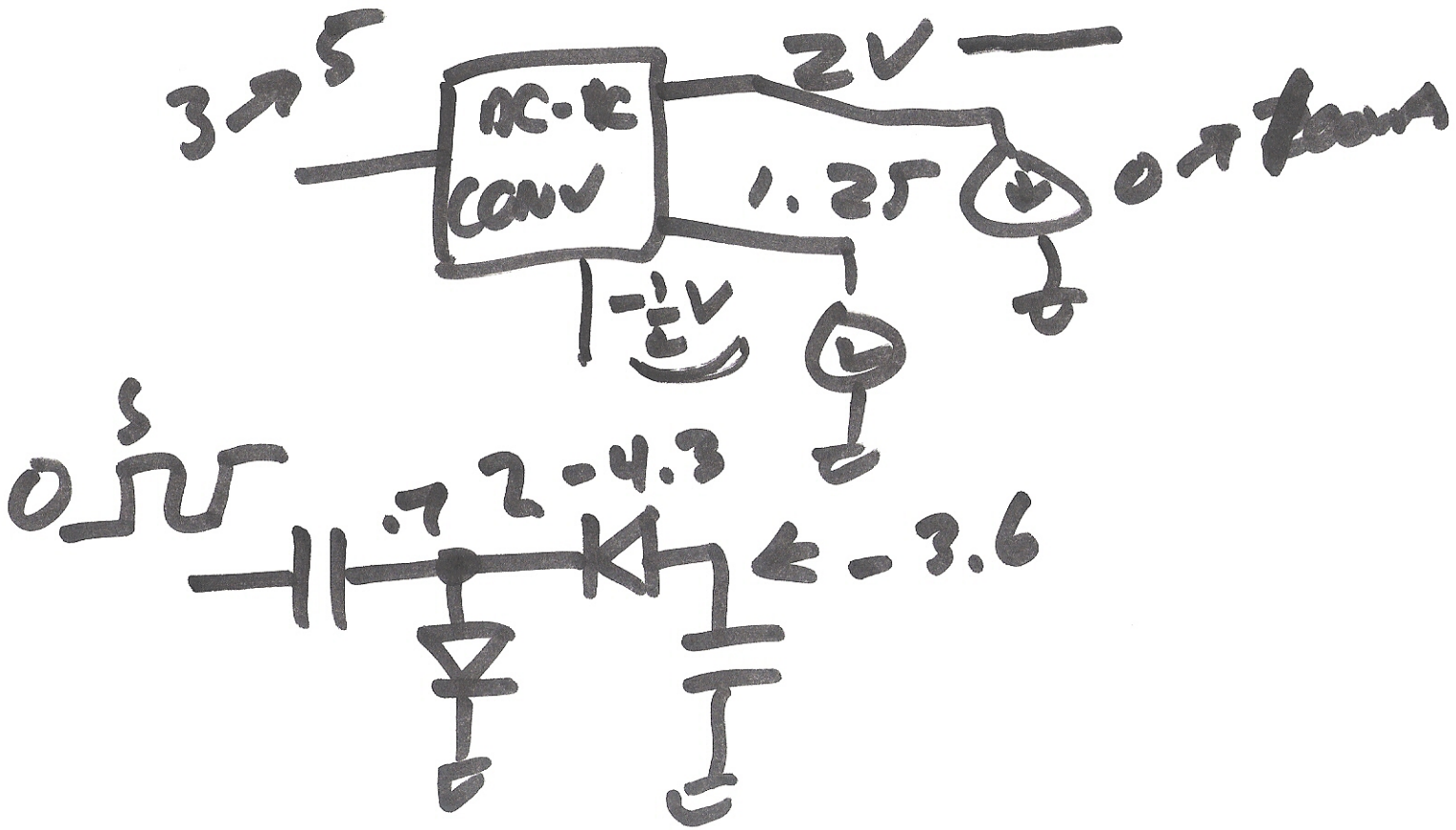
ECE 5/472 Power Electronics

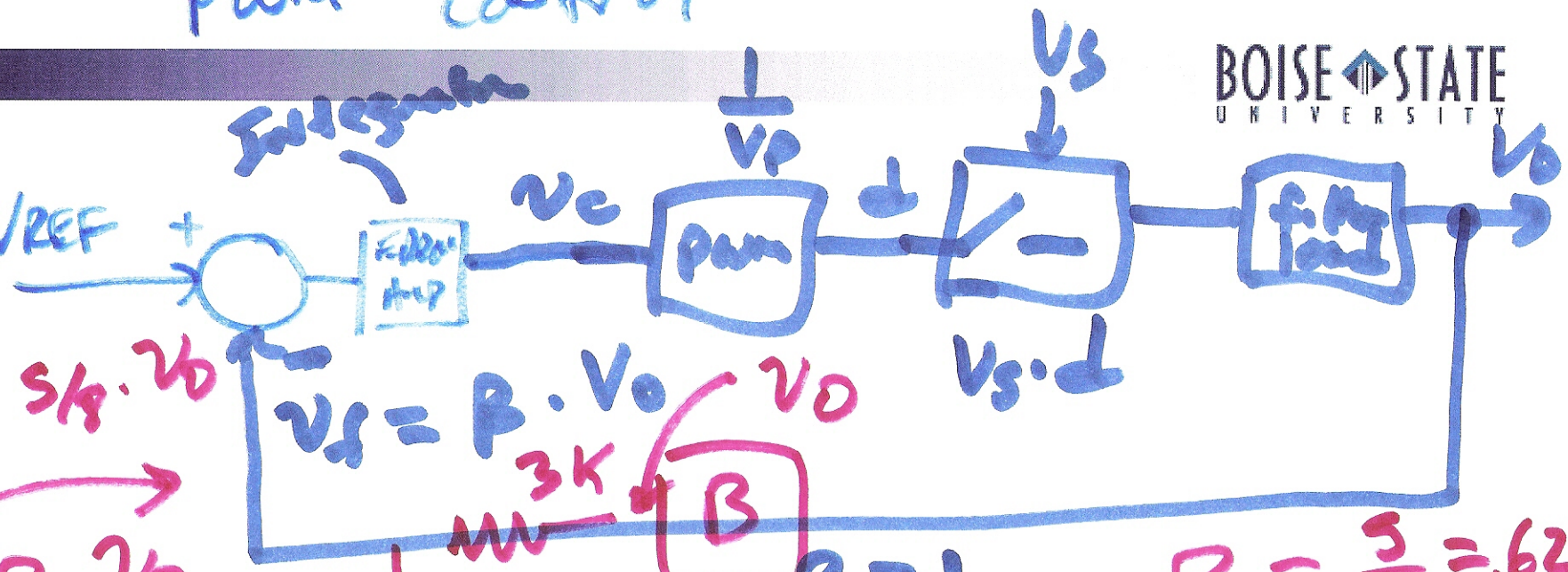
BOISE STATE UNIVERSITY

Lecture 21

OCT. 13, 2010



PWM Control



$V_f = \beta \cdot V_o$

$= \frac{5K}{3K+5K} \cdot V_o$

