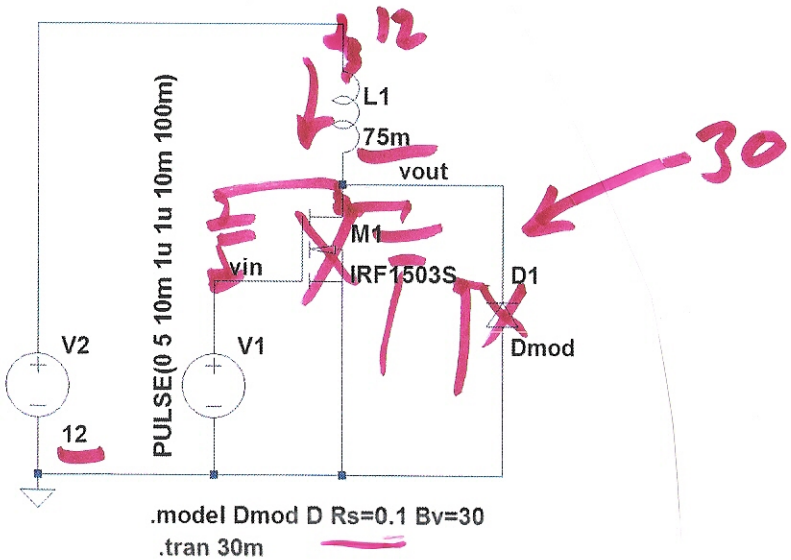
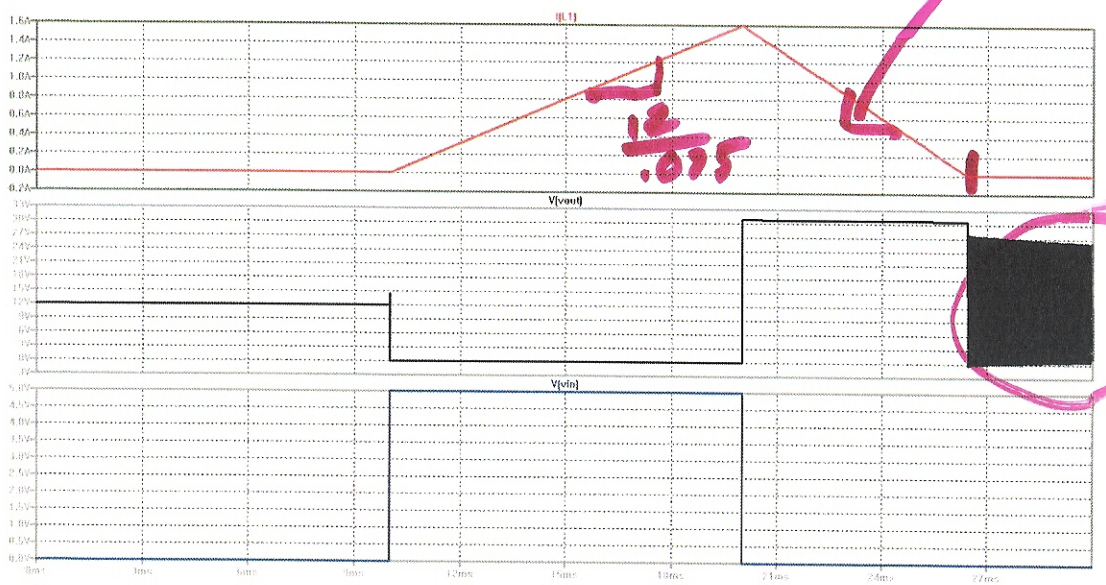
ECE 5/472 Power Electronics

