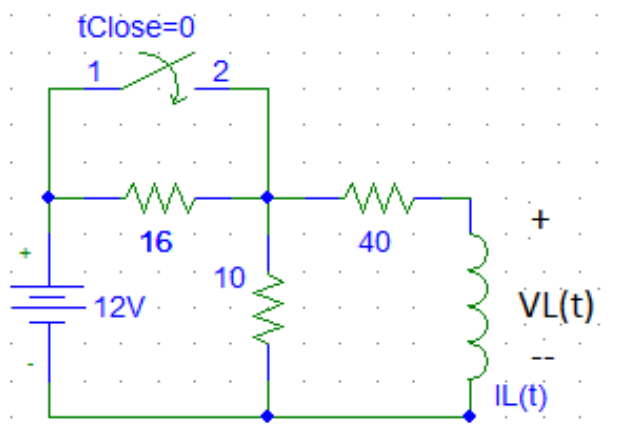
$$I_L(t) = A \cdot e^{-\frac{t}{\frac{3}{4}}} + 0,25$$

$$t=0 \text{ için } I_L(0^+) = \frac{1}{3}A$$

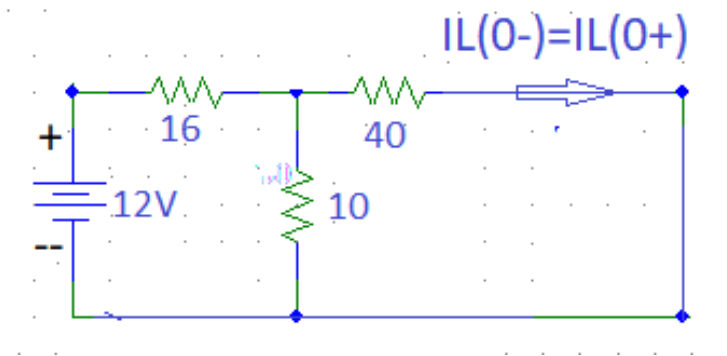
$$0,333 = A \cdot 1 + 0,25 \quad A = \frac{1}{12}$$

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

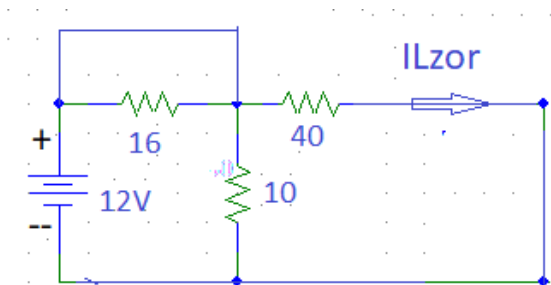
$$V_L(t) = L \cdot \frac{d_i I_L}{dt} = 6 \cdot \left(\left(-\frac{4}{3} \right) \cdot \frac{1}{12} \cdot e^{-\frac{t}{\frac{3}{4}}} \right) V$$



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

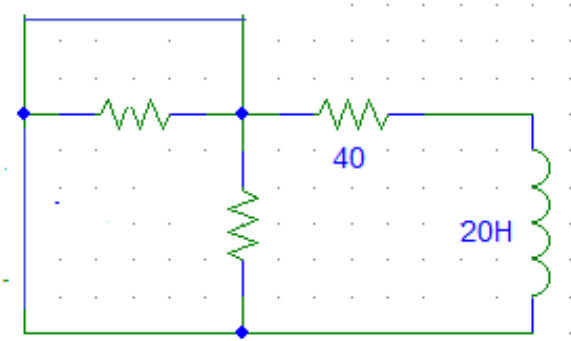


$$1.\text{durum } I_L(0^-) = \frac{12}{16 + \frac{10 \times 40}{10 + 40}} \times \frac{10}{10 + 40} = 0,1A = I_{L1}(0+)$$



$$2.\text{durum } I_L(\infty) = \frac{12}{\frac{10 \times 40}{10 + 40}} \times \frac{10}{10 + 40} = 0,3A = I_{Lzor}$$

Zaman sabiti $\tau = L/R_{eş}$ $R_{eş} \Rightarrow$ (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

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

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

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

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

$$2.r + 4 = 0$$

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

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

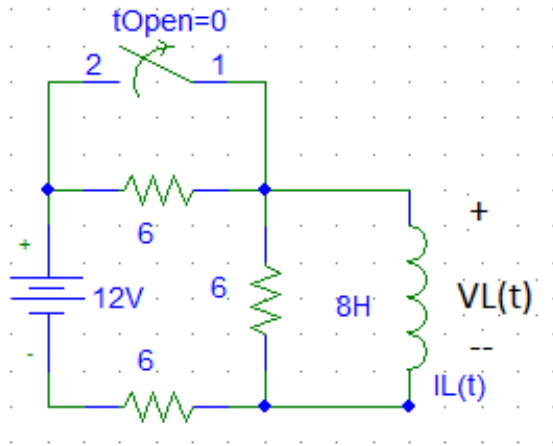
$$I_L(t) = A \cdot e^{-\frac{t}{\frac{1}{2}}} + 0,3$$