$\beta = 1, \quad \beta = \frac{5}{8} = .625$

$A_{CL} = \frac{A_{OL}}{1 + \beta A_{OL}} \Rightarrow A_{CL} = \frac{1}{\beta}$

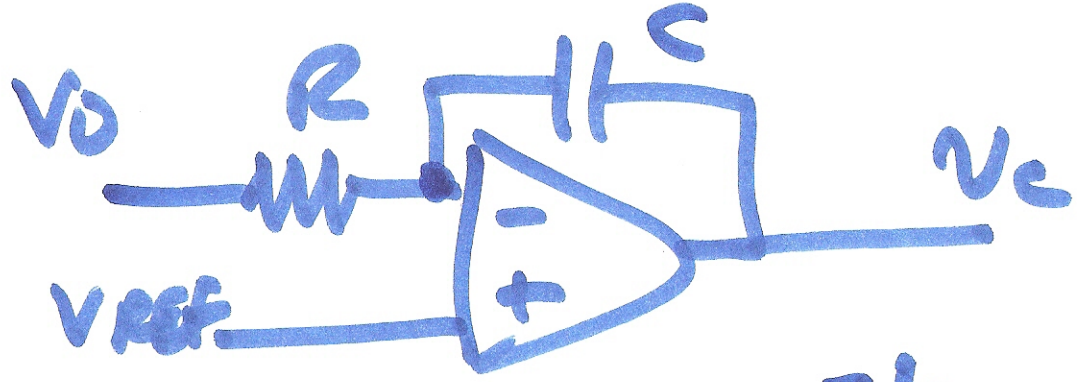
$A_{OL} \to \infty$

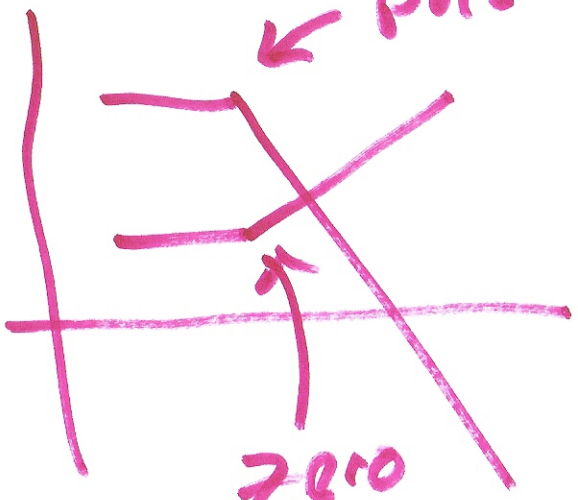
