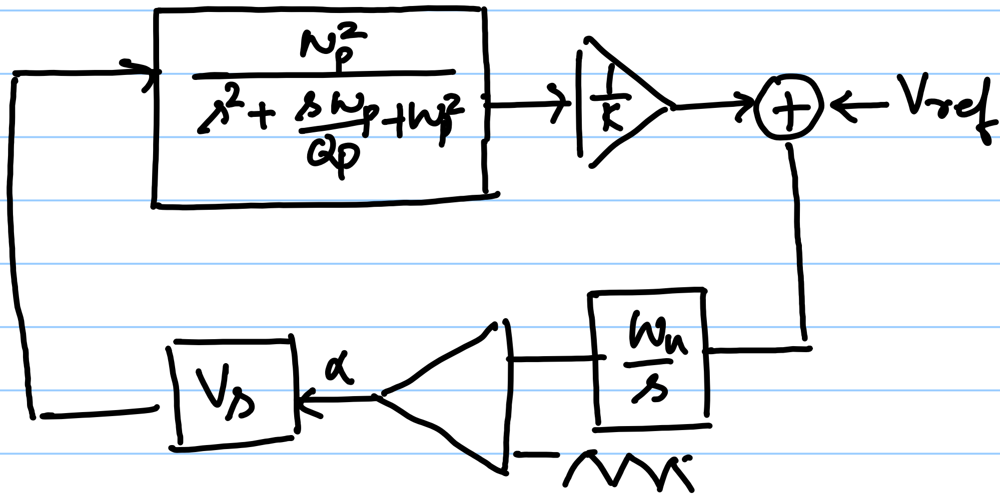
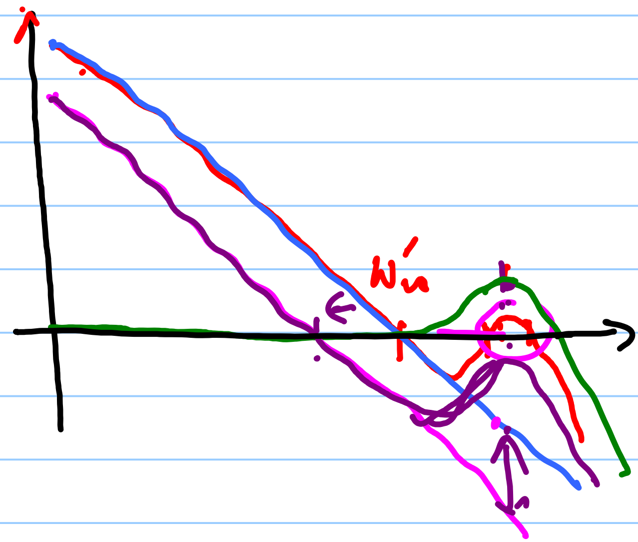
Note Title — 10-03-2022

Lecture #26





$$LG = \underbrace{\frac{1}{K} \times \frac{\omega_u}{s} \times \frac{1}{V_r} \times V_s}_{H_1} \times \underbrace{\frac{\omega_p^2}{s^2 + \frac{s\omega_p}{Q_p} + \omega_p^2}}_{H_2}$$

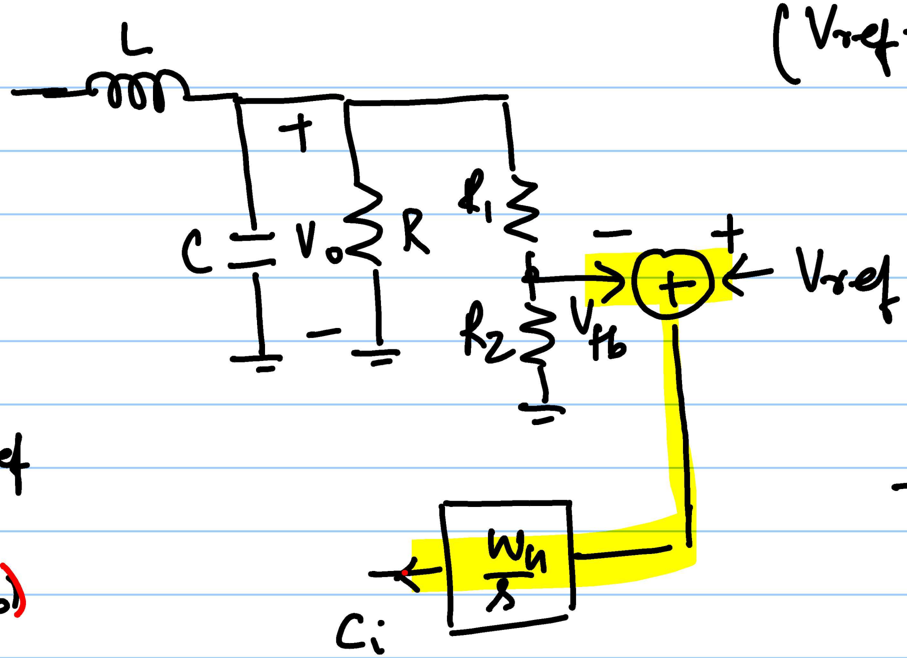
$$\left| H_1(j\omega_{pk}) \times H_2(j\omega_{pk}) \right| < 1$$