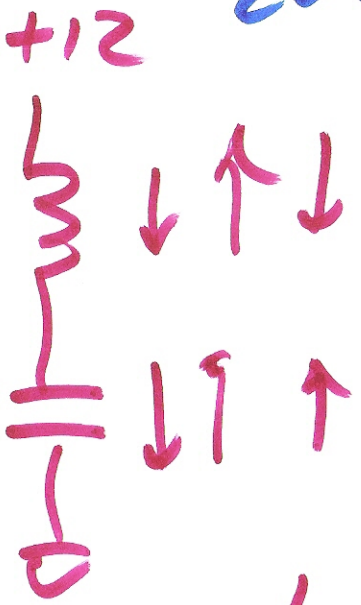
BOISE STATE UNIVERSITY

Lecture 8

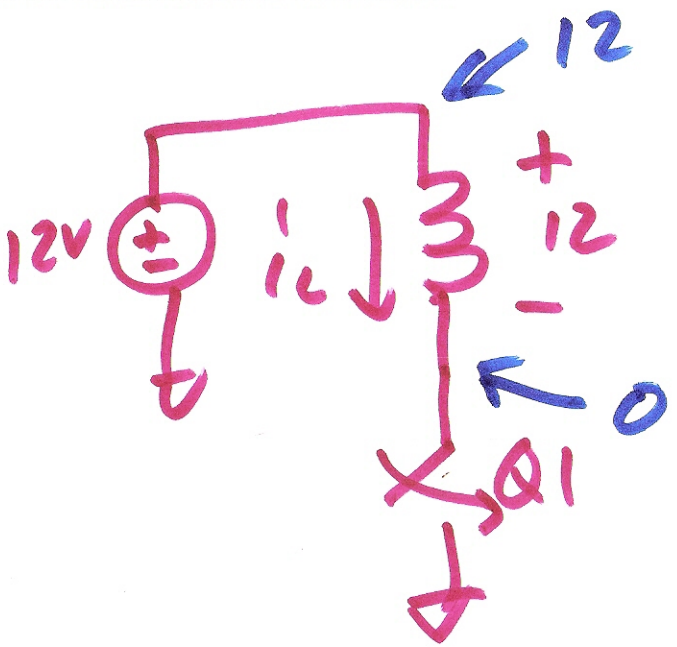
Sept. 13, 2010

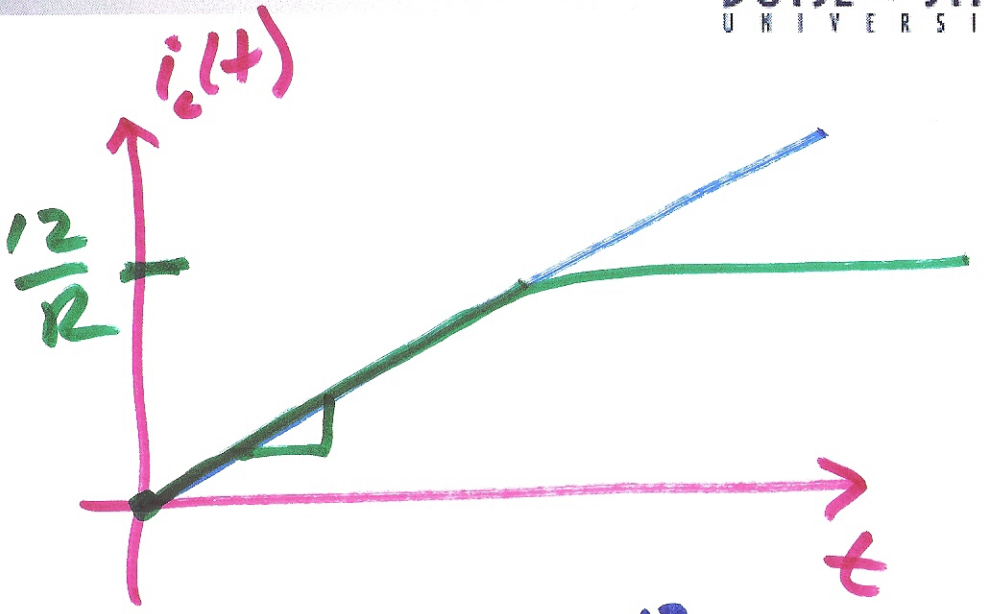






$$f_{res} = \frac{1}{2\pi\sqrt{LC}}$$

