

EE 220 Circuits 1

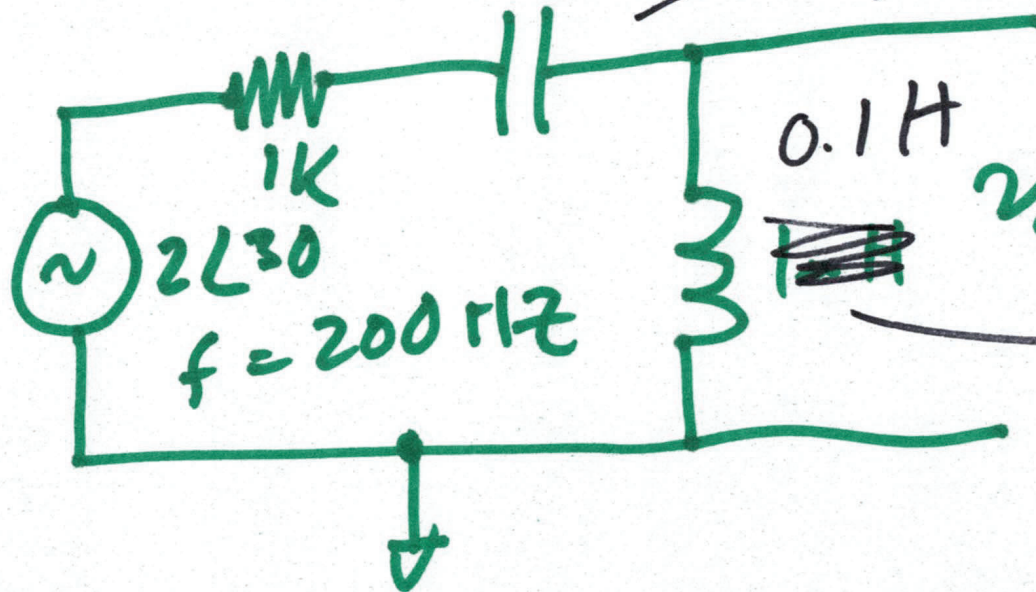
NOV. 23, 2020

Lecture

14F

24

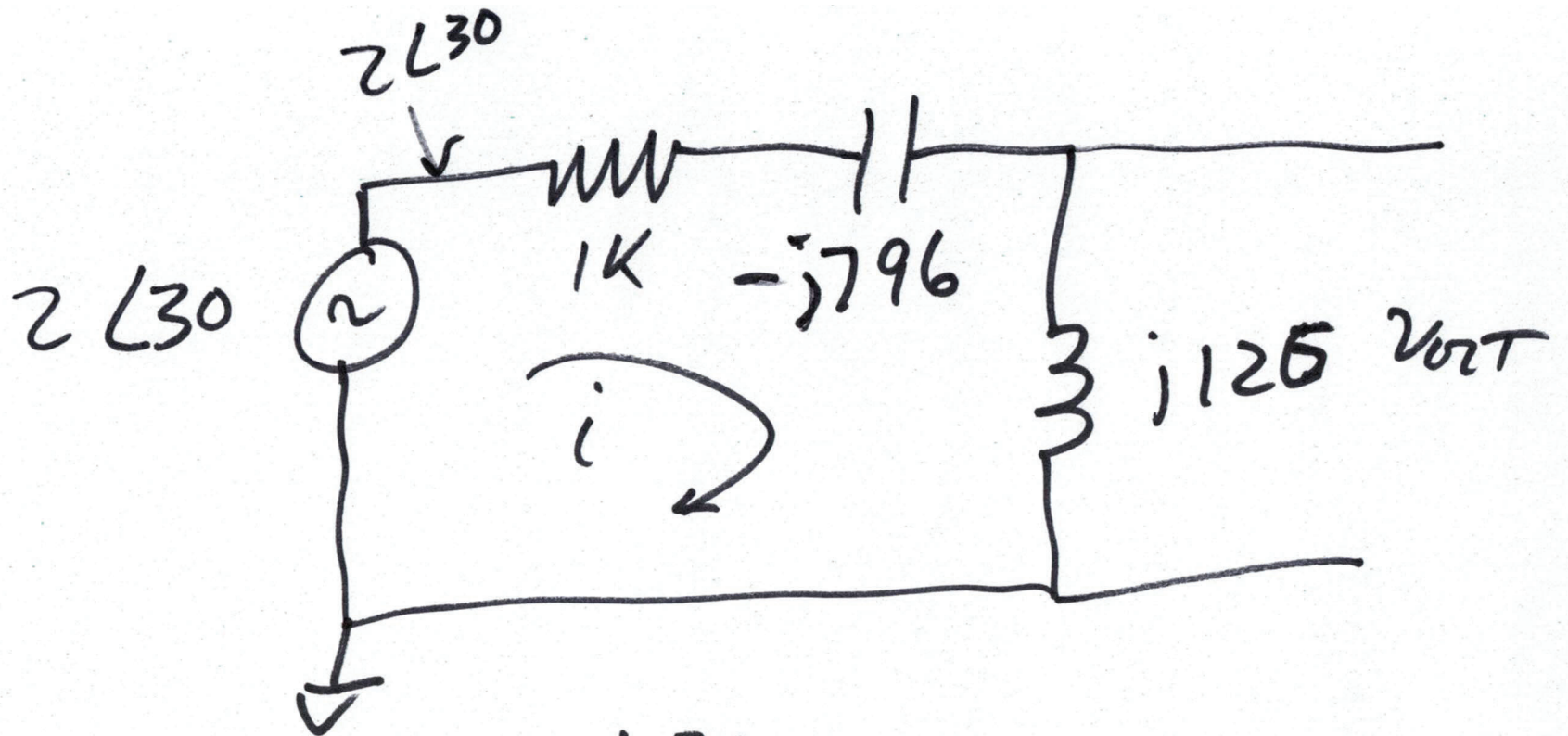
$$\frac{1}{j \cdot 2\pi \cdot 10^6 \cdot 200} = -j795.8$$