$A_{CL} = \frac{V_o}{V_{REF}} \quad V_o \to V_{REF}$

$A_{CL} = \frac{2V}{1.25} = \frac{8 \cdot .25}{5 \cdot .25} = \frac{8}{5}$

$= 1.6$

2)





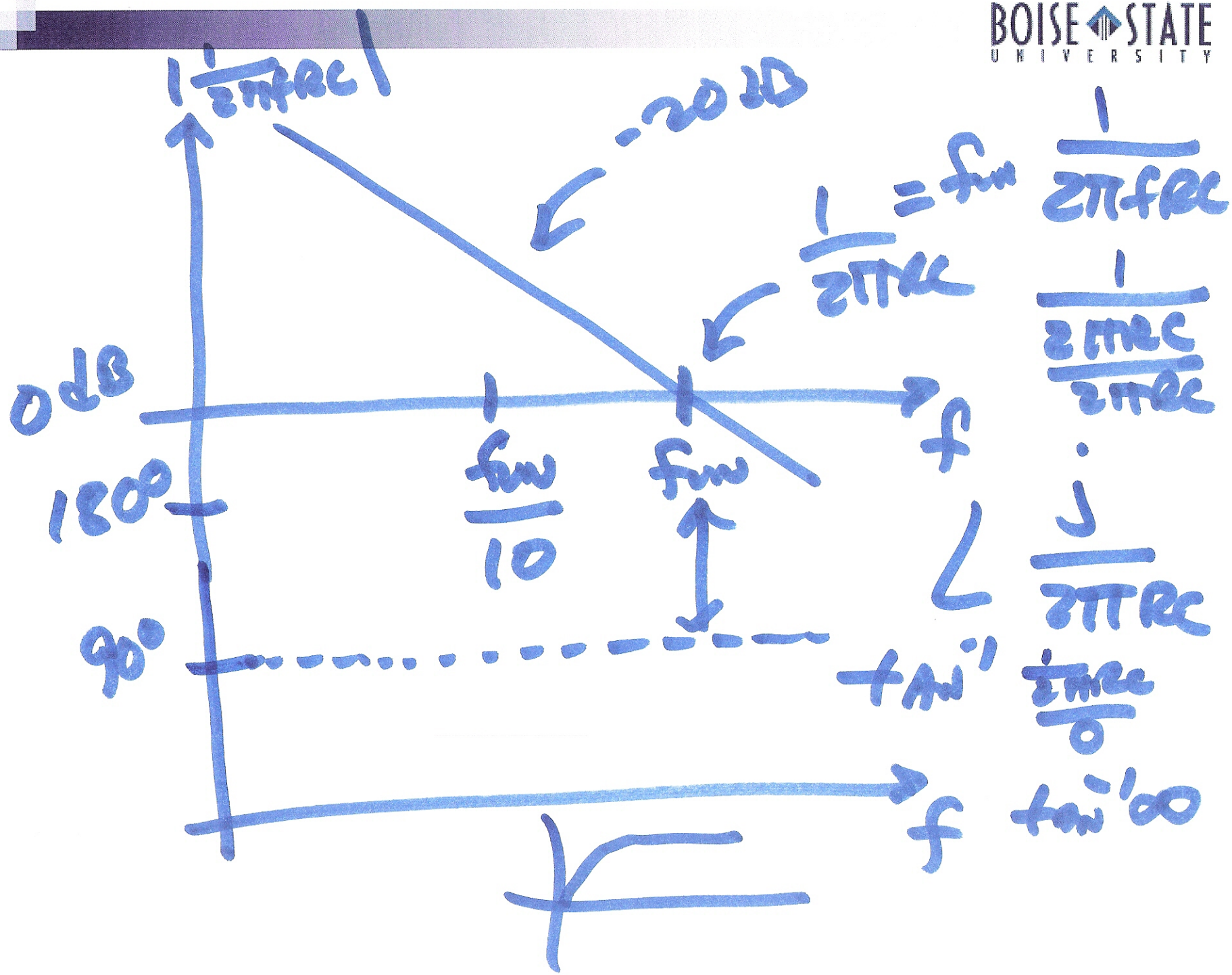
$$\frac{V_C}{V_D} = \frac{-\frac{1}{j\omega C}}{R}$$