$$t = 0 \text{ için } I_L(0^+) = 0,1A$$

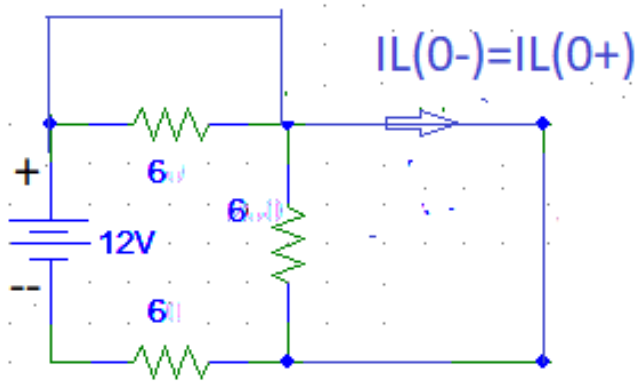
$$0,1 = A \cdot 1 + 0,3 \quad A = -0,2$$

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

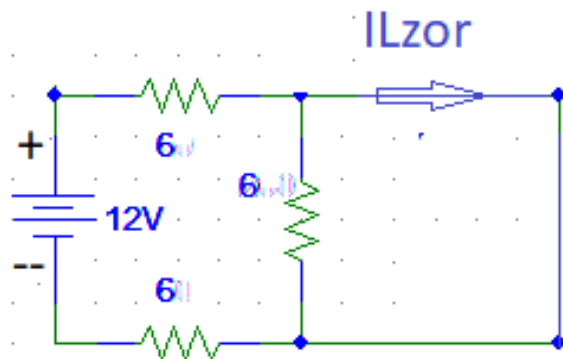
$$V_L(t) = L \cdot \frac{d_{iL}}{dt} = 20 \cdot \left((-2) \cdot \left(-0,2 \cdot e^{-\frac{t}{\frac{1}{2}}} \right) \right) V$$



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

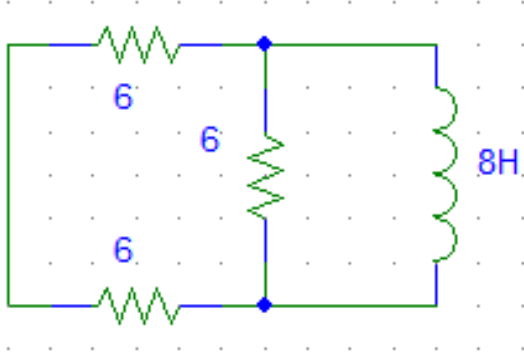


1.durum $I_L(0^-) = \frac{12}{6} = 2A = I_L(0^+)$ 6 Ohm kısa devre



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

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



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

$$\tau = \frac{L}{R_{eş}} = \frac{8}{4} = 2$$

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

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

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

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

$$18.r + 9 = 0$$

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

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

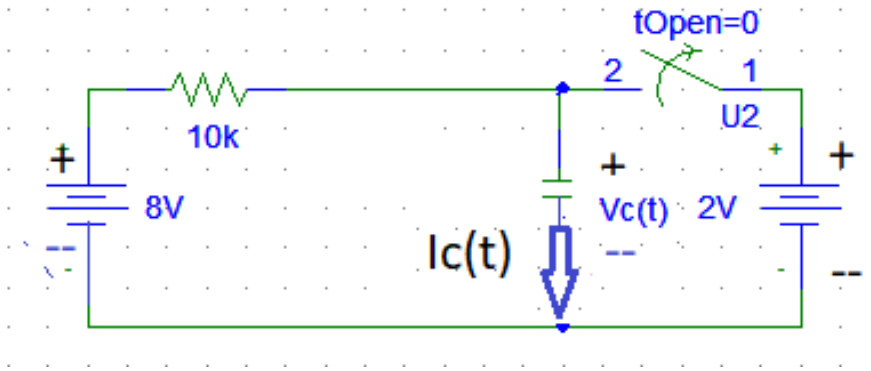
$$I_L(t) = A \cdot e^{-\frac{t}{2}} + 1$$