$$200 \angle 125.6$$

$$j \cdot 2\pi \cdot 10^6 \cdot 200$$

11



$$i = \frac{2\angle 30}{1K + j(126 - 796)}$$

$$= \frac{2\angle 30}{1K + j(-670)}$$

$$1203 \angle -34^\circ$$

2)

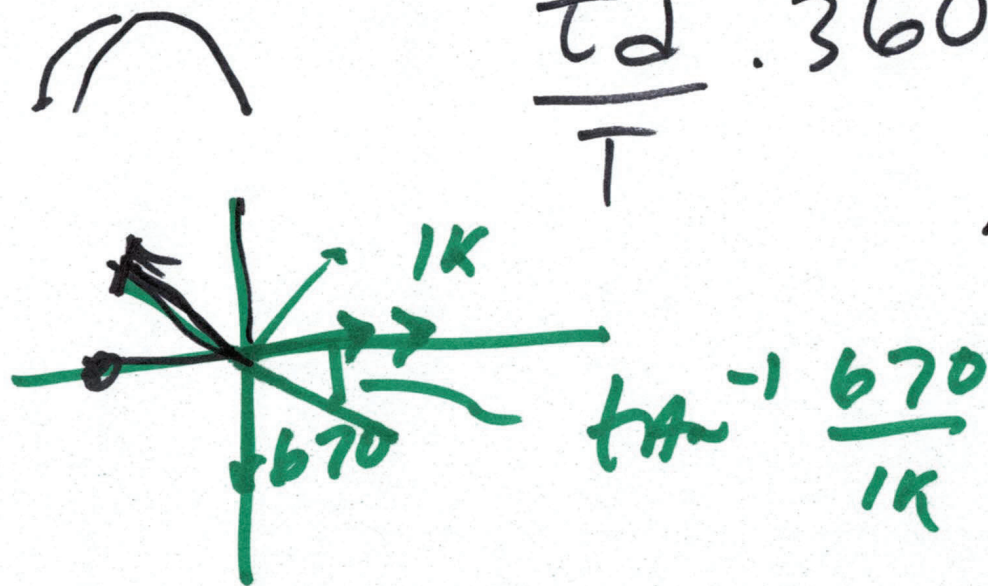
$$i = \frac{2 \angle 30}{1203 \angle -34} = 1.66 \mu A \angle 64^\circ$$

