ECE 5/472 Power Electronics

BOISE STATE UNIVERSITY

NOV. 10, 2011 Lecture 22

Review for Exam

ON Tuesday, NOV. 15!

Zero voltage switching

Zero current switching

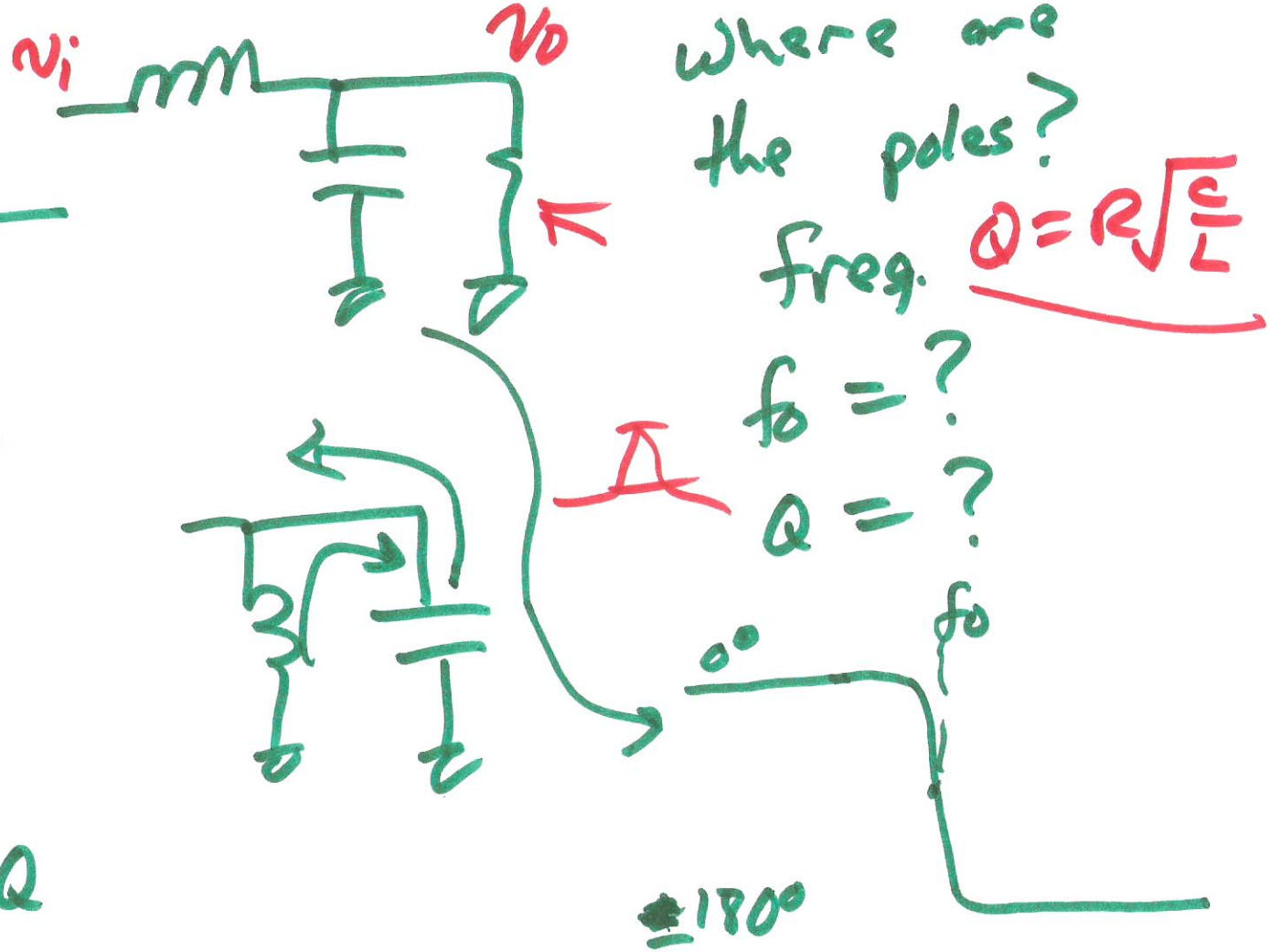
How is the resonant freq. related to the dead time between on switches?