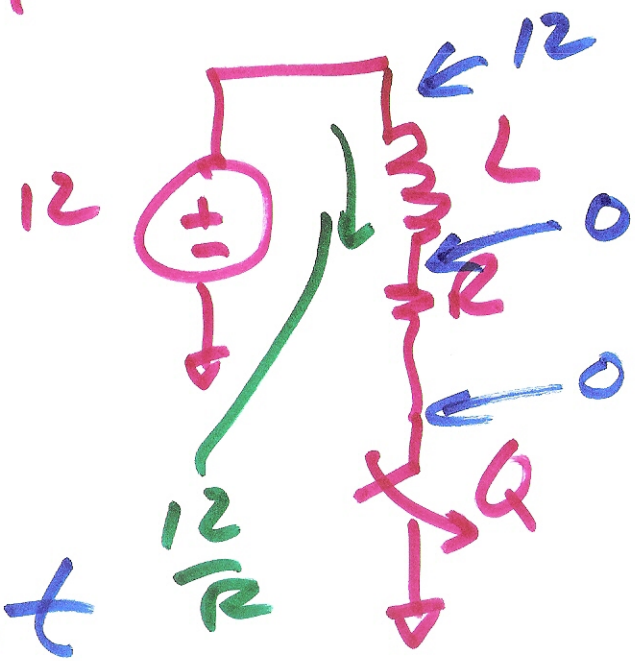




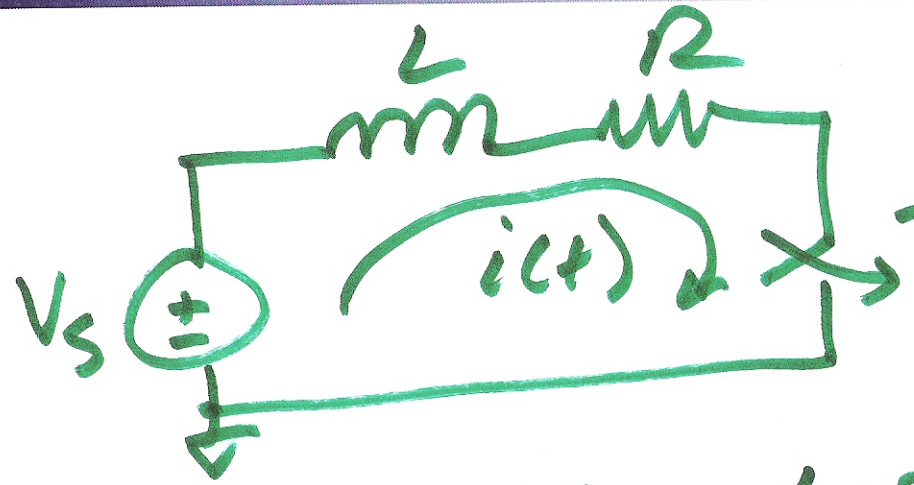
$$V_L = L \cdot \frac{di}{dt}$$

$$\frac{di}{dt} = \frac{V_L}{L}$$

$$i = \frac{V_L}{L} \cdot t$$



2)