$$200 \text{ Hz} \rightarrow T = 5 \mu s$$

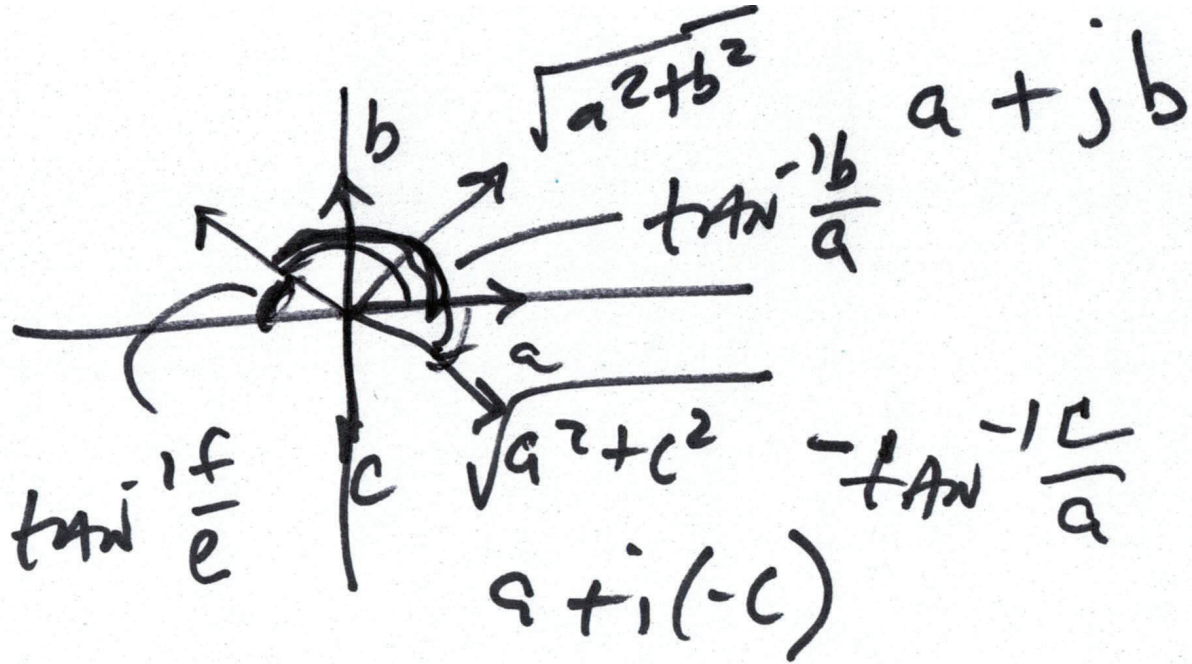
$$i(t) = 1.66 \mu A \cdot \sin(2\pi \cdot 1k \cdot t + 64^\circ)$$

$$\frac{t_d}{T} \cdot 360 = \theta, \quad t_d = \frac{T \cdot \theta}{360}$$

$$.89 \mu s = t_d = \frac{5 \mu s \cdot 64}{360}$$



3)



