ELECENG 2CI5 Lab 7 Prelab

Raeed Hassan
hassam41

i.

$$\alpha = \frac{1}{2RC} = \frac{1}{2 \cdot R \cdot 1nF} = \frac{1}{2 \cdot R \cdot 1 \times 10^{-9}} = \frac{500000000}{R}\ rad/s$$

$$\omega_0 = \frac{1}{\sqrt{LC}} = \frac{1}{\sqrt{1.5\mu H \cdot 1nF}} = \frac{1}{\sqrt{1.5 \times 10^{-6} \cdot 1 \times 10^{-9}}} = 25819888.97\ rad/s$$

$$\zeta = \frac{\alpha}{\omega_0} = \frac{\frac{500000000}{R}\ rad/s}{25819888.97\ rad/s} = \frac{19.36}{R}$$

The value of ζ is dependent on R, therefore the system would be underdamped, critically damped, or overdamped at different values of R. In the given circuit, $R = (R_1 \mid\mid R_2)$.

ii.

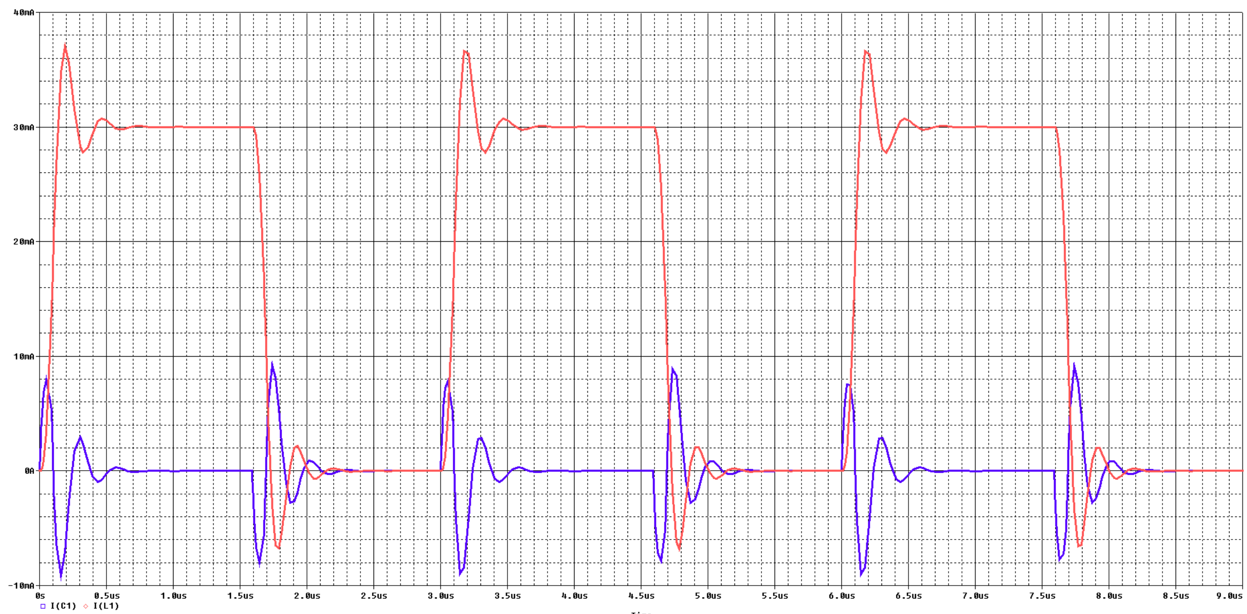
$$1 = \zeta = \frac{\frac{500000000}{R}\ rad/s}{25819888.97\ rad/s} = \frac{19.36}{R}$$

$$1 = \frac{19.36}{R}$$

$$R = 19.36\Omega$$

$R = (R_1 \mid\mid R2) = 19.36\Omega$. Therefore $2R = R_1 = R_2 = 38.72\Omega$. The value of $R_1 = R_2$ that results in the circuit being critically damped is 38.72Ω.

iii.

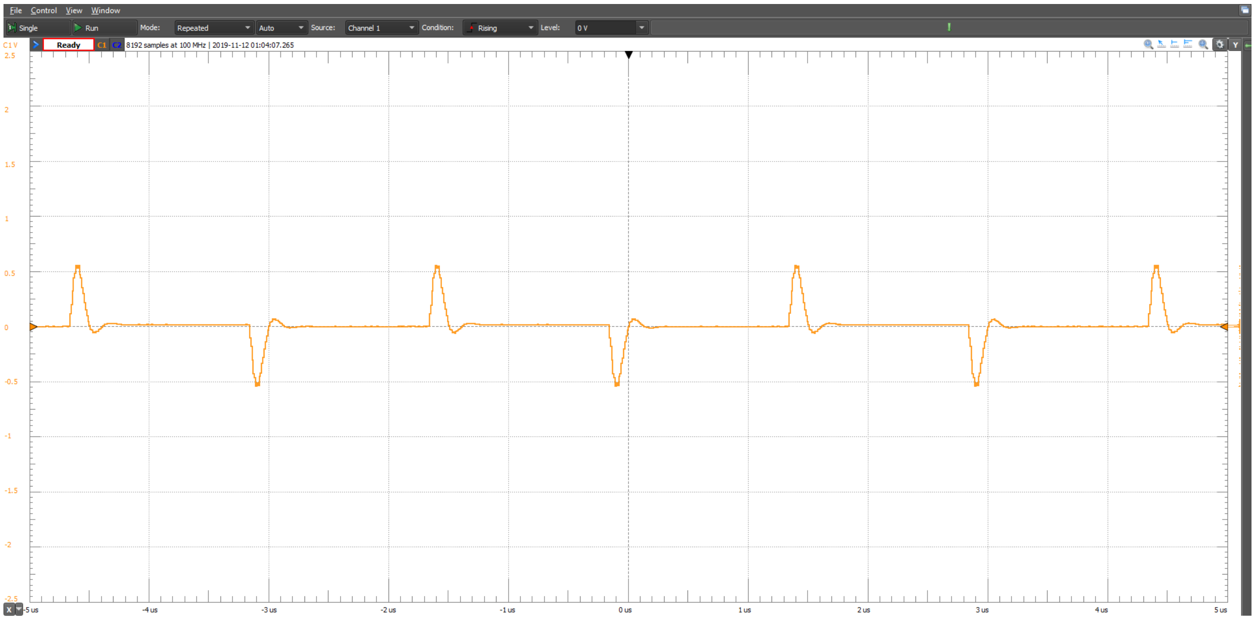


iv.

v. The phase difference in part ii is $360 \cdot \frac{280ns}{3us} = 33.6$ or $2\pi\ rad \cdot \frac{280ns}{3us} = 0.59\ rad$. The phase difference in part iii is $360 \cdot \frac{140ns}{3us} = 16.8$ or $2\pi\ rad \cdot \frac{140ns}{3us} = 0.29\ rad$.

vi.

vii.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