$$t=0 \text{ için } I_L(0^+) = 2A$$

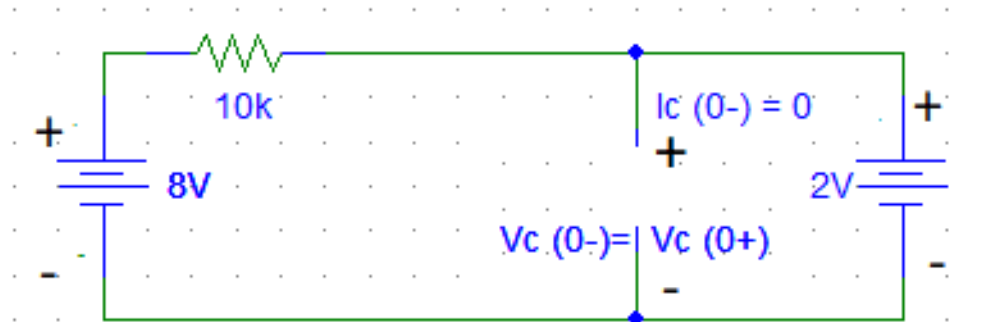
$$2 = A \cdot 1 + 1 \quad A = 1$$

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

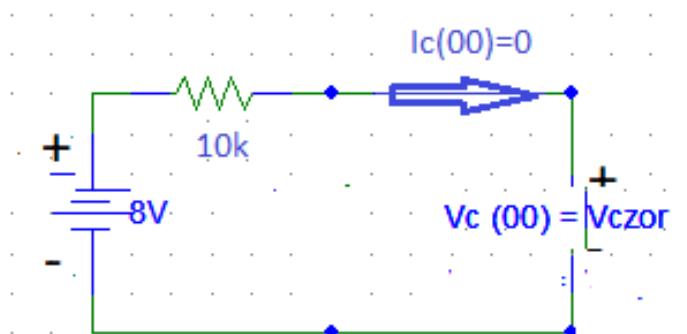
$$V_L(t) = L \cdot \frac{d_{iL}}{dt} = 8 \cdot \left((-0.5) \cdot 1 \cdot e^{-\frac{t}{2}} \right) = -4 \cdot e^{-\frac{t}{2}} V$$



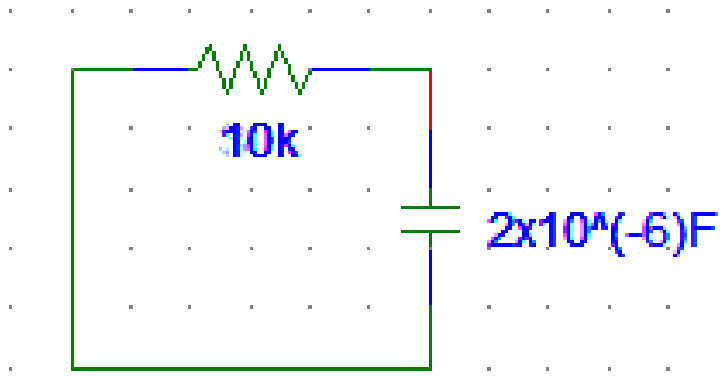
Anahtar uzun süre kapalı kaldıktan sonra $t = 0$ anında açılıyor. $t \geq 0$ için $V_c(t)$ ve $I_c(t)$ 'yi bulunuz. $V_c(t) = V_{c\text{öz}} + V_{c\text{zorlanmış}}$ şeklinde önerilir.



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



2.durum $V_c(\infty) = 8V = V_{c\text{zor}}$



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

$$R_{eş} = 10^4 \Omega$$

$$\tau = R_{eş} \times C = 10 \cdot 10^3 \times 2 \times 10^{-6} = 0,02$$

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

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

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

$$1 + 0,02 \cdot r = 0$$

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

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

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

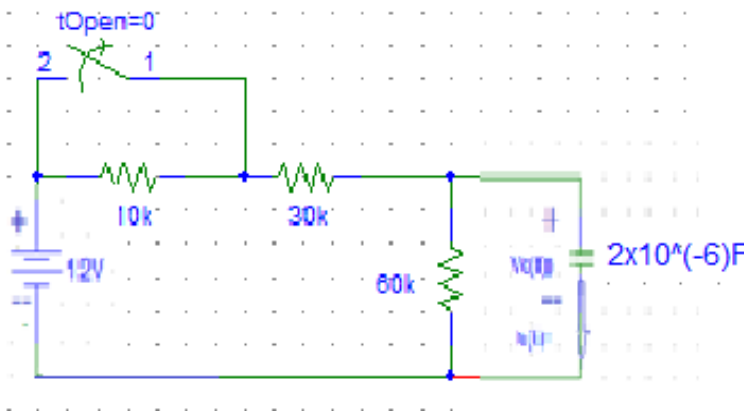
A katsayısı başlangıç şartı olan $V_C(0^+)$ 'dan bulunur.

$$t = 0 \text{ için } V_C(0^+) = 2V$$

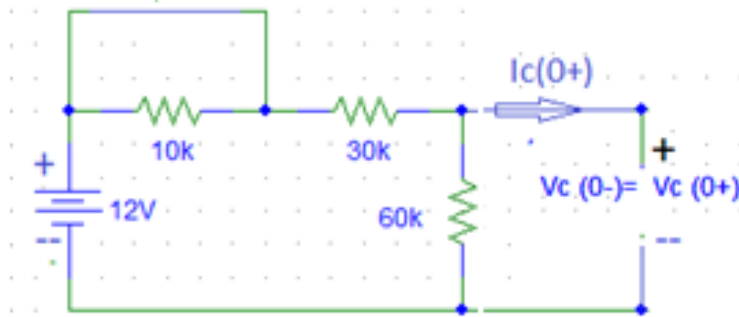
$$2 = A \cdot 1 + 8 \quad A = -6$$

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

$$I_C(t) = C \cdot \frac{dV_C}{dt} = 2 \times 10^{-6} \cdot \left(\left(-\frac{1}{0,02} \right) \cdot (-6) \cdot e^{-\frac{t}{0,02}} \right) A$$

