

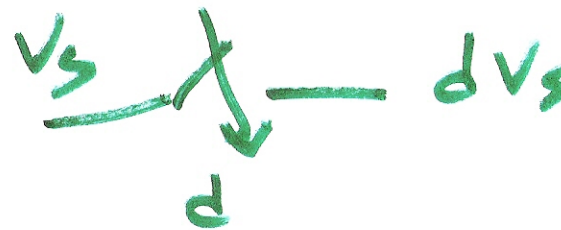
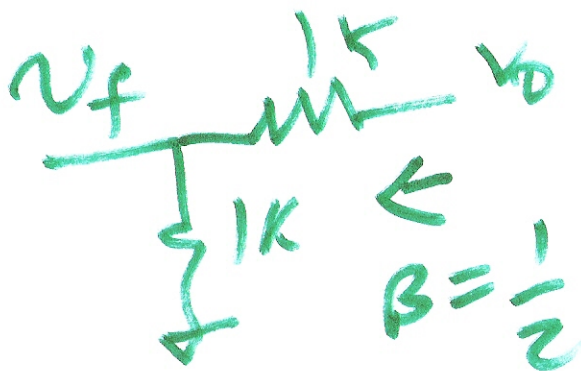
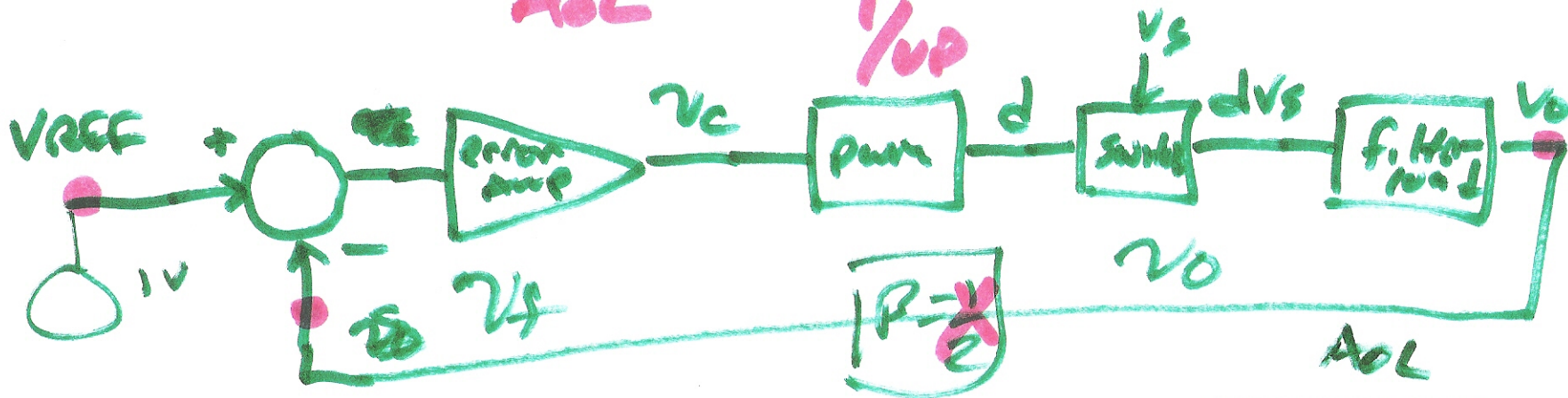
ECE 51472 Power Electronics