$$V_s = L \cdot \frac{di}{dt} + i \cdot R$$

$$V_s = L\,s\,I(s) + I(s) \cdot R$$

$$V_s = I(s)\,(L \cdot s + R)$$

$$I(s) = \frac{V_s}{s \cdot L + R}$$

$$= \frac{V_s}{L} \cdot \frac{1}{s + R/L}$$

$$i(t) = \frac{V_s}{R}\left(1 - e^{-t/\tau_R}\right)$$

$$i(t) = e^{-t/\tau_R}$$

$$i(0) = 0$$

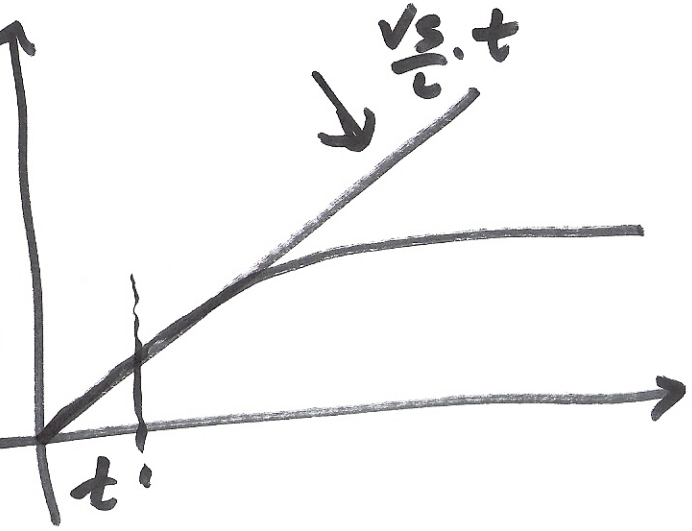
$$i(\infty) = \frac{V_s}{R}$$

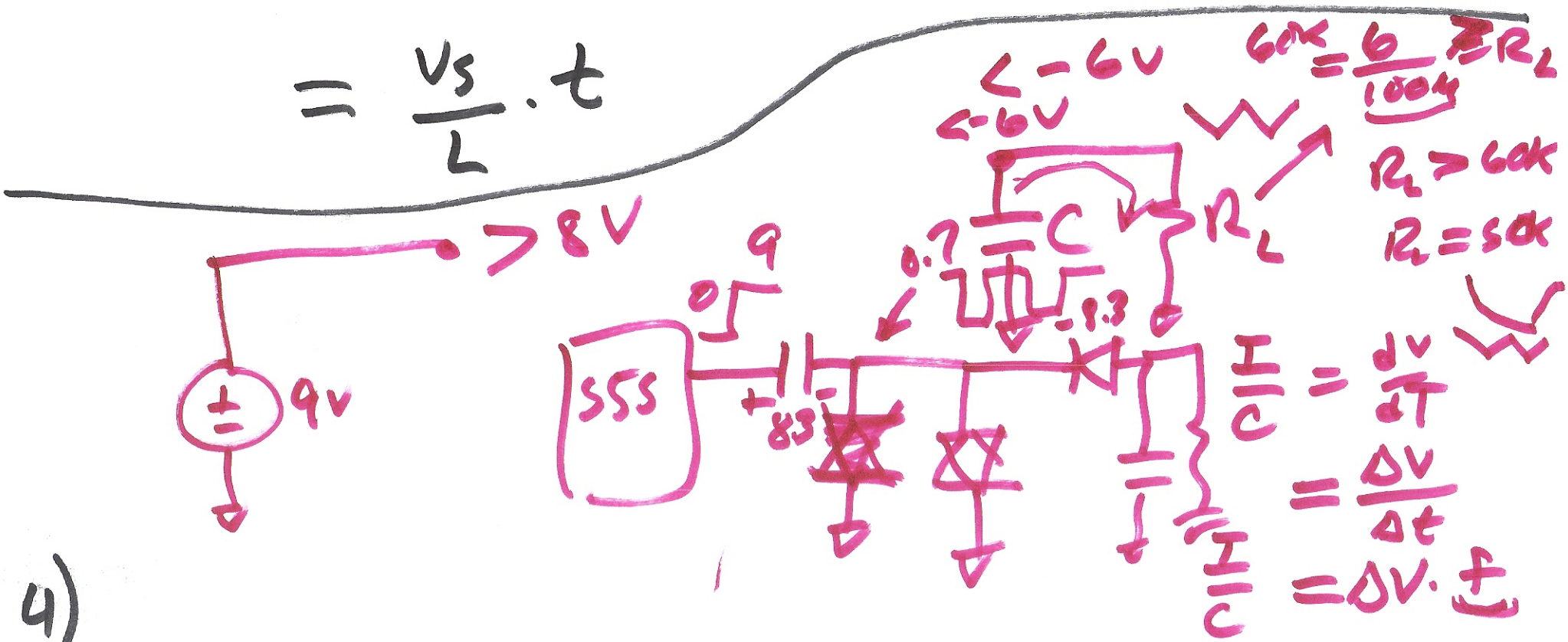
3)