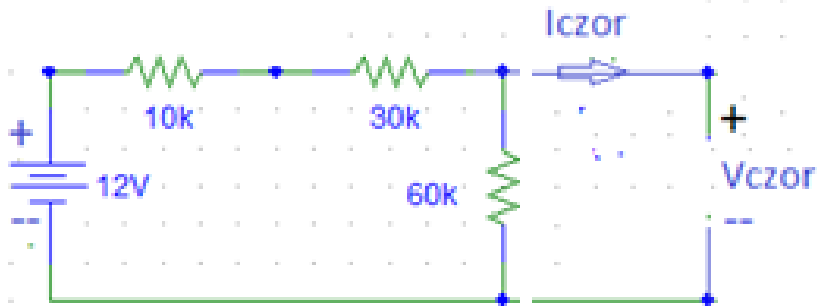


Anahtar uzun süre kapalı kaldıktan sonra $t = 0$ anında açılıyor. $t \geq 0$ için $V_c(t)$ ve $I_c(t)$ 'yi bulunuz. $V_c(t) = V_{c\text{öz}} + V_{c\text{zorlanmış}}$ şeklinde önerilir.



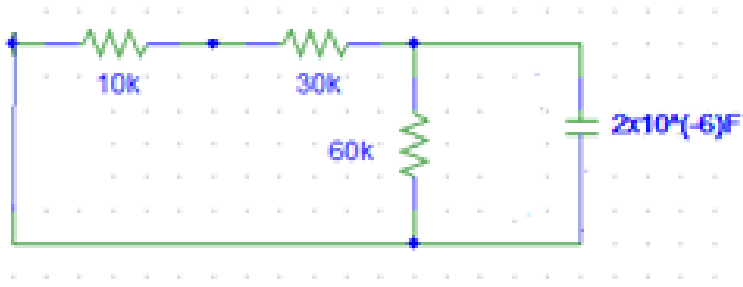
1.durum $I(0^-) = \frac{12}{(30+60) \cdot 10^3} = 0,133mA$

$V_c(0^-) = 0,133 \cdot 10^{-3} \times 60 \cdot 10^3 = 8V = V_c(0^+)$



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

$V_c(\infty) = 0,12 \cdot 10^{-3} \times 60 \cdot 10^3 = 7,2V = V_{c\text{zor}}$



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

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

$$\tau = R_{eş} \times C = 24.10^3 \times 2 \times 10^{-6} = 48.10^{-3} = 0,048$$

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

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

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

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

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

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

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

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

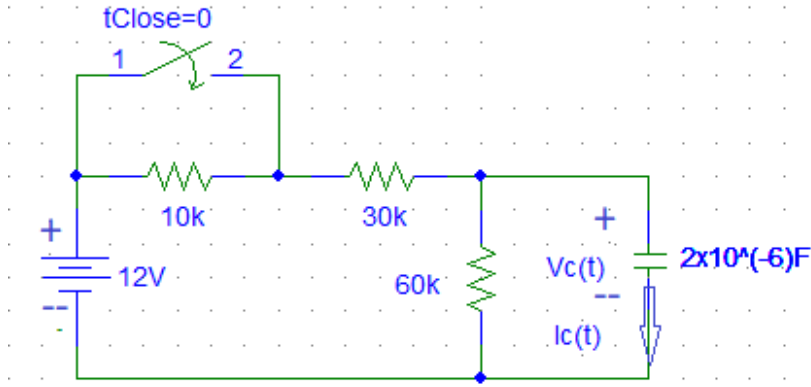
A katsayısı başlangıç şartı olan $V_C(0^+)$ 'dan bulunur.

$$t=0 \text{ için } V_C(0^+) = 8V$$

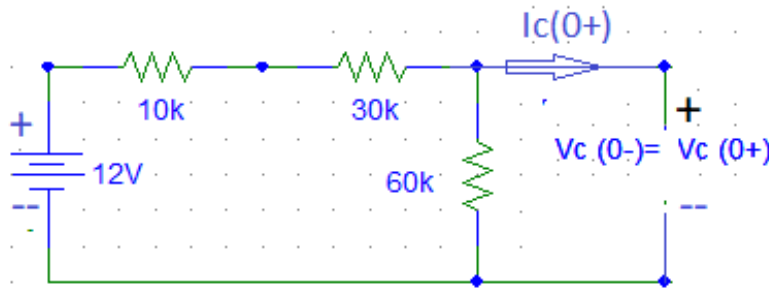
$$8 = A. 1 + 7,2 \quad A = 0,8$$

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

$$I_C(t) = C. \frac{dV_C}{dt} = 2 \times 10^{-6}. \left(\left(-\frac{1}{0,048} \right). (0,8) e^{-\frac{t}{0,048}} \right) A$$

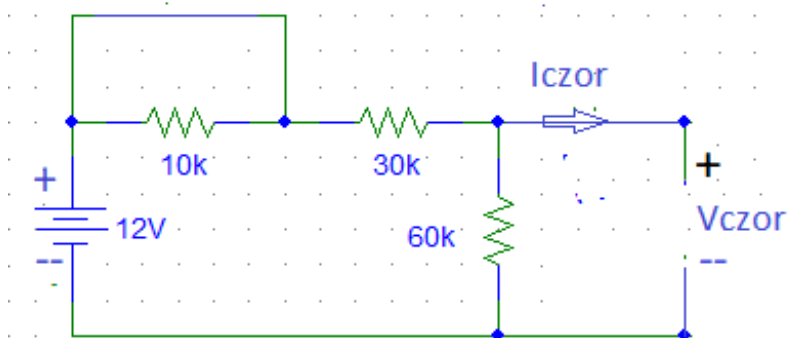


Anahtar uzun süre açık kaldıktan sonra $t = 0$ anında kapatılıyor. $t \geq 0$ için $V_c(t)$ ve $I_c(t)$ 'yi bulunuz. $V_c(t) = V_{c\text{öz}} + V_{c\text{zorlanmış}}$ şeklinde önerilir.