→ZVS←

ZIS

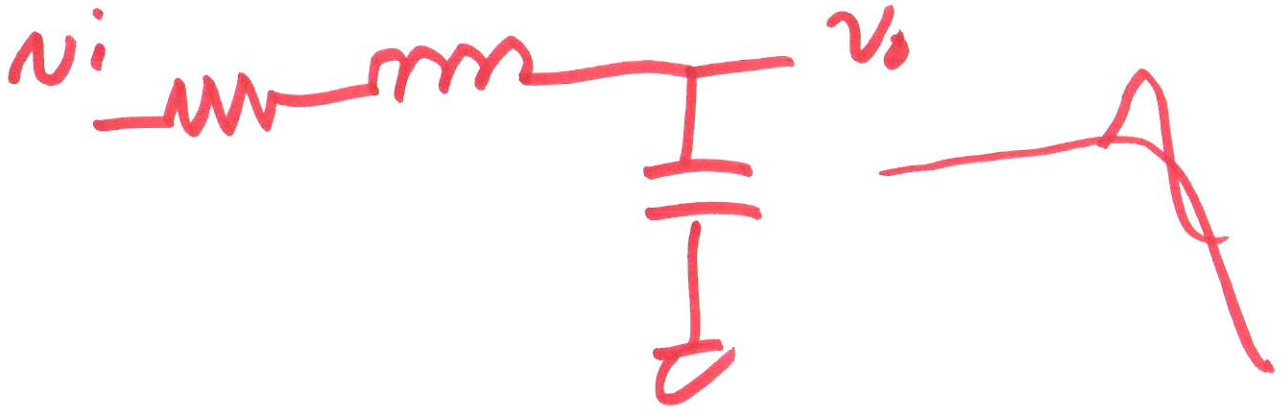
Bode plots

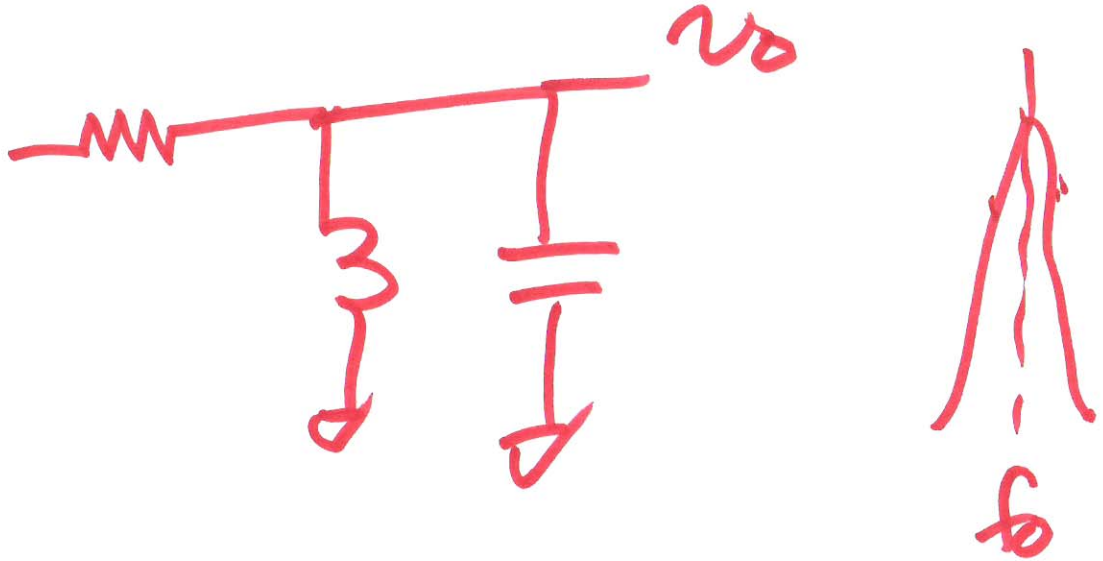
$$\frac{1}{s^2 + x \cdot s + y} \qquad \frac{Q}{s}$$



$$\frac{\text{energy stored}}{\text{energy lost}}$$

$$\frac{f_c}{BW} = Q$$





3)