OCT. 18, 2010

Lecture 23

AOL

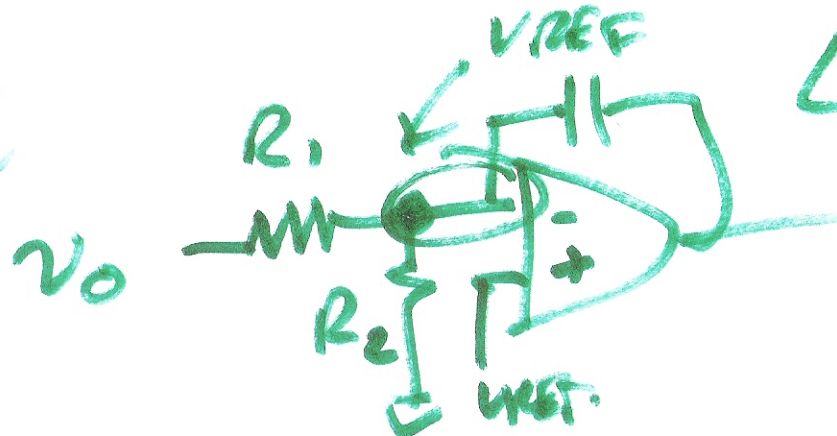
1/2



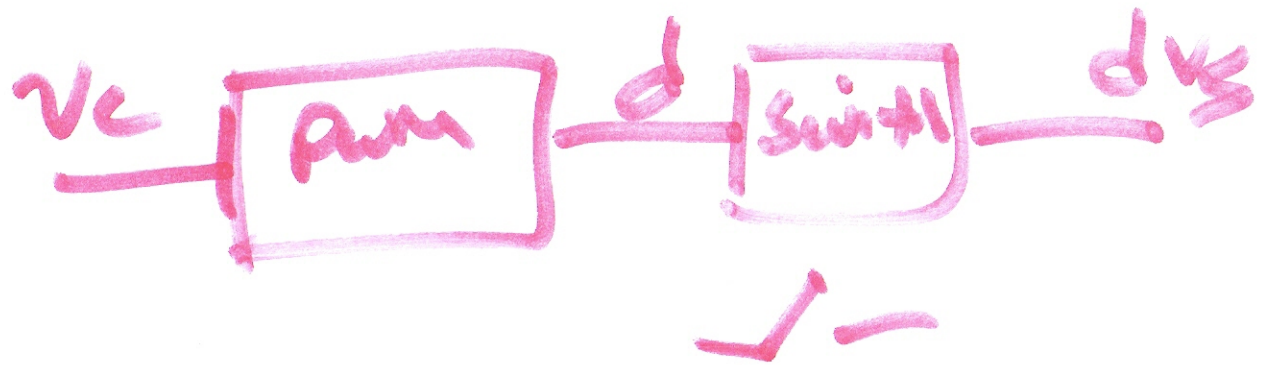
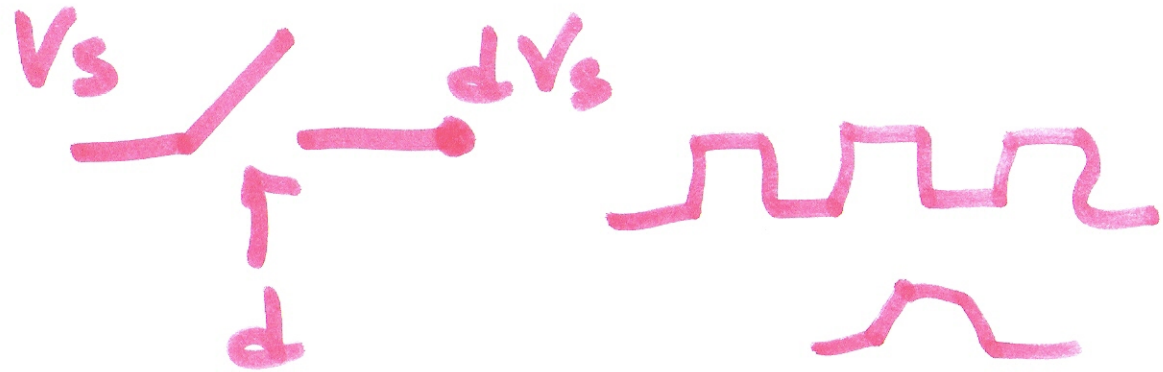
$$\frac{AOL}{1 + \beta AOL}$$

