1A) Calculate C_1 that gives resonance frequency $f_0 = 50kHz$

$$f_0 = \frac{\omega_0}{2\pi} = \frac{1}{2\pi\sqrt{LC}} \quad \text{in Hz}$$

$$50kHz = \frac{1}{2\pi\sqrt{10\times10^{-3}C}}$$

$$50\times10^3\,(2\pi\sqrt{10\times10^{-3}}) = \frac{1}{\sqrt{C}}$$

$$\frac{1}{50\times10^3\,(2\pi\times10^{-1})} = \sqrt{C}$$

$$C = 1.01\times10^{-9} \cong 1nf$$

1B) $f_d = \omega_d/2\pi$ τ is constant for $R_1=0$, $R_1=100$ and $1k$ ohm.

$$\omega_d = \sqrt{\frac{1}{LC} - \frac{R^2}{4L^2}} \quad , \quad \text{At } R_1=0 \quad R_{total} = 250 \text{ ohm}$$

$$\omega d_1 = \sqrt{10^{11} - \frac{(250)^2\times10^4}{4}} = 3{,}15\times10^5 \,,\quad fd_1 = 50\times10^3 = 50kHz$$

$R=100$

$$\omega d_2 = \sqrt{10^{11} - \frac{(350)^2\times10^4}{4}} = 3.15\times10^5 \,,\quad fd_1 = 50\times10^3 = 50kHz$$

$R=1k\,oh$

$$\omega d_3 = \sqrt{10^{11} - \frac{(1250)^2\times10^4}{4}} = 3{,}1\times10^5 \quad fd_1 = 49\times10^3 = 49\,kHz$$

1C

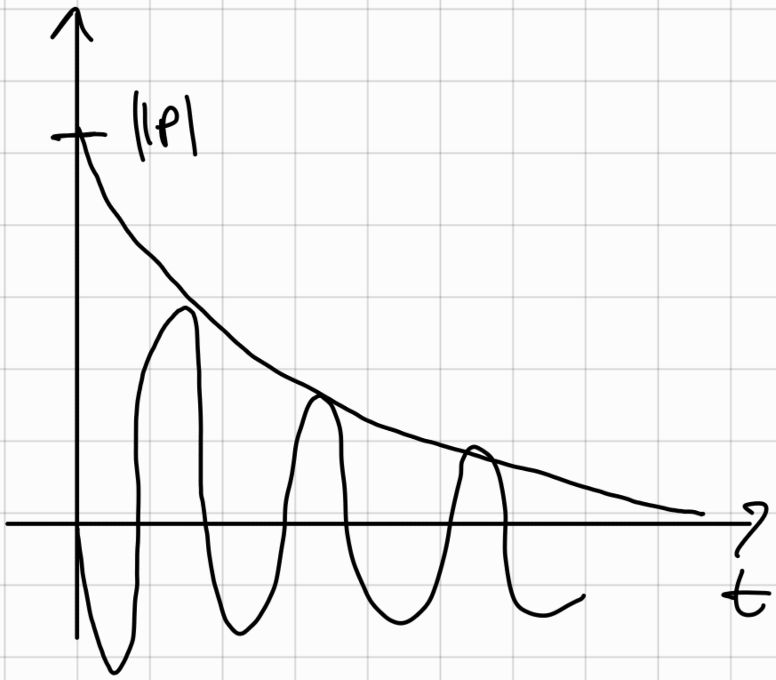
$$i(t) = I_P \sin(\omega d\, t)\, e^{-t/\tau}$$

$V_C(0^-) = V_{in} = 5V$

$$i(0^-) = i(0^+) = 0 \qquad I_P = \frac{-1}{\omega d}\frac{V_C(0)}{L} = \frac{-1}{3{,}15\times10^5}\frac{5}{10^{-2}} = \frac{-5}{3{,}15\times10^3}$$

$I_p = -1{,}58\times10^{-3}$, $|I_p| = 1{,}38\times10^{-3}$ $\qquad \tau = \dfrac{2\,10^{-2}}{350} = \dfrac{0{,}02}{350} = 5{,}71\times10^{-5}$

$i(t) = -1{,}58\times10^{-3}\,\sin(3{,}15\times10^{5}\,t)\; e^{-t/5{,}71\times10^{-5}}$



$$i_c = C\,\frac{dv}{dt}$$

$$v = \int_0^t i_{c(t)}\,dt + i_{(0)}$$

$$\hookrightarrow v_c(t) = \int_0^t i(t) = -1{,}58\times10^{-3}\,\sin(3{,}15\times10^{5}\,t)\; e^{-t/5{,}71\times10^{-5}}$$

1)

D $R = 2\sqrt{\frac{L}{C}} = 6293{,}16$

2) $R_1 = 0\,\Omega$ $V_{LC} = i(t)\cdot 200 = 2V$

$i(t) = \frac{2{,}5 \sin(\omega_d t)}{250 + R_1}$

$R_1 = 100\,\Omega$

$i(t) = \frac{2{,}5}{350} = 0{,}00714$, $V_C(t) = \frac{\ell\,(2{,}5)\,\omega_d t \cdot \cos(\omega_d t)}{350}$

$= 1.4V$

$R_{1k\Omega} = 1k\,\Omega$

$i(t) = 0{,}002$

$V_C(t) = \frac{\ell \cdot 2{,}5 \cdot \omega_d \cdot \cos(\omega_d t)}{1250} = 0{,}4$

$J = 1{,}6 \times 10^{-5}$

$V_C(t) = \frac{-1}{\omega_d RC} V_p \cos(\omega_d t)$ when $\omega_d \sqrt{\frac{1}{LC} - \frac{R^2}{4L}}$

Case 1 $10L_1$ and $0.1C_1$

Case 2 $0.1L_1$ and C_1

at $t=0$ V_p are equal $\to 5V$ so we need to

look $\frac{-1}{\omega_d RC}$ value so this a negativ value

so if we want bigger values we must increase

$\omega_d \cdot R \cdot C$ values R is equal for both cases

for ω_d there is no big diffrence at all but C

Values makes the diffrence so Case 2 $V(t) >$ Case 1 $V(t)$