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Active - PI filter

$\frac{1}{2.5 \cdot \frac{2}{3}} = GAIN$

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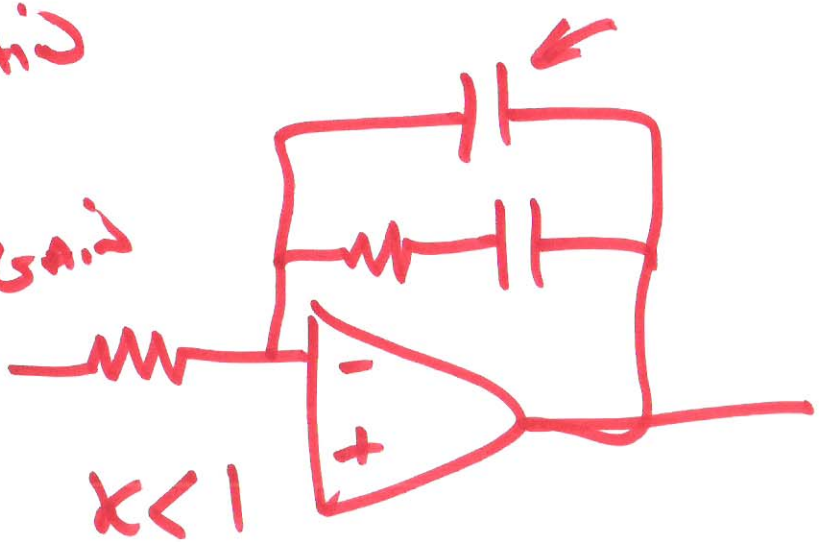
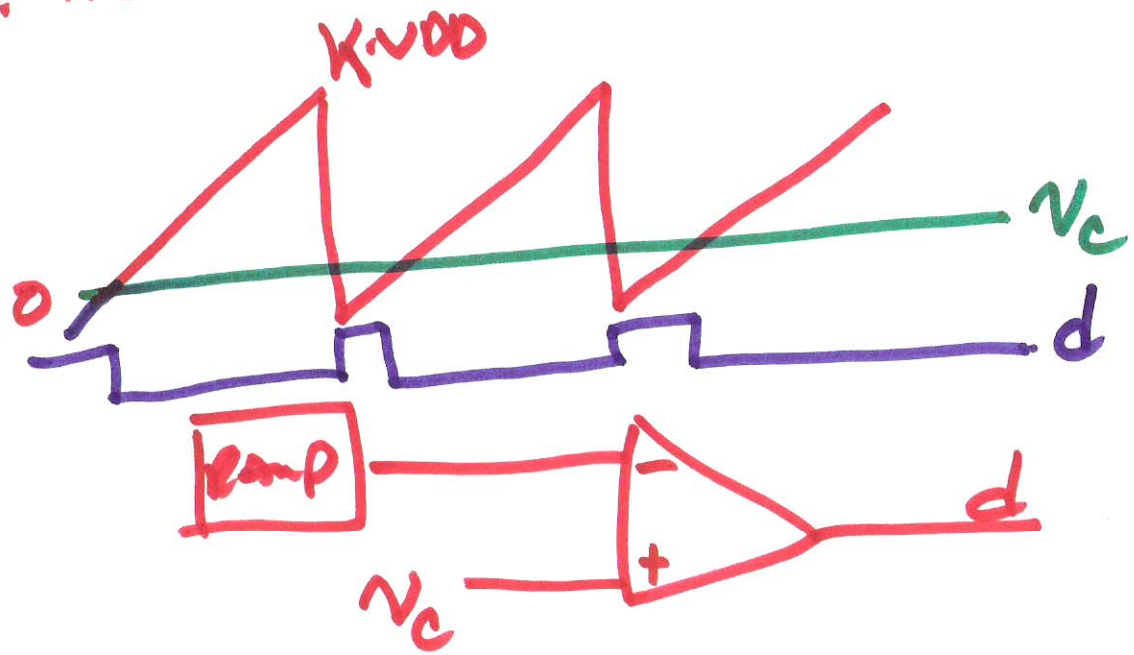
1.25

