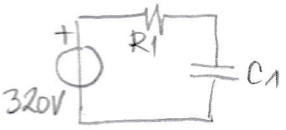
AE - 20160217

① 


$$I_0 = \frac{V_{in}(0) - V_{C1}(0)}{R1}$$

$$I_0 = \frac{320 - 0}{1} = 320A.$$

$$V_{C1}(t) = V_{C1}(\infty) + [V_{C1}(0) - V_{C1}(\infty)] \cdot e^{-\frac{t}{\tau}}$$

$V_{C1}(\infty) = V_{in} = 320V$;

$V_{C1}(0) = 0$;

$\tau = R1C1 = 1 \cdot 0{,}33 \cdot 10^{-3} = 330\mu s$;

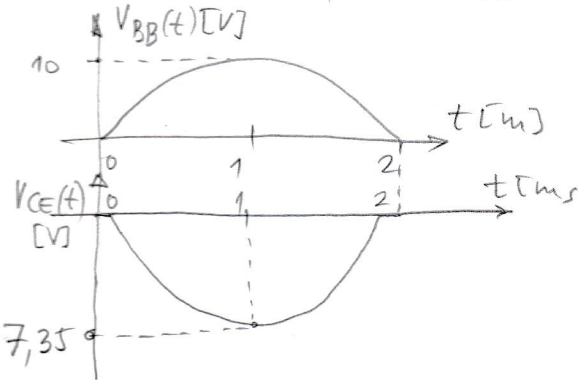
$$V_{C1}(t_1) = 300 = 320 + [0 - 320]e^{-\frac{t_1}{\tau}}$$

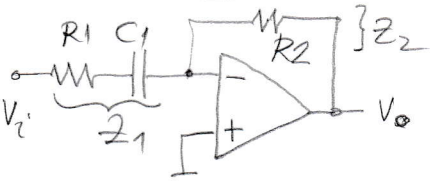
$$20 = 320 \cdot e^{-\frac{t_1}{\tau}}; \quad t_1 = \tau \ln \frac{320}{20} = 915\mu s$$

② $V_{BB} < 0{,}7V \Rightarrow I_{BB} = 0$; $V_{BB} = 10V \Rightarrow I_{BBm} = \frac{10 - V_{BE}}{R_1} = \frac{9{,}3}{10^5} = 93\mu A.$

$I_{cm} = \beta I_{BBm} = 50 \cdot 93 \cdot 10^{-6} = 4{,}65mA$

$V_{CEmax} = 12V$; $V_{CEmin} = 12 - I_{cm} \cdot R_2 = 12 - 4{,}65 = 7{,}35V > V_{CEsat}$




③ 


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

$$Z_1 = R_1 + \frac{1}{j\omega C_1}$$

$Z_2 = R_2$

$$A(j\omega) = -\frac{R_2}{R_1 + \frac{1}{j\omega C_1}} = -\frac{j\omega C_1 R_2}{j\omega C_1 R_1 + 1} = -\frac{j\frac{\omega}{\omega_0}}{1 + j\frac{\omega}{\omega_p}} = \frac{j\frac{\omega}{1/C_1 R_2}}{1 + \frac{j\omega}{1/C_1 R_1}}$$

$A(\infty) = -10 = -\frac{R_2}{R_1} \Rightarrow R_2 = 10R_1 = 100k\Omega$

$$\omega_p = \frac{1}{C_1 R_1} = 2\pi \cdot f_p; \quad C_1 = \frac{1}{2\pi f_p R_1} = \frac{1}{2\pi \cdot 10^3 \cdot 10^4} = 15{,}9nF$$