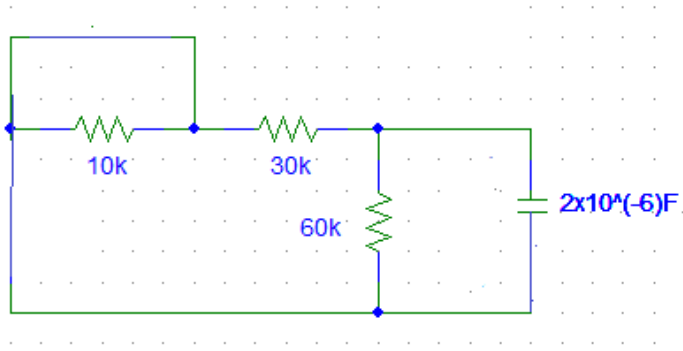
1.durum
$$I(0^-) = \frac{12}{(10+30+60) \cdot 10^3} = 0,12mA$$

$$V_c(0^-) = 0,12 \cdot 10^{-3} \times 60 \cdot 10^3 = 7,2V = V_c(0^+)$$



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

$$V_c(\infty) = 0,133 \cdot 10^{-3} \times 60 \cdot 10^3 = 8V = V_{c\text{zor}}$$



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

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

$$\tau = R_{eş} \times C = 20.10^3 \times 2 \times 10^{-6} = 40.10^{-3} = 0,04$$

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

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

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

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

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

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

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

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

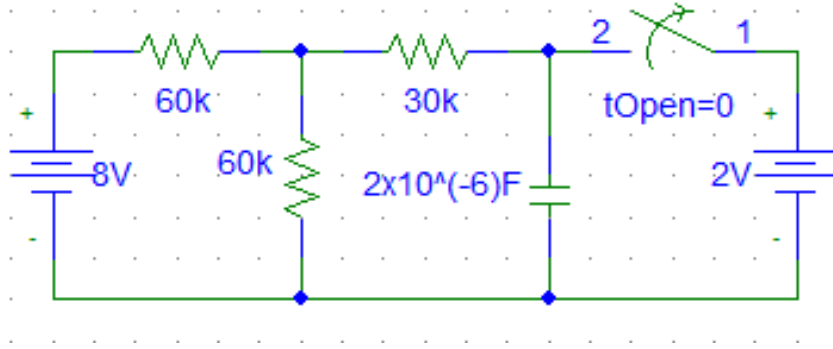
A katsayısı başlangıç şartı olan $V_C(0^+)$ 'dan bulunur.

$$t=0 \text{ için } V_C(0^+) = 7,2V$$

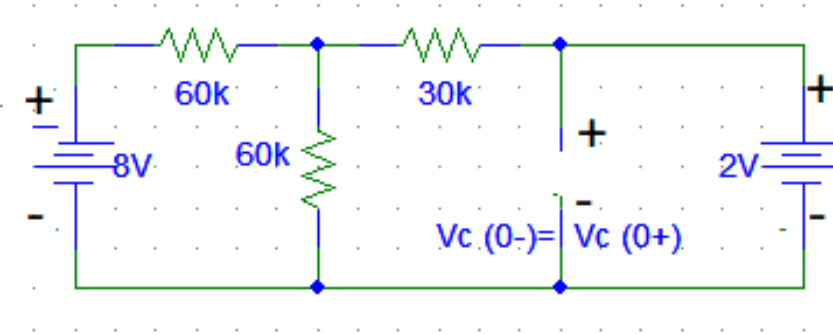
$$7,2 = A.1 + 8 \quad A = -0,8$$

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

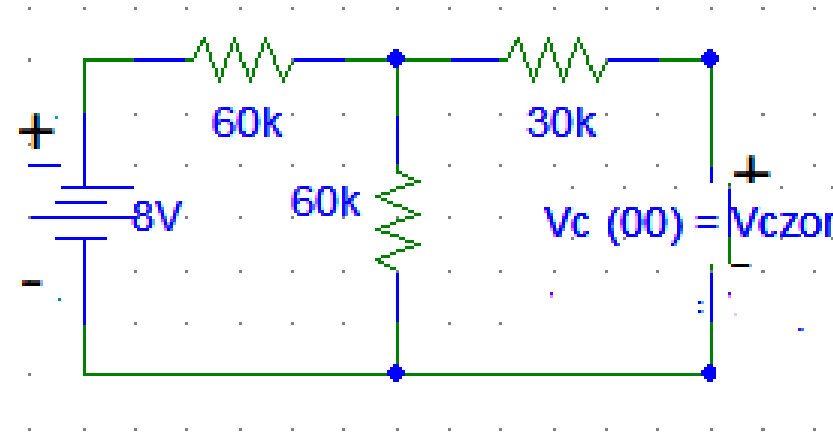
$$I_C(t) = C. \frac{dV_C}{dt} = 2 \times 10^{-6}. \left(\left(-\frac{1}{0,04} \right). (-0,8). e^{-\frac{t}{0,04}} \right) A$$



