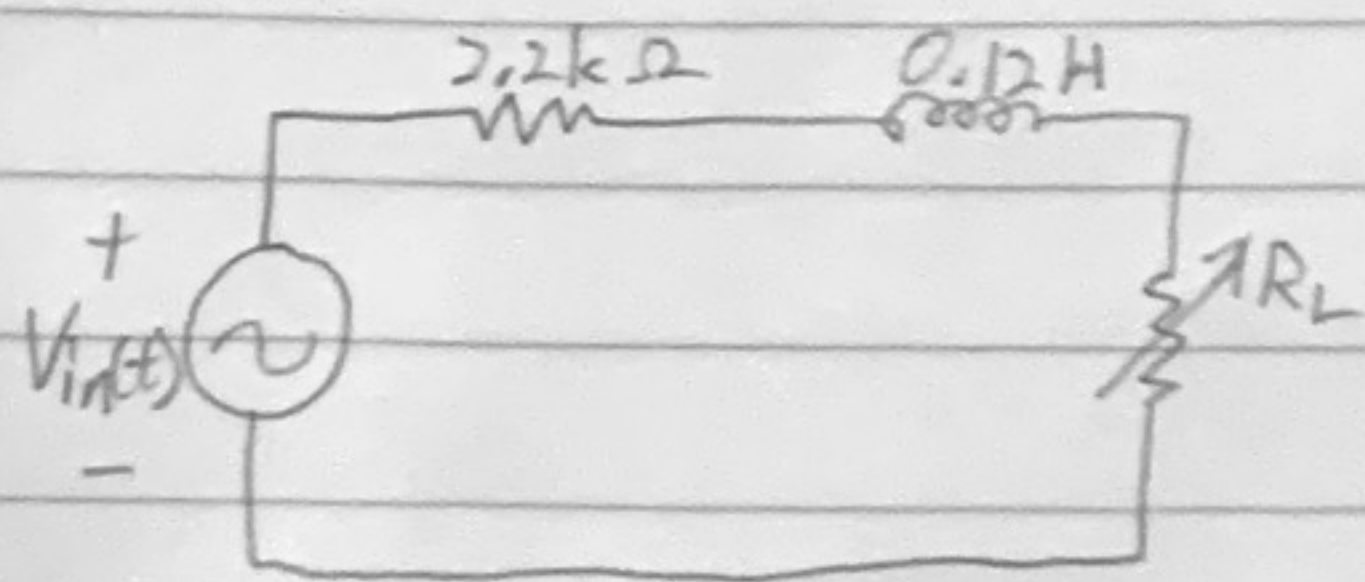


# Prelab 9

A.



p-p value: 8Volts & frequency: 10kHz

Solution:  $\omega = 2\pi f = 62831.85 \text{ rad/sec}$

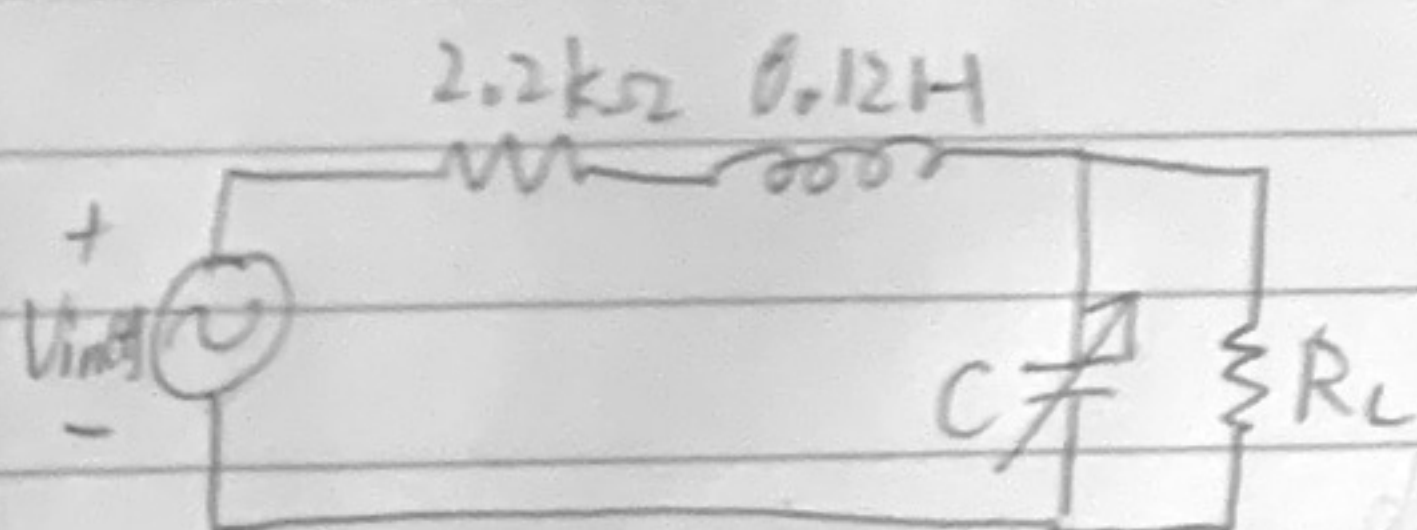
$$P_L = \frac{|V_{in}|^2 R_L}{2((R_L + R_S)^2 + (\omega L)^2)} = \frac{64 R_L}{2((R_L + 2200)^2 + 56848915.79)}$$