$$\omega_{pk} = \omega_p \sqrt{1 - \frac{1}{2Q_p^2}}$$

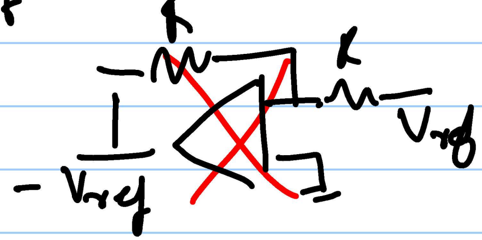
$$\frac{\omega_u V_s}{K V_r} \times \frac{1}{\omega_{pk}} \times Q_p < 1$$

ω_u

$$\frac{(V_{fb} - V_{ref})}{R_i} = \frac{V_{ref} - V_0}{1/sC_i}$$

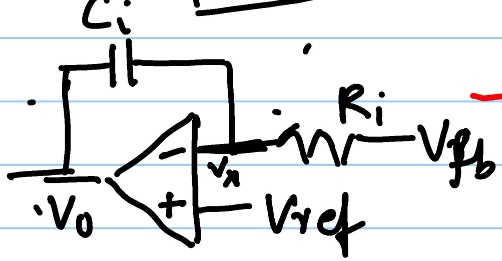


$$(V_{ref} - V_{fb})\frac{\omega_u}{s}$$

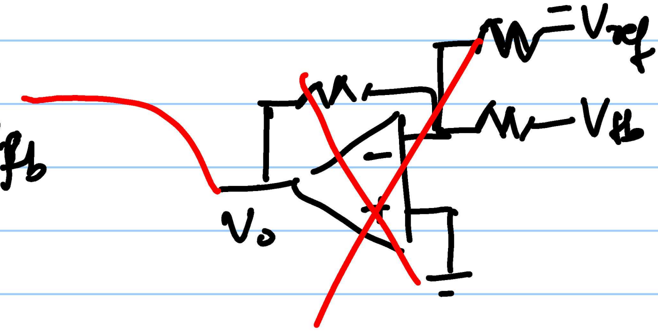


