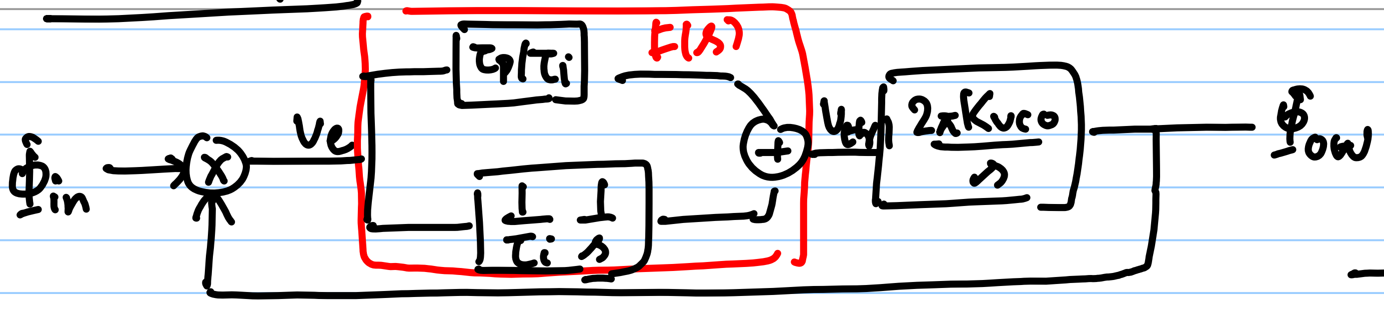
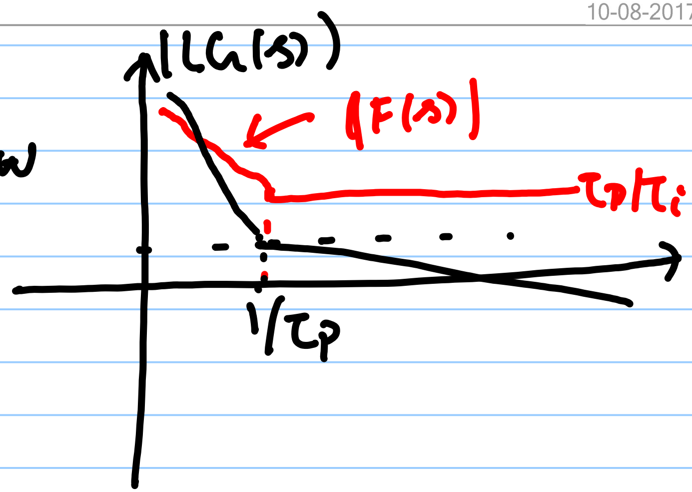
Note Title 10-08-2017

Lecture # 8



Type-II, Order II



$V_{in} = \sin(w_{in} t)$ $\qquad$ $w_{in} - w_{out} = \Delta w$

$V_{out} = \cos\left(w_{out} t + 2\pi K_{vco} \int \left(\frac{\tau_p}{\tau_i} v_e + \int_0^t \frac{1}{\tau_i} v_e \, dx \right) dt \right)$

$\Delta w_L \leq \quad 2\pi K_{vco} \cdot K_{pd} \frac{\tau_p}{\tau_i} = 2\pi K_{vco} \cdot K_{pd} F(\infty)$

$LG(s) = \frac{K_{pd}}{s^2 \tau_i} (1 + s\tau_p) \; 2\pi K_{vco}$

$$V_e \to \boxed{\frac{1}{\tau_i}\int dt} \to V_{ctrl}$$

at $t=0$; $\omega_{in} - \omega_{out} = \Delta\omega$

$\Omega_{out}(t) = \omega_{out} + 2\pi K_{VCO} \cdot V_{ctrl}$

$\Delta\Omega(t) = \omega_{in} - \Omega_{out}$

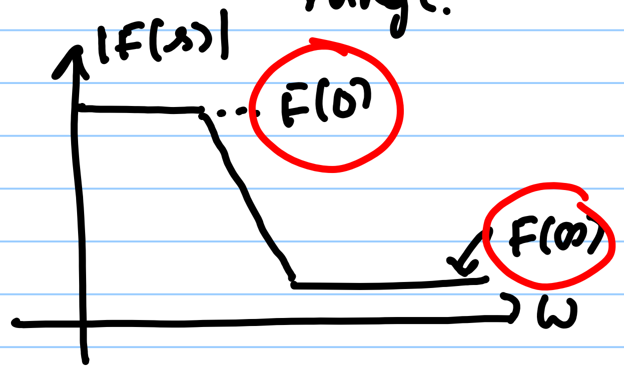
$= \Delta\omega - 2\pi K_{VCO} \cdot V_{ctrl}$