$$|AOL| = 1$$

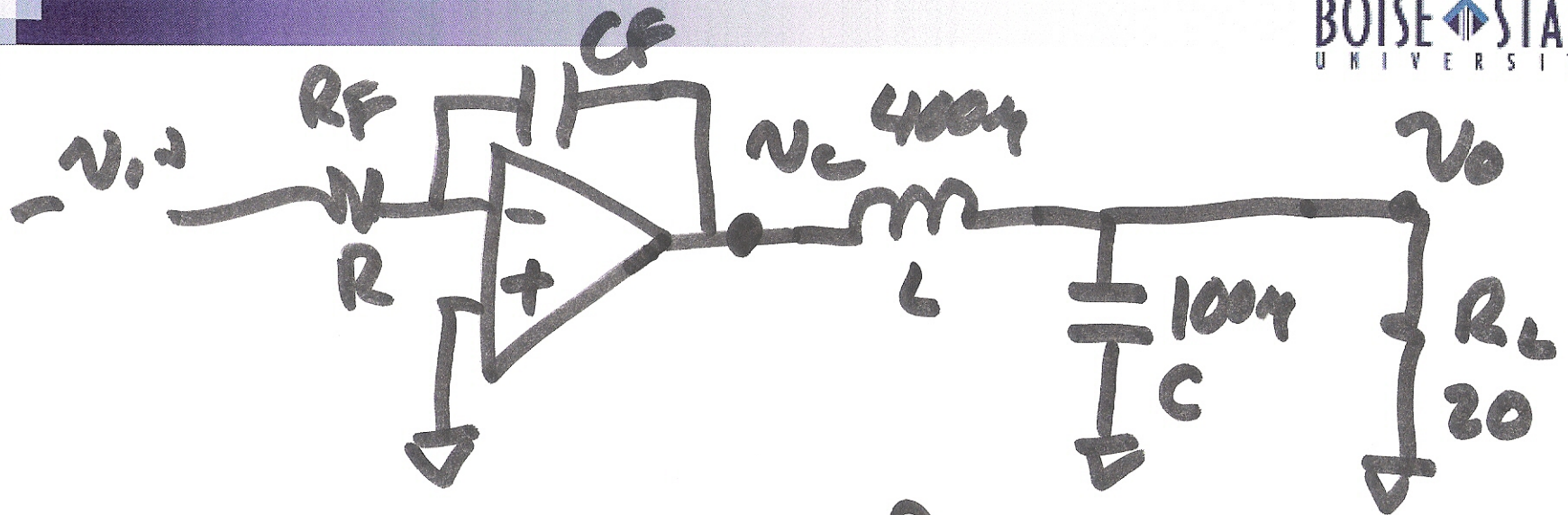
$$|AOL| = 100$$



1)



2)



$$\frac{v_o}{v_c} = \frac{R_L}{1 + j\omega R_L C}$$

$$\frac{R_L}{1 + j\omega R_L C} + j\omega L$$

$$= \frac{R_L}{R_L + j\omega L + s^2 R_L C L}$$

3)

$$= \frac{1}{LC} \cdot \frac{1}{s^2 + s \cdot \frac{1}{R_2C} + \frac{1}{LC}}$$

$$\text{poles } s_{P1,2} = \frac{-\frac{1}{R_2C} \pm \sqrt{\left(\frac{1}{R_2C}\right)^2 - 4 \frac{1}{LC}}}{2}$$