$$V_0 = \frac{-1}{sC_iR_i}(V_{fb} - V_{ref}) + V_{ref}$$

$$= V_{ref} + \frac{1}{sC_iR_i}(V_{ref} - V_{fb})$$

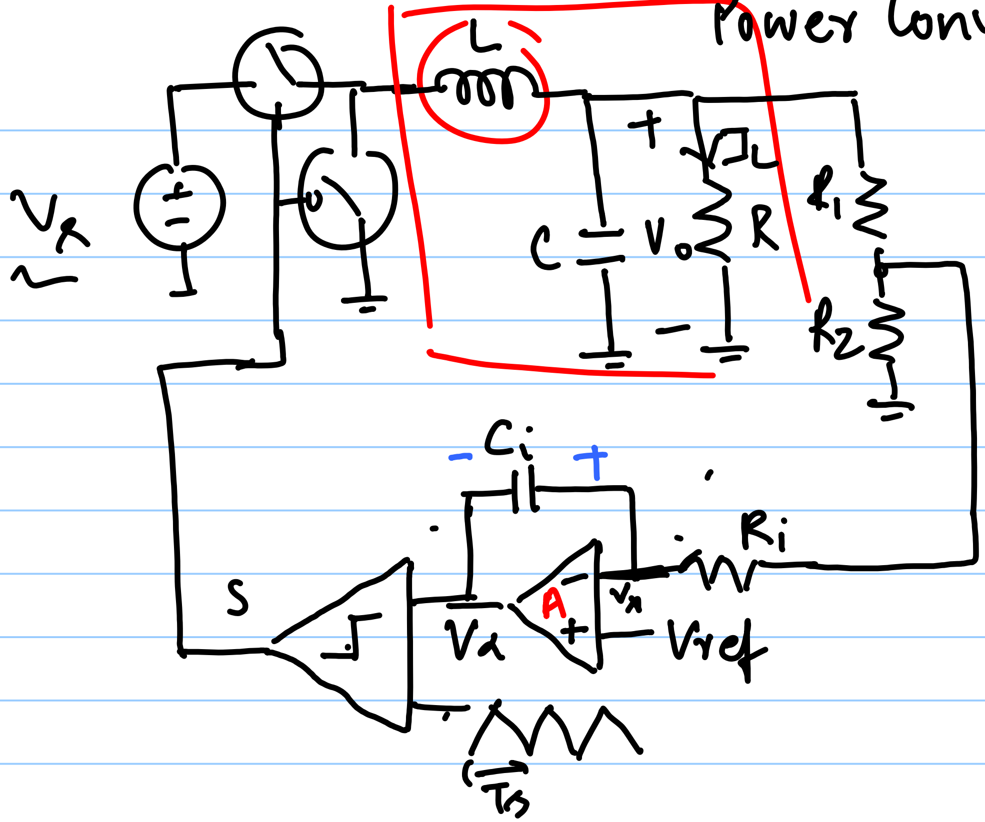


$$\frac{-V_{fb}}{sR_iC_i}$$

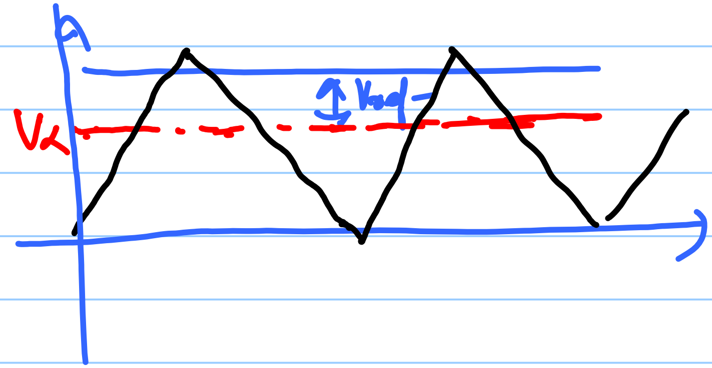


$$\frac{(V_{fb} - V_x)}{R_i} = \frac{(V_x - V_o)}{1/sC_i} \ldots$$

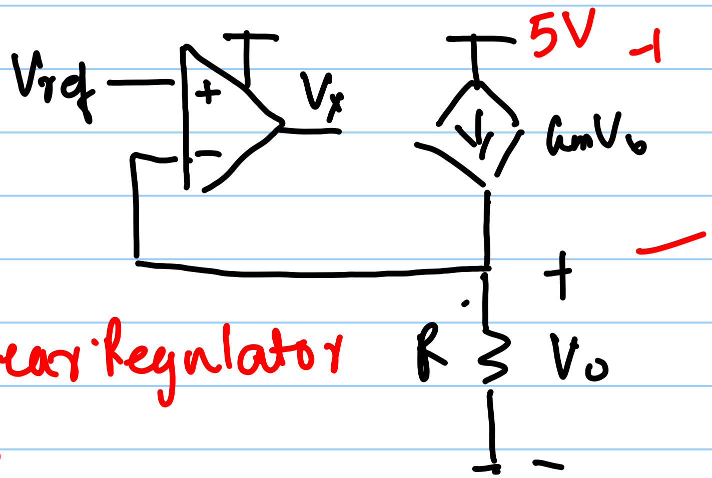
"Power Converter"