$$t_d = \frac{154 \cdot 360}{360} = 2.14 \mu s$$

$$V_{RT} = \frac{j126 \cdot 2 \angle 30^\circ}{1k + j(126 - 796)}$$

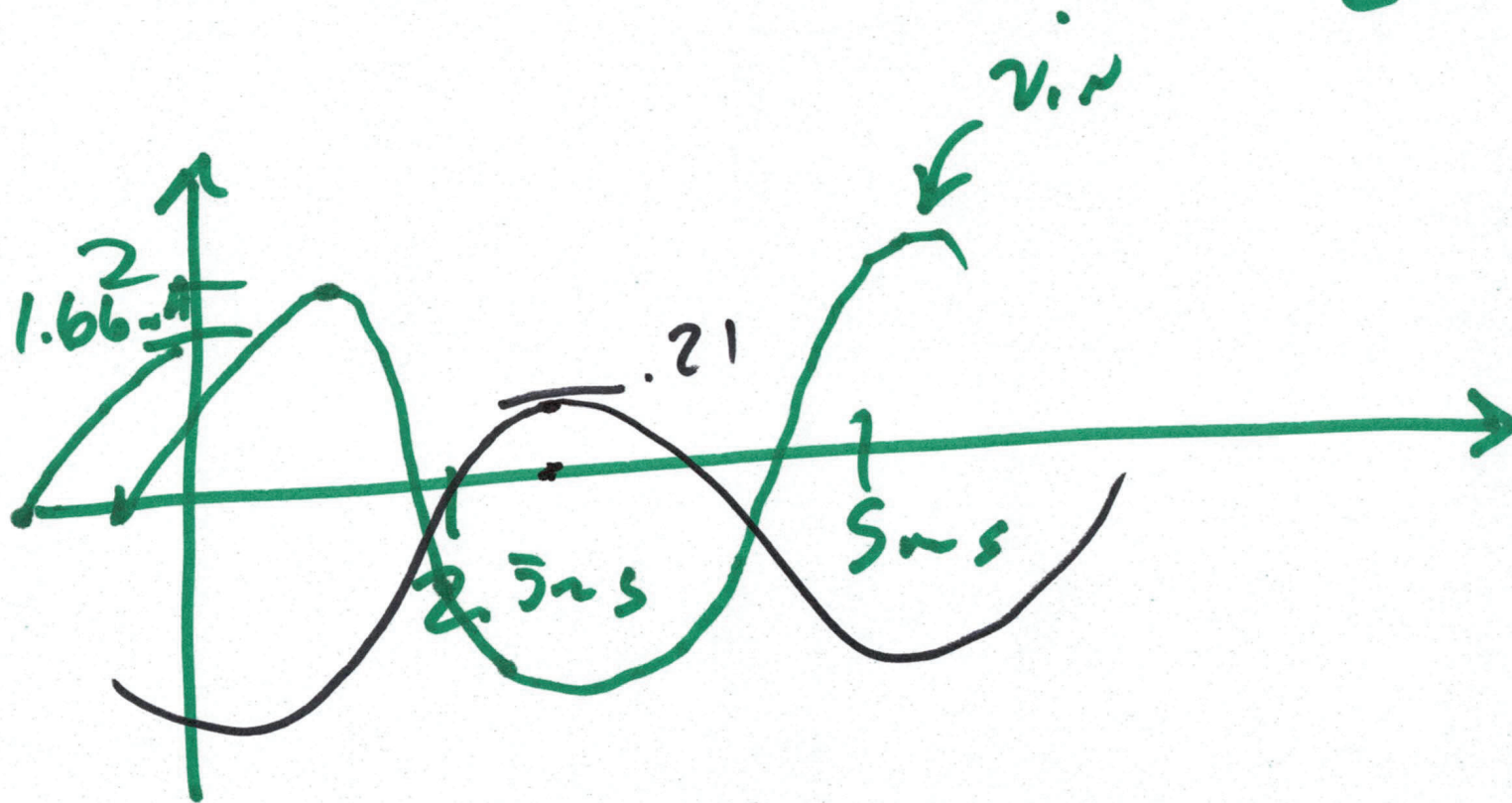
$$= \frac{126 \angle 90^\circ 2 \angle 30^\circ}{1203 \angle -34^\circ} = 0.21 \angle 154^\circ$$

$$= 0.21 \sin(2\pi \cdot 200 \cdot t + 154^\circ)$$

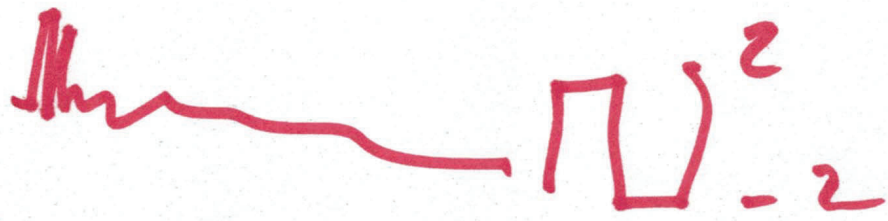
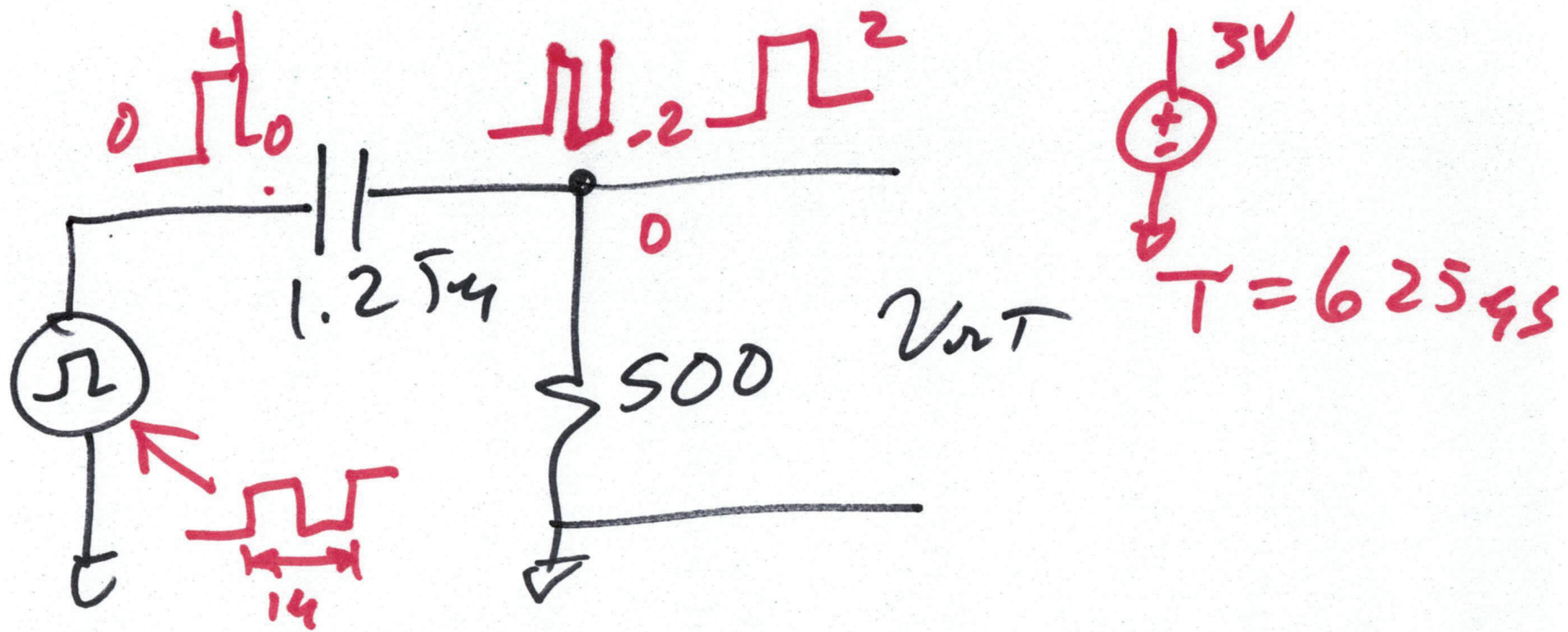
$$v_{in} = 2 \sin(2\pi \cdot 200 \cdot t + 30)$$