$\Delta\Omega(t) = \Delta\omega - 2\pi K_{VCO} \cdot (\underbrace{F(0) - F(\infty)}_{K_{int}})\, V_{e,pull}$

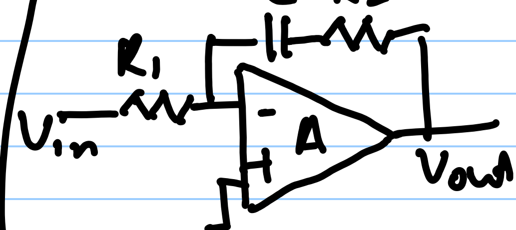
$$F(s) = \frac{a_0 + a_1 s^{-1} + a_2 s^{-2} + \cdots}{b_0 + b_1 s^{-1} + b_2 s^{-2} + \cdots}$$

$$F(s) = \frac{1 + s\tau_p}{s\tau_i}$$

if $F(0) = \infty \Rightarrow$ Infinite pull-in range.



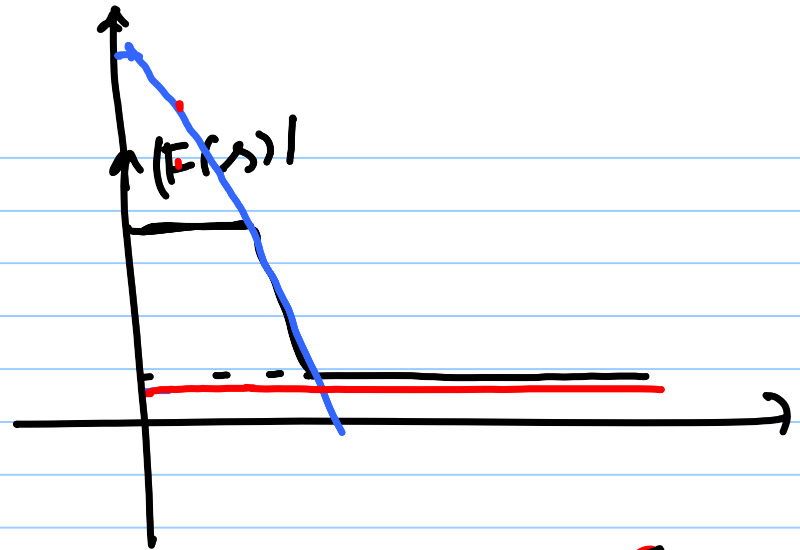
$F(s)$ = Prop. path + Integral path.

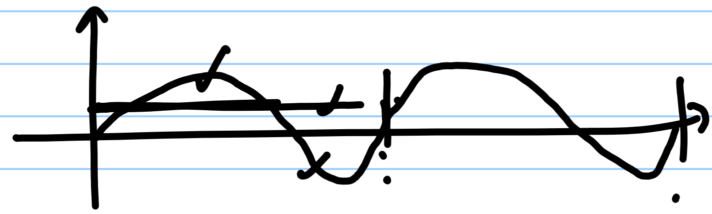


$$F(s) = \frac{1 + s\tau_p}{s\tau_i}$$

$A = \infty$

$A \neq \infty \Rightarrow F(0) \neq \infty$





$$\overline{V_{e,pull}} = K_{pd}\left(\frac{\Delta\Omega}{K} - \sqrt{\left(\frac{\Delta\Omega}{K}\right)^2 - 1}\right)$$

$$K = 2\pi K_{vco} \cdot K_{pd} \cdot F(\infty)$$