$$= -\frac{1}{jRC\omega}$$

$$= \frac{\frac{1}{f_z \cdot 2\pi \cdot RC} + 0}{1 + 0}$$

$$f_z = \infty$$

$$f_p = 0$$

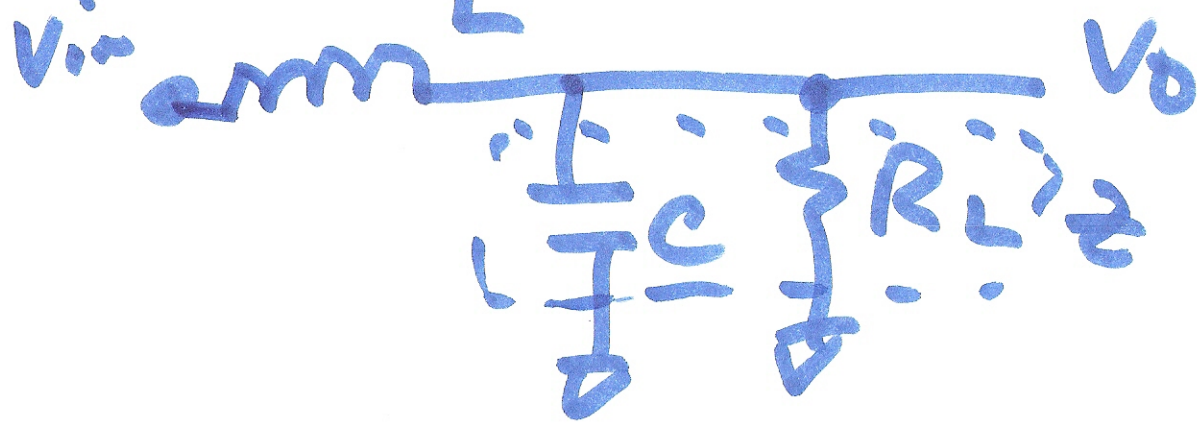

$\frac{1}{2\pi RC}$
-20 dB
$\frac{1}{2\pi RC} = f_m$
$\frac{1}{2\pi RC}$
0 dB
180°
$\frac{f_m}{10}$
f_m
f
90°
$\tan^{-1}$
f
$\frac{1}{2\pi RC}$
$\frac{1}{2\pi RC}$
$\frac{1}{2\pi RC}$
$\frac{1}{2\pi RC}$
$\tan^{-1}\infty$

$$A_{OL} \Rightarrow \frac{1}{sec} \cdot \frac{1}{V_P} \cdot V_S \cdot d\left(K_F\right)$$

$$V_O = K_F \cdot V_S \cdot D$$

$$A_{OL} = \frac{V_O}{V_{IDEF}}$$

5)



$$\frac{V_o}{V_{in}} = \frac{Z}{Z + j\omega L}, \quad Z = \frac{\frac{1}{j\omega C} \cdot R_L}{\frac{1}{j\omega C} + R_L}$$

$$\frac{V_o}{V_{in}} = \frac{\frac{R_L}{1 + sR_LC}}{\frac{R_L}{1 + sR_LC} + \frac{R_L \cdot sL \cdot s}{1 + sR_LC}} = \frac{R_L}{1 + j\omega R_L C}$$

6)

$$\frac{V_o}{V_{in}} = \frac{R_L}{R_L + s \cdot L(1 + sR_LC)} = K_F$$

V_{in} ↑ flow input

$$= \frac{R_L}{s^2 LR_L C + sL + R_L}$$

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

$$V_O = K_F \cdot V_{IN} = K_F \cdot \frac{1}{SRC} \cdot \frac{1}{V_P} \cdot V_S \cdot V_{AOL}$$

filter input

$$\frac{V_O}{V_{REF}} = \frac{\frac{1}{LC}}{s^2 + s \cdot \frac{1}{RC} + \frac{1}{LC}} \cdot \frac{1}{SRC} \cdot \frac{V_S}{V_P}$$

A_{OL}

2)