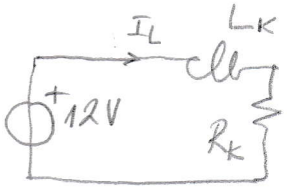
AE – 2016 0210

**①**

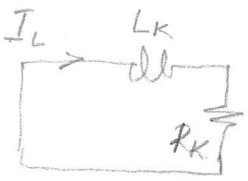



$I_L = I_L(\infty)\left(1 - e^{-\frac{t}{\tau}}\right)$;

$I_L(\infty) = \frac{12}{R_K} = 120\,mA$. $\tau = \frac{L}{R} = 2{,}5\,ms$

$I_L(t_1) = I_L(\infty)\left(1 - e^{-\frac{t_1}{\tau}}\right) \Rightarrow t_1 = \tau \cdot \ln \frac{1}{1 - \frac{I_L(t_1)}{I_L(\infty)}}$

$t_1 = 2{,}5 \cdot 10^{-3} \cdot \ln \frac{1}{1 - \frac{0{,}1}{0{,}12}} = 4{,}48\,ms.$




$I_L(0) = I_L(\infty) = 120\,mA.$

$I_L(t) = I_L(0) \cdot e^{-\frac{t}{\tau}}$; $I_L(t_2) = I_L(0)\, e^{-\frac{t_2}{\tau}} = 30\,mA$

$t_2 = \tau \cdot \ln \frac{I_L(0)}{I_L(t_2)} = 2{,}5 \cdot 10^{-3} \cdot \ln \frac{0{,}12}{0{,}03} = 3{,}47\,ms$

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**②**

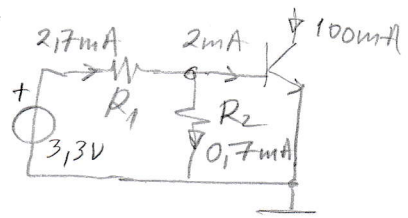
$I_{K1} = \frac{12\,V}{R_K} = \frac{12}{120} = 0{,}1\,A = I_{C1}$

$I_{B1} = I_{C1}/\beta = \frac{0{,}1}{50} = 2\,mA$;

$I_{R1} = I_{R2} + I_{B1} = 2{,}7\,mA$;

$U_{R1} = U_{GG} - V_{BE} = 3{,}3 - 0{,}7 = 2{,}6\,V$;

$R_1 = \frac{U_{R1}}{I_{R1}} = \frac{2{,}6}{2{,}7 \cdot 10^{-3}} = 963\,\Omega$

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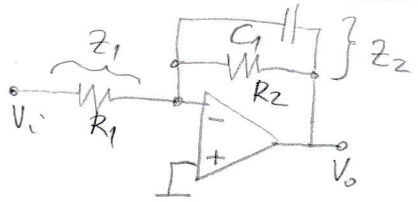
**③**




$A(j\omega) = -\frac{Z_2}{Z_1}$;

$Z_1 = R$

$Z_2 = \left(j\omega C_1 + \frac{1}{R_2}\right)^{-1}$

$A(j\omega) = -\frac{1}{R_1 \cdot \left(j\omega C_1 + \frac{1}{R_2}\right)} = -\frac{R_2}{R_1}\,\frac{1}{1 + j\omega C_1 R_2} = A_0 \cdot \frac{1}{1 + j\frac{\omega}{\omega_p}}$

$\omega_p = \frac{1}{C_1 R_2} = 2\pi f_p$

$A_0 = -\frac{R_2}{R_1} = -10 \Rightarrow R_2 = 10 R_1 = 100\,k\Omega$. $A_0[dB] = 20\log|A_0| = 20\,dB$

$f_p = \frac{1}{2\pi C_1 R_2} \Rightarrow C_1 = \frac{1}{2\pi f_p R_2} = \frac{1}{2\pi \cdot 10^3 \cdot 10^5} = 1{,}59\,nF$