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

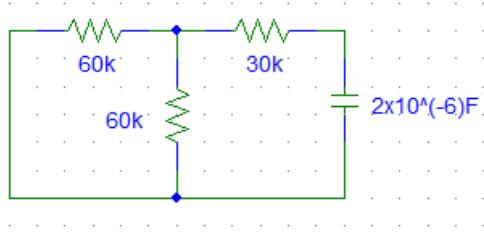


1.durum $V_c(0^-) = 2V = V_c(0^+)$



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

$V_c(\infty) = 0,066 \cdot 10^{-3} \times 60 \cdot 10^3 = 4V = V_{\text{czor}}$



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

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

$$\tau = R_{eş} \times C = 60.10^3 \times 2 \times 10^{-6} = 0,12$$

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

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

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

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

$$0,12 \cdot r + 2 + 0,12 \cdot r = 0$$

$$2 + 0,24 \cdot r = 0$$

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

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

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

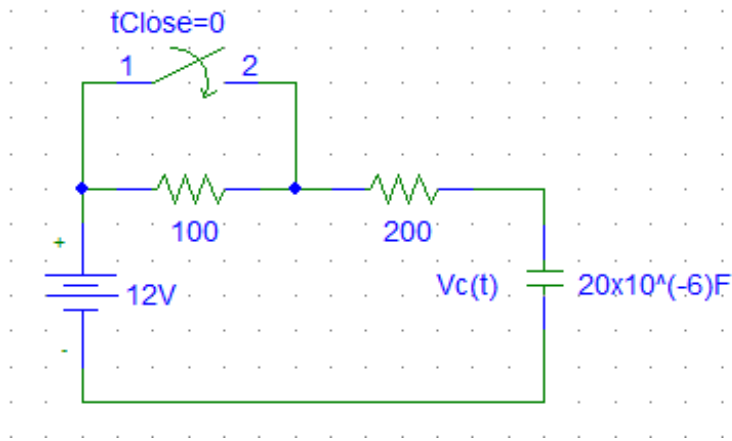
A katsayısı başlangıç şartı olan $V_C(0^+)$ 'dan bulunur.

$$t=0 \text{ için } V_C(0^+) = 2V$$

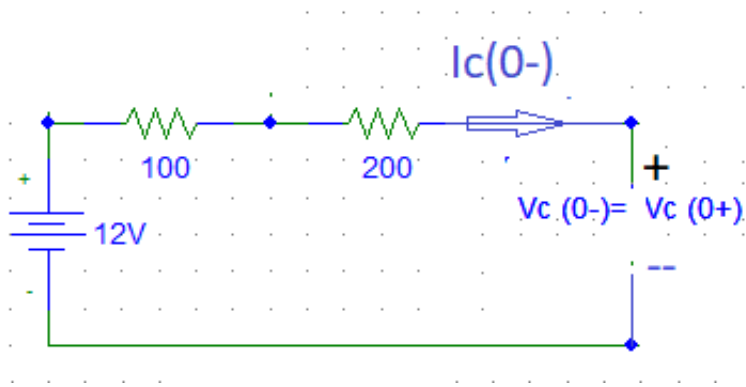
$$2 = A \cdot 1 + 4 \quad A = -2$$

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

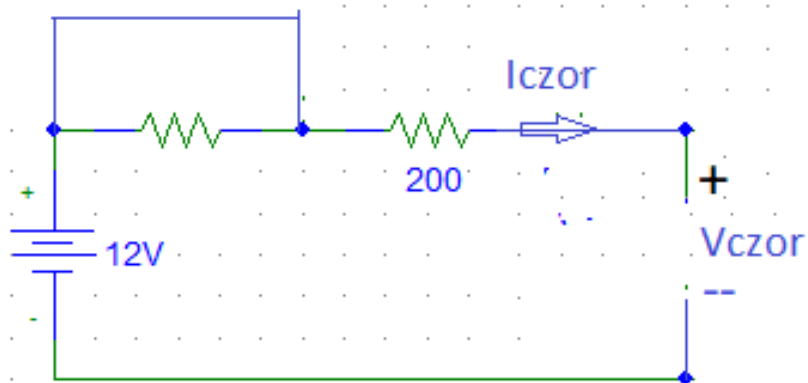
$$I_C(t) = C \cdot \frac{dV_C}{dt} = 2 \times 10^{-6} \cdot \left(\left(-\frac{1}{0,12} \right) \cdot (-2) \cdot e^{-\frac{t}{0,12}} \right) A$$