≈ 1.22



$K < 1$



$\frac{d}{V_c} = GAIN$

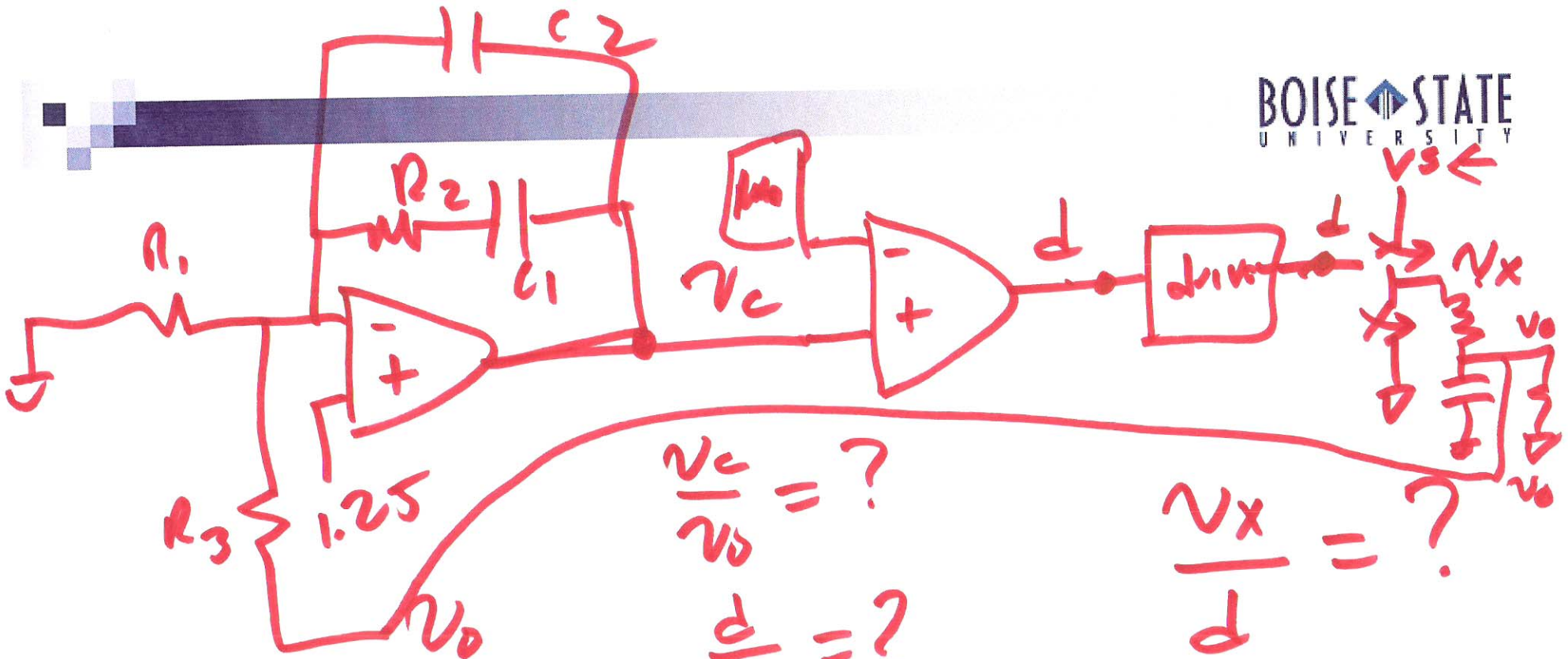
$d = GAIN \cdot V_c$

$V_c = K \cdot VDD$

$d = 1 = GAIN \cdot K \cdot VDD$

$GAIN = \frac{1}{K \cdot VDD}$

4)