$$i(t) = \frac{V_s}{R}\left(1 - e^{-t/\tau}\right)$$

$$= \frac{V_s}{R}\left(1 - \left(1 + \left(\frac{-t}{\tau/R}\right) + \cdots\right)\right)$$

$$= \frac{V_s}{L} \cdot t$$





4)

$CV = Q$

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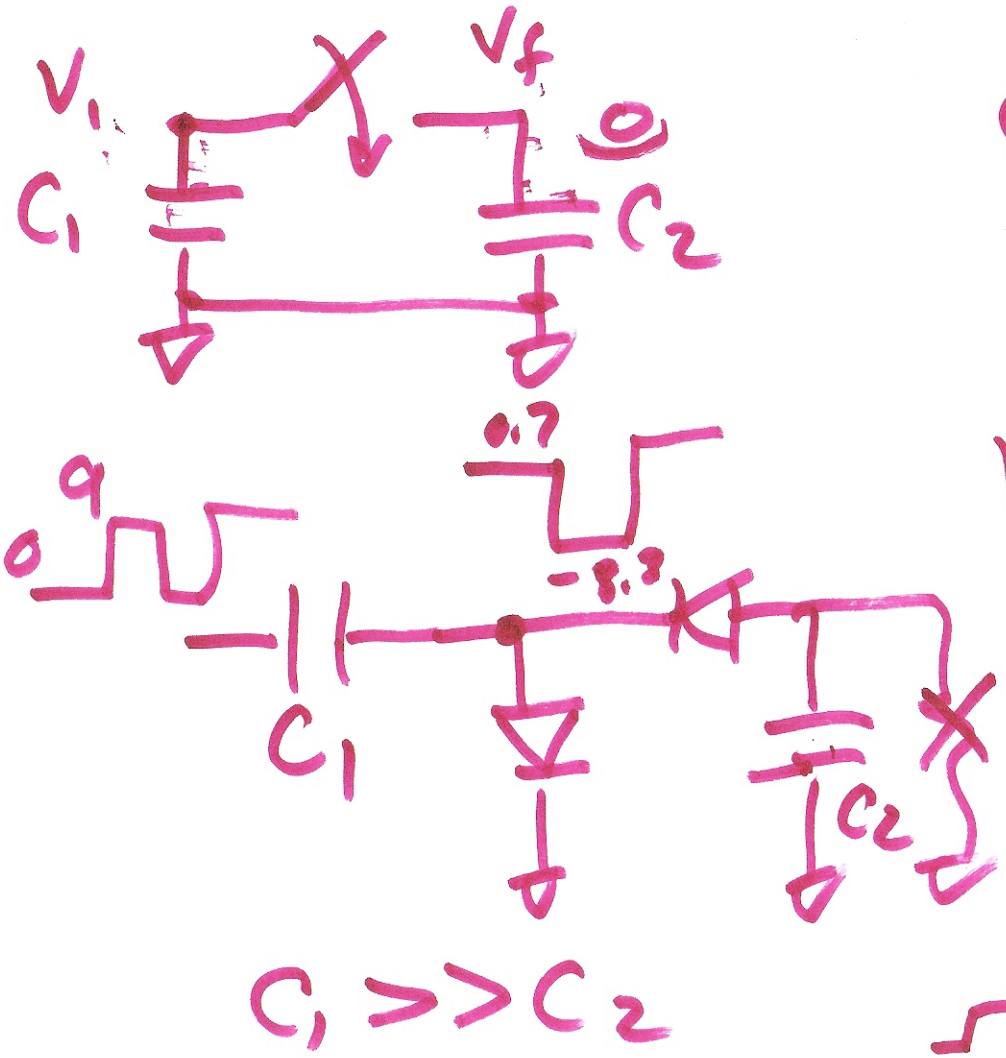
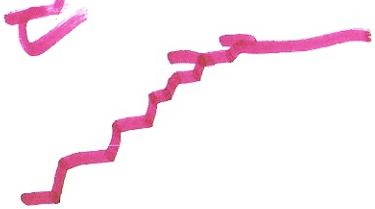