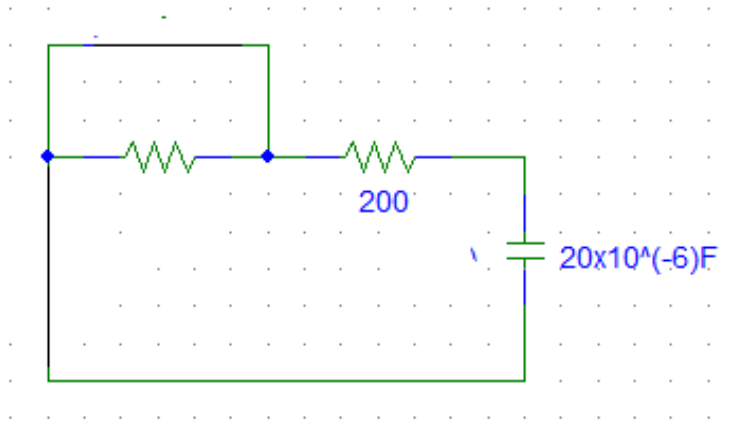
Anahtar uzun süre açık kaldıktan sonra $t = 0$ anında kapatılıyor. $t \geq 0$ için $V_c(t)$ ve $I_c(t)$ 'yi bulunuz. $V_c(t) = V_{c\text{öz}} + V_{c\text{zorlanmış}}$ şeklinde önerilir.



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



2.durum $V_c(\infty) = 12V = V_{c\text{zor}}$



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

$$R_{eş} = 200\Omega$$

$$\tau = R_{eş} \times C = 200 \times 20 \times 10^{-6} = 0,004$$

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

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

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

$$1 + 0,004 \cdot r = 0$$

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

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

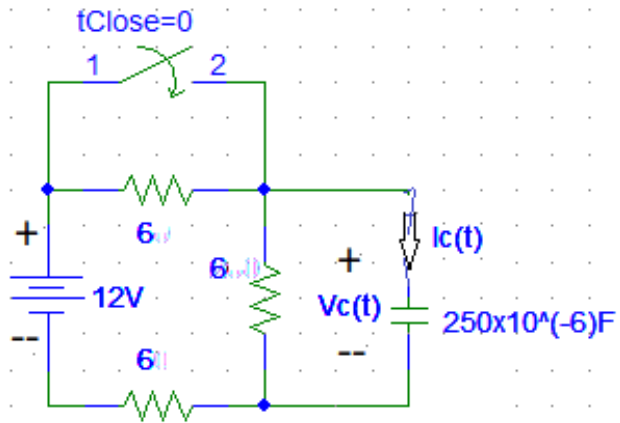
$$V_C(t) = A \cdot e^{-\frac{t}{0,04}} + 12$$

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

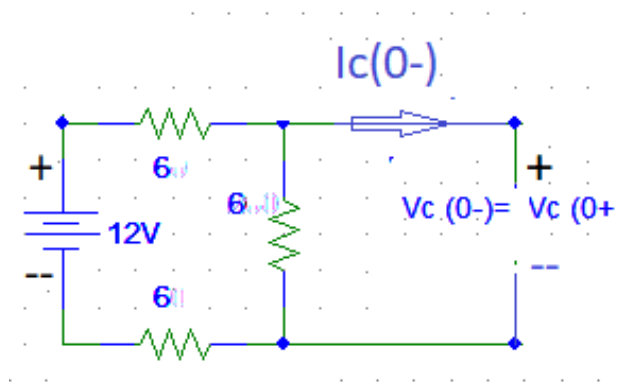
$$t=0 \text{ için } V_C(0^+) = 12V$$

$$12 = A \cdot 1 + 12 \quad A = 0$$

$$V_C(t) = 12V$$

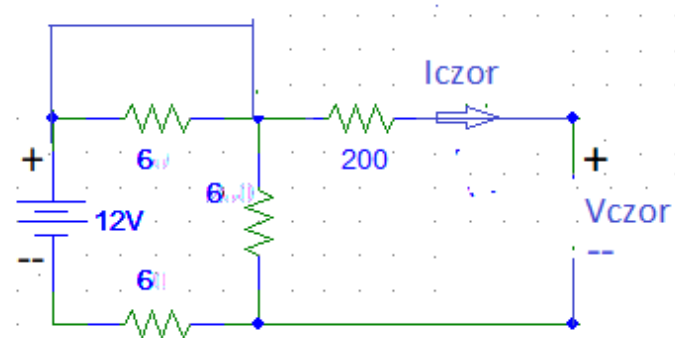


Anahtar uzun süre açık kaldıktan sonra $t = 0$ anında kapatılıyor. $t \geq 0$ için $V_c(t)$ ve $I_c(t)$ 'yi bulunuz. $V_c(t) = V_{\text{cöz}} + V_{\text{czorlanmış}}$ şeklinde önerilir.