$\frac{V_c}{V_o} = ?$

$\frac{d}{V_c} = ?$

$\frac{V_x}{d} = ?$

transfer function
mag & phase $\frac{d}{V_o} = ?$

Bode response
$f_w = ?$ $f_o = ?$
$f_p = ?$ $f_z = ?$

$\frac{V_o}{V_x}$

$d = 0$ or V_{DD}

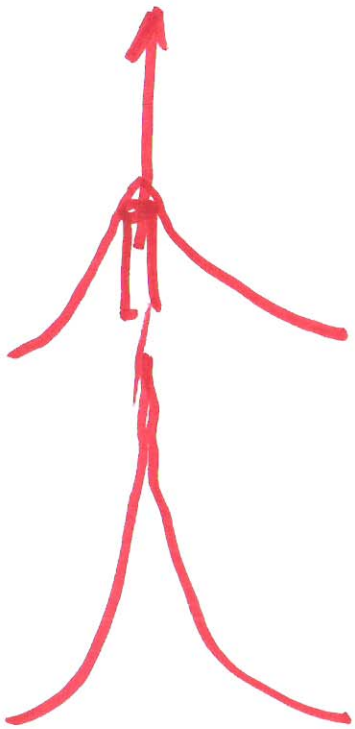
$d = 0$, $V_x = 0$

$d = V_{DD}$, $V_x = V_s$

$$\frac{V_x}{d} = \frac{V_s}{V_{DD}}$$

5)

$s = \sigma + j\omega$

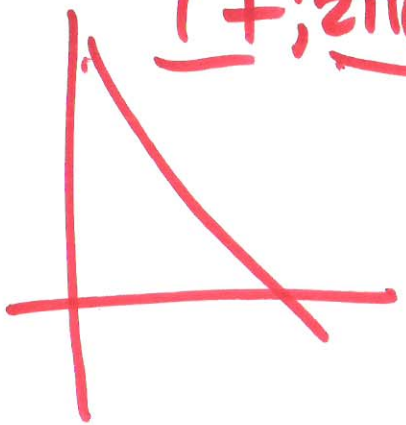


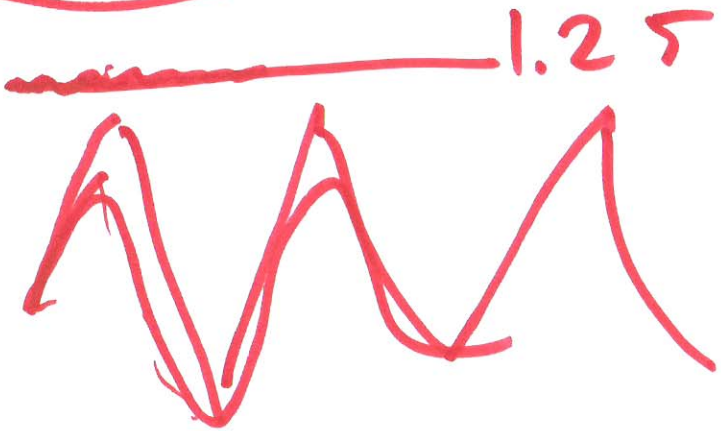
$$\frac{X}{0 + sR_1C_1} = \frac{X}{0 + j \cdot 2\pi f \cdot R_1C_1}$$