Ideal V_x



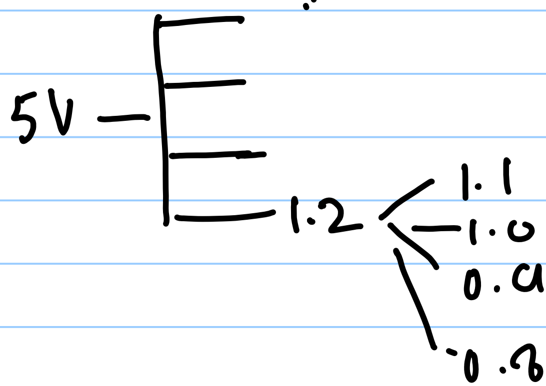
- Fast transient will prefer LDOs



Linear Regulator

LDO

\$6000 per mm^2 in 65nm CMOS

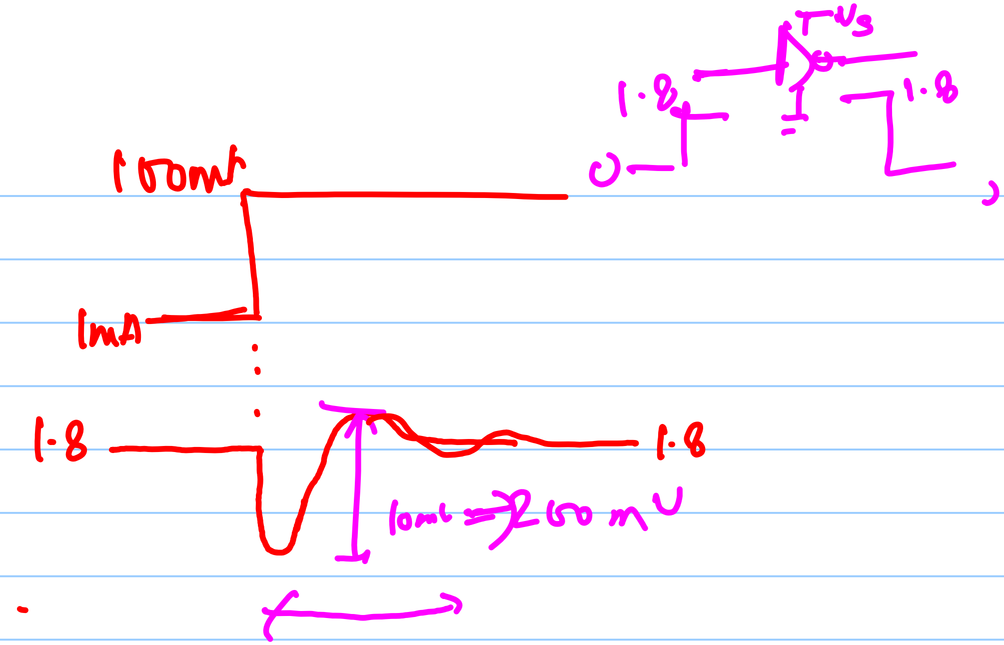


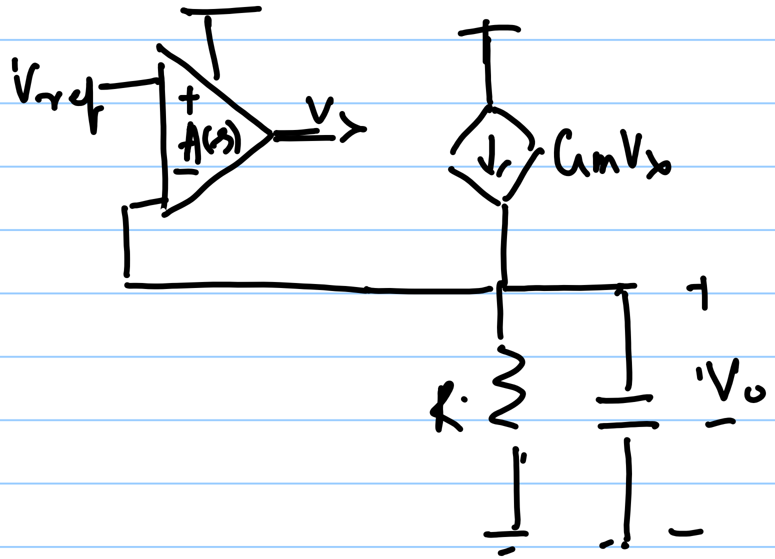
Load Regulation $= \frac{\Delta V_{out}}{\Delta V_s}$

Line Regulation $= \frac{\Delta V_{out}}{\Delta I_L}$

(Load) Output transient =

Efficiency =





$$A(s) = \frac{A_o}{1 + s/\omega_p}$$

$A_o \omega_p$ = Gain × Bandwidth Product