when  $\frac{dP_L}{dR_L} = 0$ ,  $P_L$  is at maximum. Let  $R_L$  be  $x$

$$\frac{dP_L}{dR_L} = - \frac{3200(100x^2 - 61688915.79)}{(100x^2 + 440000x + 61688915.79)^2} = 0 \Rightarrow R_L = 7854.229165$$

Plug  $R_L$  to  $P_L$ :  $P_L = 1.5914 \times 10^{-3} \text{ W}$

B.



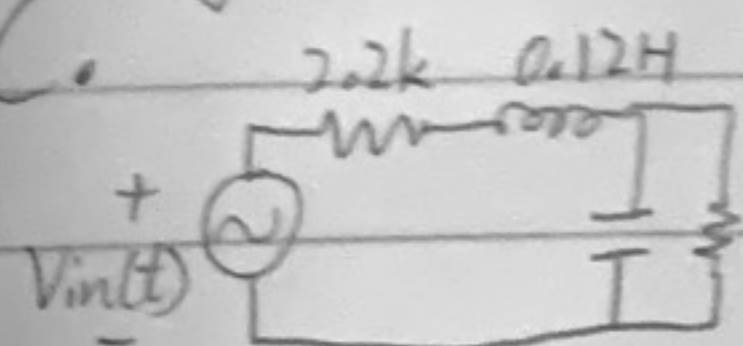
$$P_L = \frac{|V_{in}|^2 R_L}{2((R_L + R_S - \omega^2 R_L L C)^2 + (\omega(L + R_L R_S C))^2)}$$

when  $\frac{dP_L}{dC} = 0$ ,  $R_L = \frac{14800 \sqrt{1862232368325709354}}{1570845833 \sqrt{22472907620582819638637149}} \approx 2.71216 \times 10^{-9}$

Plug  $C$  to  $P_L$ :  $P_L = 0.002486 \text{ W}$ , which higher than part A

$$\approx 2.71216 \times 10^{-9}$$

C.

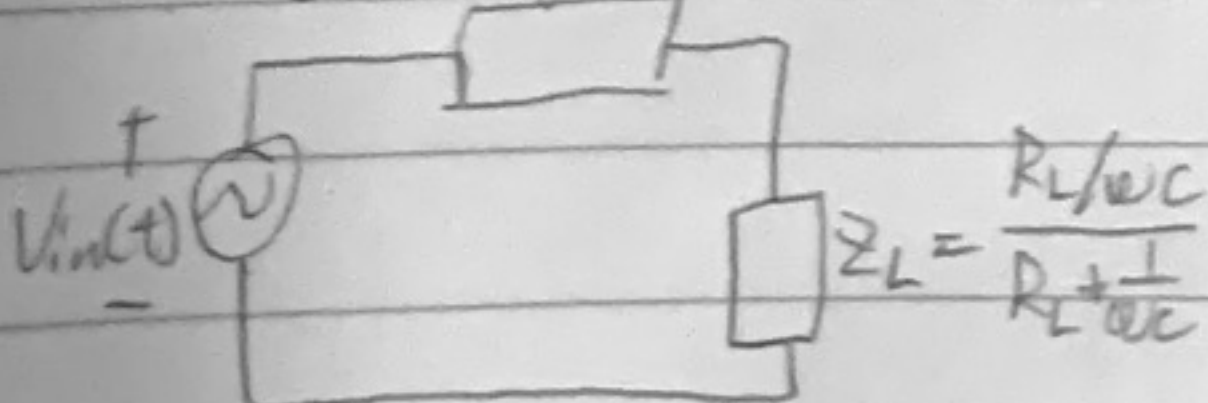


$$Z_S = 2200 + j\omega \times 0.12 = 2200 + 7539.82j \Omega$$

$$R_L = 2200 \Omega$$

$$P_{max} = \frac{|V_L|^2}{4R_L} = \frac{4^2}{4 \times 2200} = 1.818 \times 10^{-3} \text{ W}$$

$$Z_S = R + j\omega L$$



$$X_C = 7539.82 \Rightarrow \frac{1}{\omega C} = 7539.82 \Rightarrow C = 2.11 \times 10^{-9} \text{ F}$$