$C_1 \cdot V_1 + 0 \cdot C_2 = V_f(C_1 + C_2)$ 9V

$V_f = \frac{C_1}{C_1 + C_2} \cdot V_1$

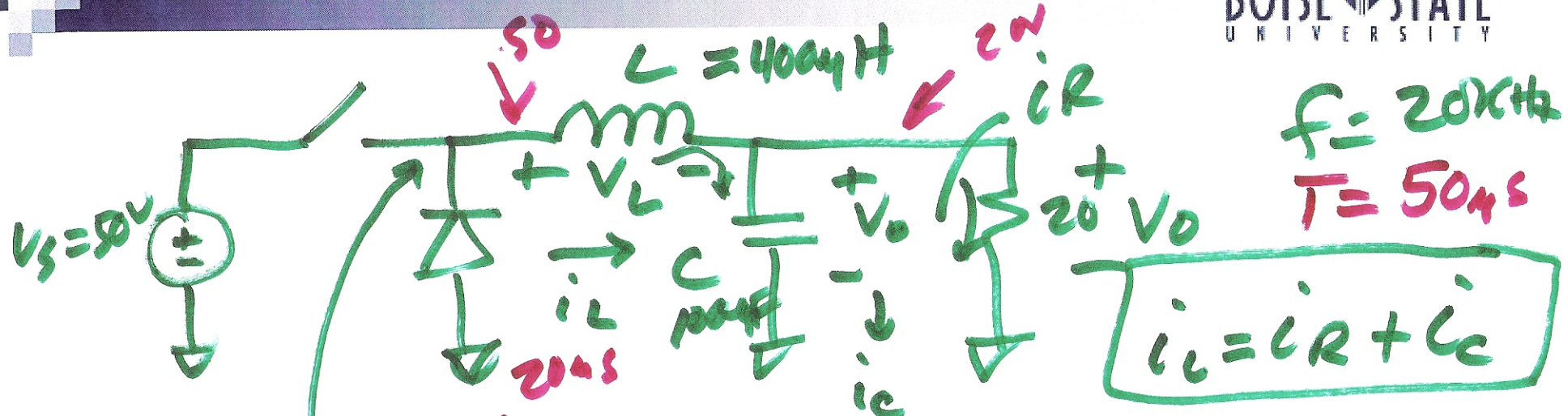
$C_1 = C_2$

$V_f = 4.5V$



5)