$$t_d = 5 \mu s \cdot \frac{30}{360}$$

$$t_d = .4 \mu s$$

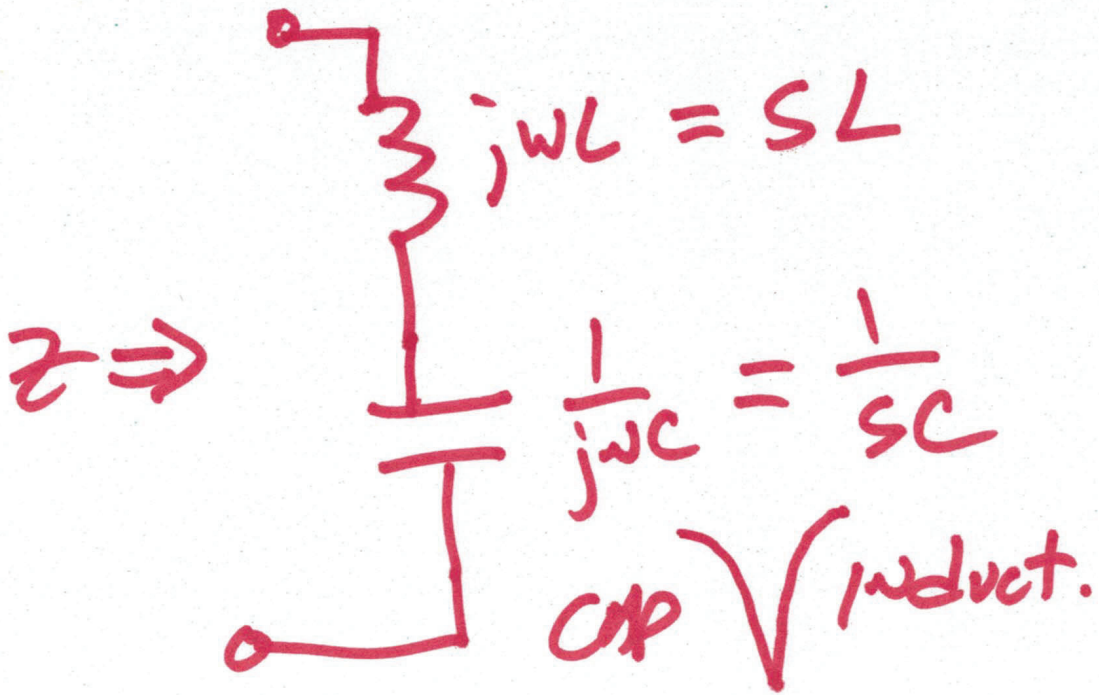


5)