$$\frac{1}{\sqrt{1^2 + 1^2}} = \frac{1}{\sqrt{2}} = .707 \quad -3dB$$

$$\frac{O}{1 + sC_1R_2}$$

$$\frac{1 + j2\pi f C_1 R_2}{1}$$





$O = 2\pi f R_1 C_1$

$f_p = 0$

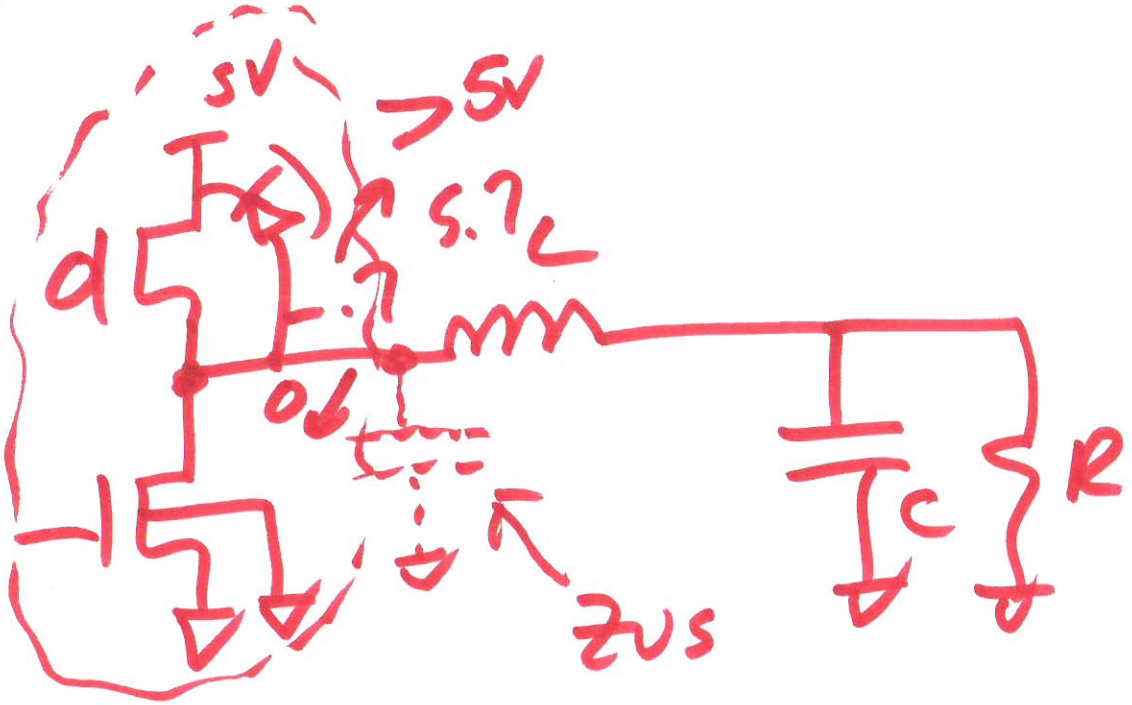
$2\pi f_z C_1 R_2 = 1$

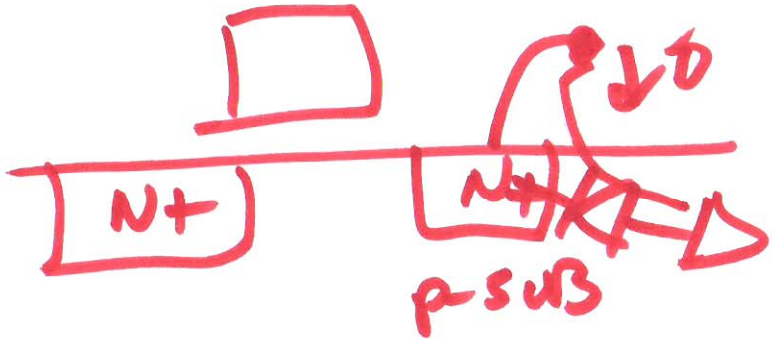
$f_z = \frac{1}{2\pi C_1 R_2}$

b)

Buck → Review, ZVS

Boost →





7)