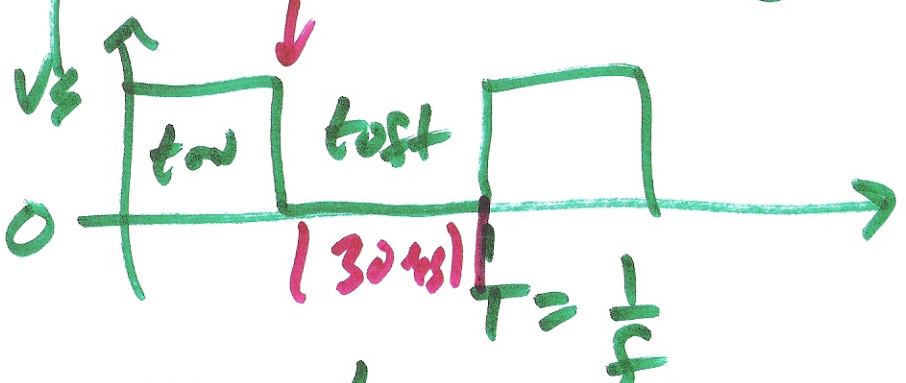
Ex. 6.1



$f = 20\text{kHz}$

$T = 50\mu s$

$i_L = i_R + i_C$



$D = 0.4$

$V_o = 0.4 \cdot 50$

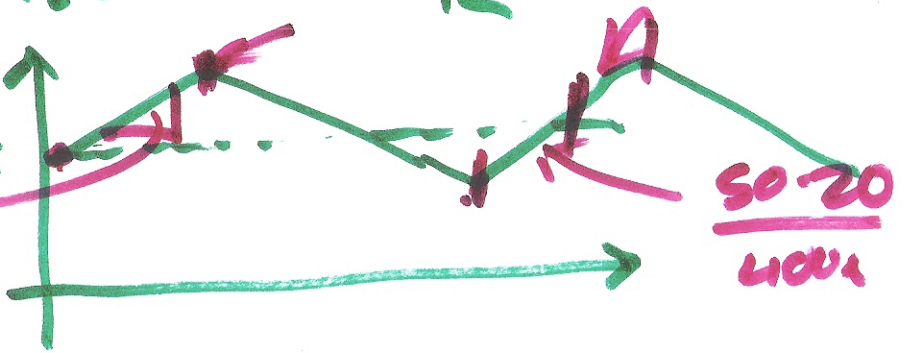
$= \underline{20V}$

$D \cdot T = t_{on}$

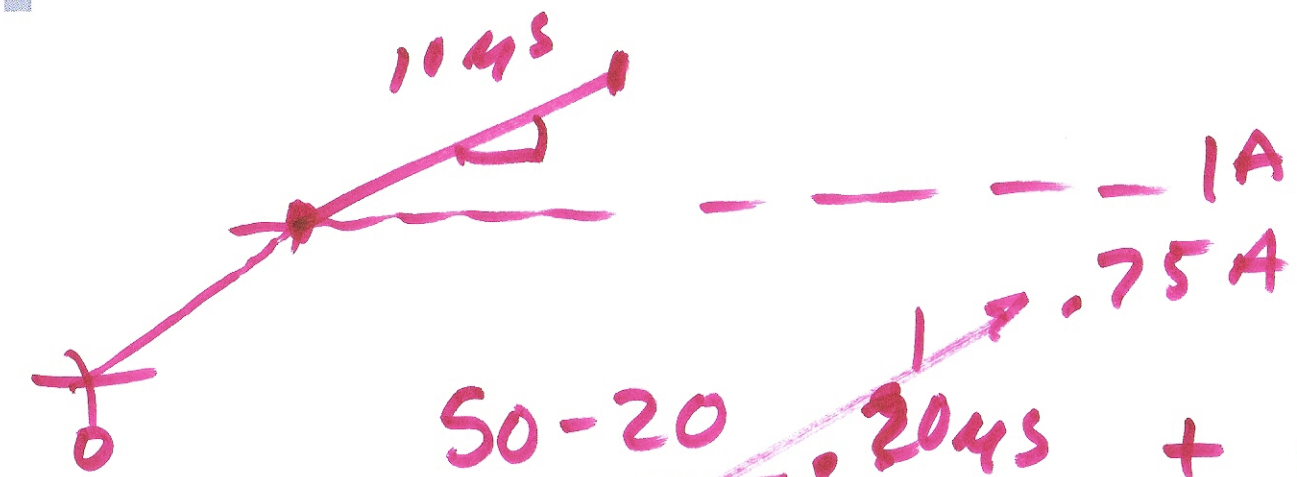
$(1-D) \cdot T = t_{off}$