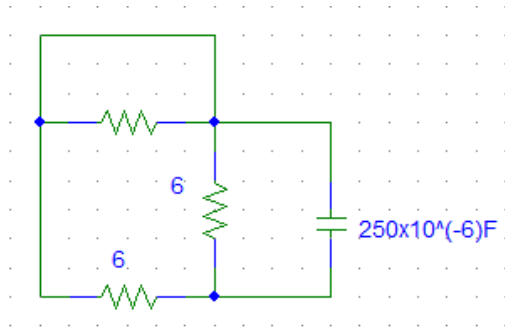


1.durum $I_6(0^-) = \frac{12}{(6+6+6)} = 0,666A$

$V_c(0^-) = 0,666 \times 6 = 4 = V_c(0^+)$



2.durum $I_6(\infty) = \frac{12}{(6+6)} = 1A$ $V_c(\infty) = 1 \times 6 = 6V = V_{\text{czor}}$



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

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

$$\tau = R_{eş} \times C = 3 \times 250 \times 10^{-6} = 0,00075$$

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

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

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

$$1 + 0.00075.r = 0$$

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

$$V_C(t) = A \cdot e^{-\frac{t}{0,75 \cdot 10^{-3}}} + V_C(\infty)$$

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

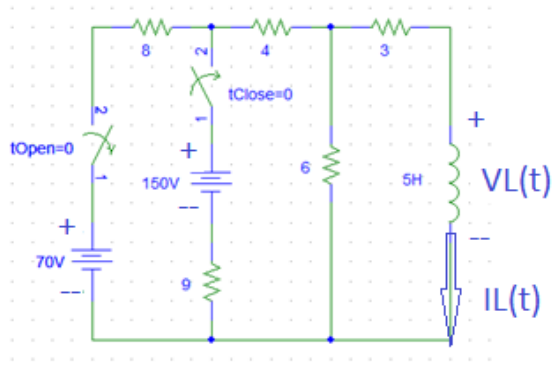
A katsayısı başlangıç şartı olan $V_C(0^+)$ 'dan bulunur.

$$t=0 \text{ için } V_C(0^+) = 4V$$

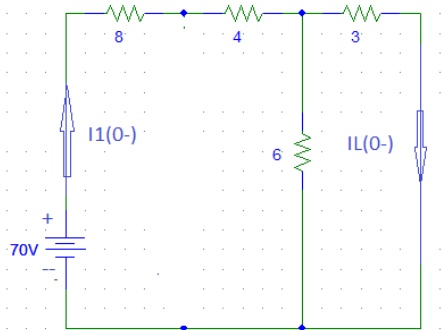
$$4 = A \cdot 1 + 6 \quad A = -2$$

$$V_C(t) = \left(-2 \cdot e^{-\frac{t}{0,75 \cdot 10^{-3}}} + 6 \right) \cdot u(t) V$$

$$I_C(t) = C \cdot \frac{dV_C}{dt} = 250 \times 10^{-6} \cdot \left(\left(-\frac{1}{0,75 \cdot 10^{-3}} \right) \cdot (-2) \cdot e^{-\frac{t}{0,75 \cdot 10^{-3}}} \right) A$$

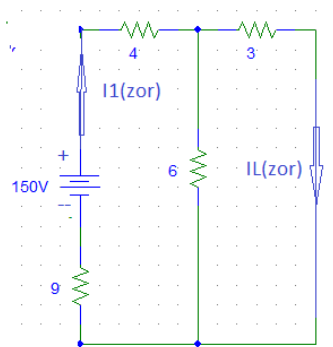


70 V'luk kaynaktaki anahtar uzun süre kapalı kaldıktan sonra $t = 0$ anında açılıyor. 150 V'luk kaynaktaki anahtar uzun süre anahtar ise açık kaldıktan sonra $t=0$ anında kapatılıyor. $t \geq 0$ için $I_L(t)$ ve $V_L(t)$ 'yi bulunuz.



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

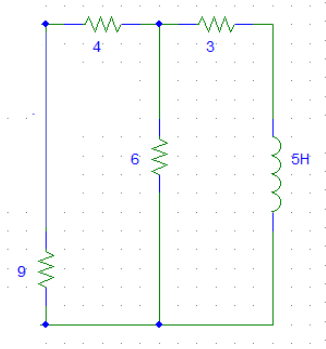
$$I_L(0^-) = \frac{\begin{vmatrix} 18 & 70 \\ -6 & 0 \end{vmatrix}}{\begin{vmatrix} 18 & -6 \\ -6 & 9 \end{vmatrix}} 1 = \frac{18 \times 0 - (70 \times (-6))}{18 \times 9 - ((-6) \times (-6))} = \frac{420}{162 - 36} = 3,33 = I_L(0^+)$$



$$2.\text{durum} \begin{vmatrix} 9 + 4 + 6 & -6 \\ -6 & 6 + 3 \end{vmatrix} \begin{vmatrix} I1\text{zor} \\ IL\text{zor} \end{vmatrix} = \begin{vmatrix} 150 \\ 0 \end{vmatrix}$$

$$I_L(\infty) = \frac{\begin{vmatrix} 19 & 150 \\ -6 & 0 \end{vmatrix}}{\begin{vmatrix} 19 & -6 \\ -6 & 9 \end{vmatrix}} 1 = \frac{19 \times 0 - (150 \times (-6))}{19 \times 9 - ((-6) \times (-6))} = \frac{900}{171 - 36} = 6,66 = I_{L\text{zor}}$$

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



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

$$\tau = \frac{L}{R_{eş}} = \frac{5}{7,1} = \frac{5}{7,1}$$

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

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

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

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

$$95.r + 135 = 0$$

$$r = -1,42$$

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

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

$$t=0 \text{ için } I_L(0^+) = 3,33A$$

$$3,33 = A + 6,66 \quad A = -3,33$$

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

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

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