$$\text{poles } s_{P1,2} = \frac{-250 \pm \sqrt{(500)^2 - 100 \cdot 10^6}}{2}$$

$$-250 \pm i \cdot 5000$$

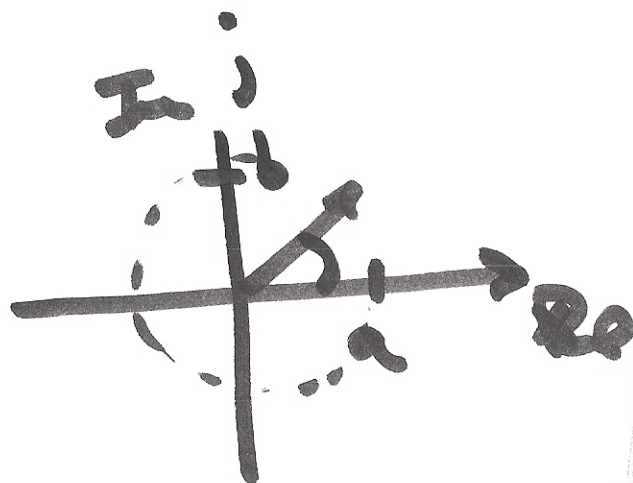
$$s_{P1} = -250 + 5ki$$

$$s_{P2} = -250 - 5k \cdot i$$

4)

$$\frac{1}{Lc} \cdot \frac{1}{(s - s_{p1})(s - s_{p2})}$$

$$= \frac{1}{Lc} \cdot \frac{1}{(s - (-250 + 5k \cdot i)) \cdot (s - (-250 - 5k \cdot i))}$$



$$|l| = \sqrt{a^2 + b^2}$$

$$L = \tan^{-1} \frac{b}{a}$$

5)

$$\frac{1}{c+id} \cdot \frac{c-jd}{c-jd} \rightarrow \text{conj}^{-1} = \frac{-d}{c}$$

$$\frac{c}{c^2+d^2} + j \cdot \frac{-d}{c^2+d^2}$$

$$| | = \sqrt{\frac{c^2}{(c^2+d^2)^2} + \frac{d^2}{(c^2+d^2)^2}}$$

$$= \frac{\sqrt{c^2+d^2}}{\sqrt{(c^2+d^2)^2}} = \frac{1}{\sqrt{c^2+d^2}}$$

b)

$$\left(j\omega + \frac{1}{Lc} \right) \cdot \left(\frac{1}{(j(\omega - 5000) + 250)} \right)$$

$$\left(\frac{1}{(j(\omega + 5000) + 250)} \right)$$

$$| | = \frac{1}{Lc} \cdot \frac{1}{\sqrt{250^2 + (\omega - 5k)^2}} \cdot \frac{1}{\sqrt{250^2 + (\omega + 5k)^2}}$$

$$\angle 0 - \tan^{-1} \frac{\omega - 5000}{250} - \tan^{-1} \frac{\omega + 5000}{250}$$

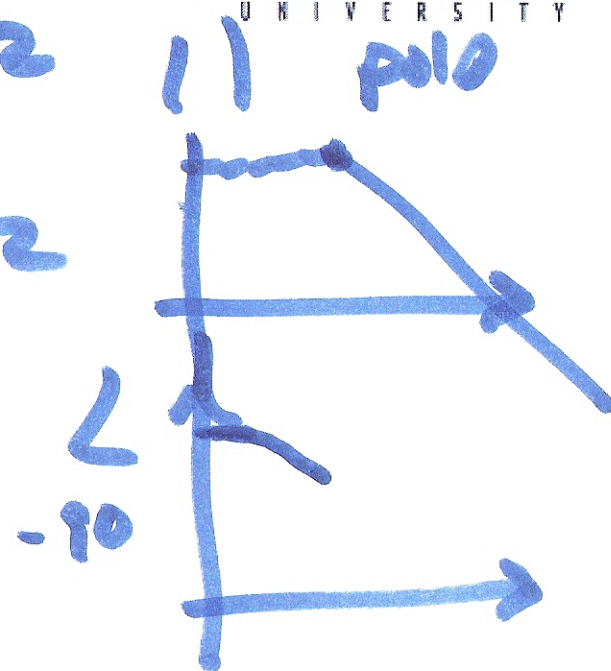
$$(\omega - 5000)^2 = 250^2$$

$$(\omega + 5000)^2 = 250^2$$

$$\omega = 5250$$

$$f = \frac{5250}{2\pi} = \underline{\underline{836 \text{ Hz}}}$$

$$f = \frac{-4750}{2\pi} = \underline{\underline{756 \text{ Hz}}}$$



8)