6)

SERIES RESONANT



$$s = j\omega$$

$$s = \sigma + j\omega$$

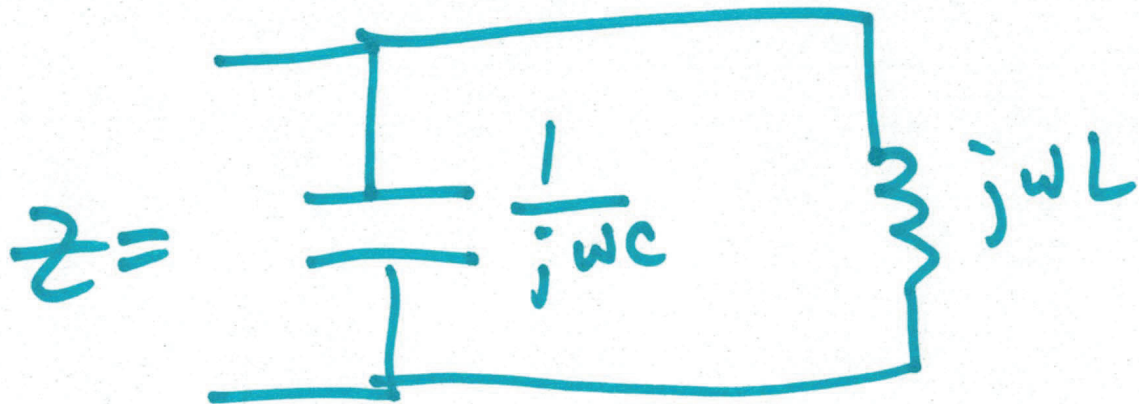
$$Z = sL + \frac{1}{sC} \stackrel{?}{=} 0 \rightarrow f = f_{res}$$

$$(2\pi f_{res})^2 = \frac{1}{LC} \quad sL = -\frac{1}{sC}$$

$$f_{res} = \frac{1}{2\pi\sqrt{LC}} \quad j \cdot 2\pi f_{res} \cdot L = j \cdot \frac{1}{2\pi f_{res} C}$$

7)

Parallel Resonance



$$Z = \frac{\frac{1}{j\omega C} \cdot j\omega L}{\frac{1}{j\omega C} + j\omega L} = \frac{j\omega L}{1 + (-\omega^2 LC)}$$

$f_{res} = \frac{1}{2\pi\sqrt{LC}}$

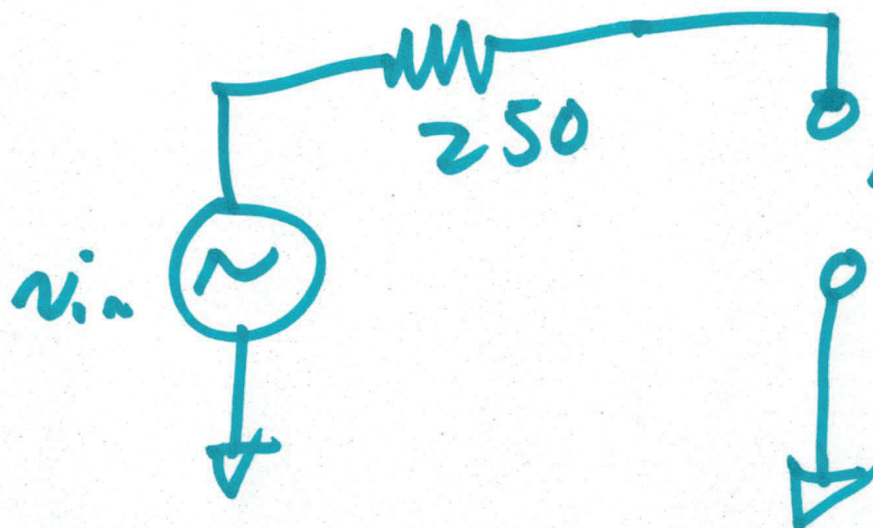
At resonance $Z = \infty$

$$1 + (-\omega_{res}^2 LC) = 0, f_{res} = \frac{1}{2\pi\sqrt{LC}}$$

40 mH 14 F

$$f_{res} = \frac{1}{2\pi \cdot \sqrt{40 \cdot 10^{-3} \cdot 10^{-6}}}$$

$$f_{res} = 796 \text{ Hz}$$



$$v_{out} = v_{in} \cdot \frac{\infty}{\infty + 250} = v_{in}$$

9)