$\frac{50-20}{400\,\mu H} \cdot 30\mu s + I$

$i_L(t)$ $I_L = \frac{V_o}{R} = \frac{20}{20} = 1A$



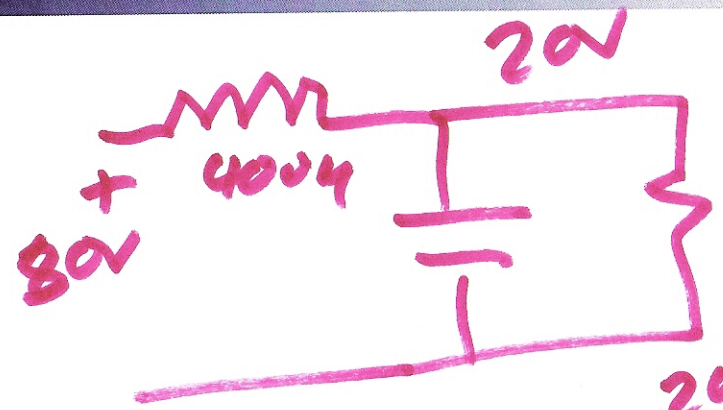
6)

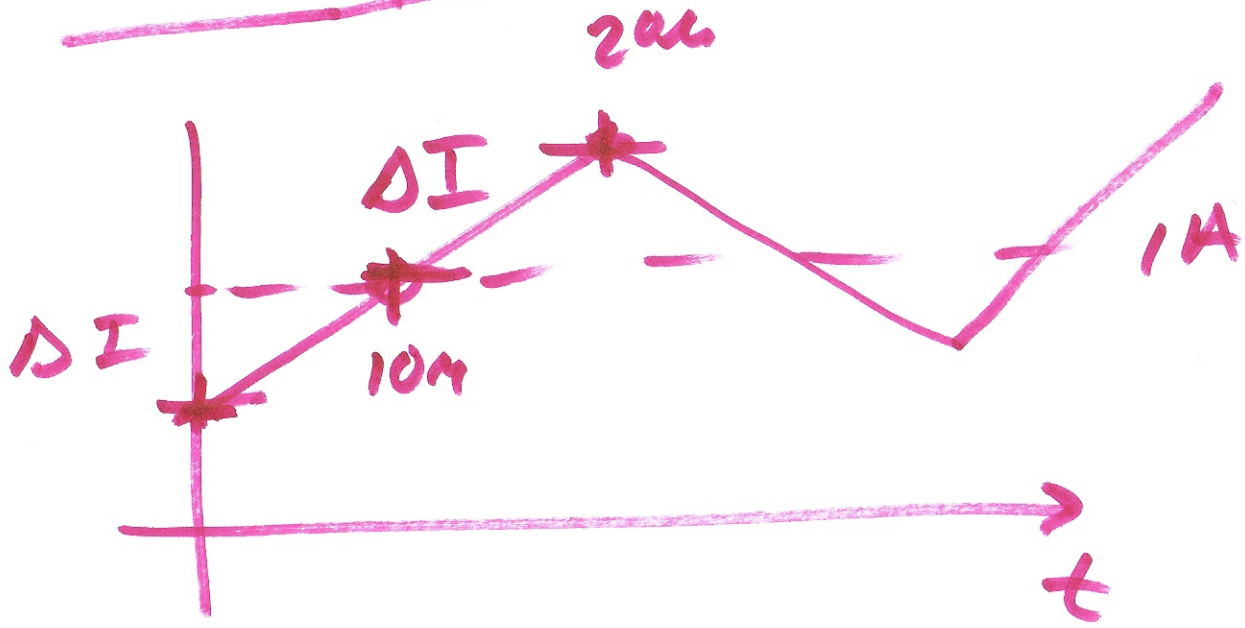


$$\frac{50-20}{400\mu} \cdot 20\mu s + 1A = I_{pk}$$

$$1.75A$$

7)





$$\frac{50-20}{40\mu}\cdot(10\mu) + 1A = I_p$$

$$I_n = .25A$$

8)