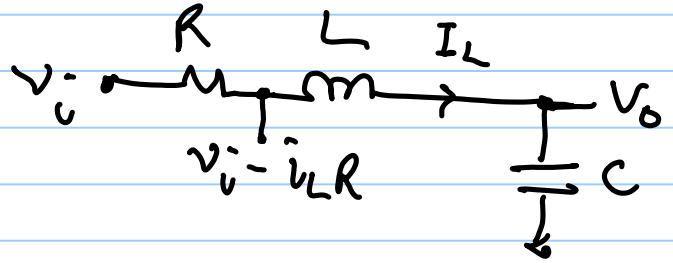
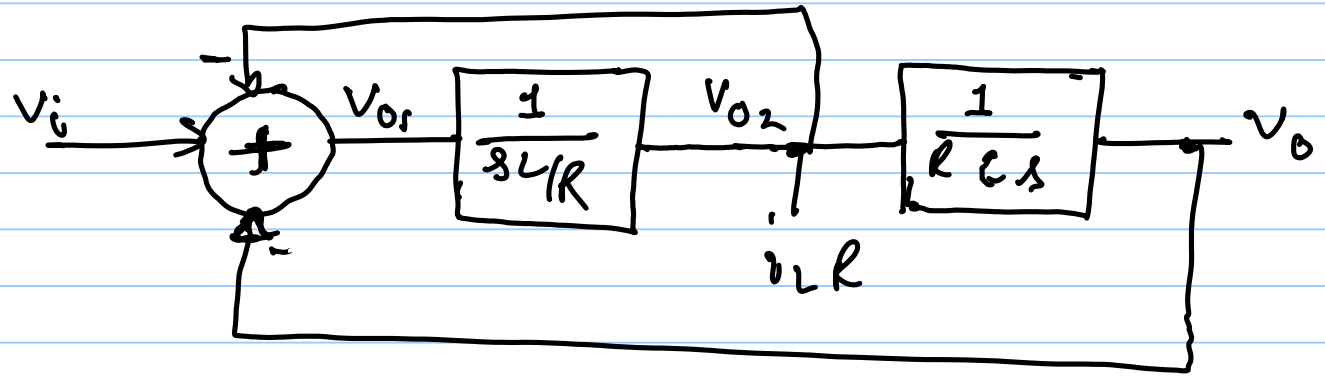
EE2019

Note Title 3/22/2019



$$v_o = \frac{i_L R}{R C s} \quad \text{—— (1)}$$

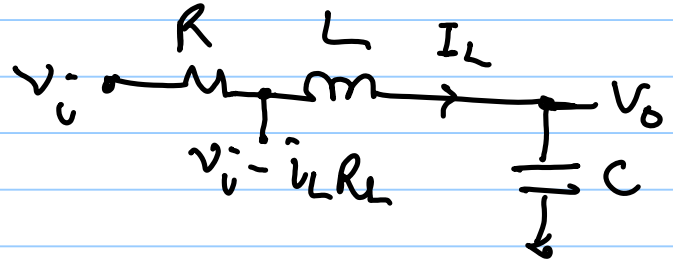
$$i_L R = \frac{v_i - i_L R - v_o}{sL/R} \quad \text{— (2)}$$



$$V_0 = \frac{1}{LCs^2 + RCs + 1}$$ L.P.F

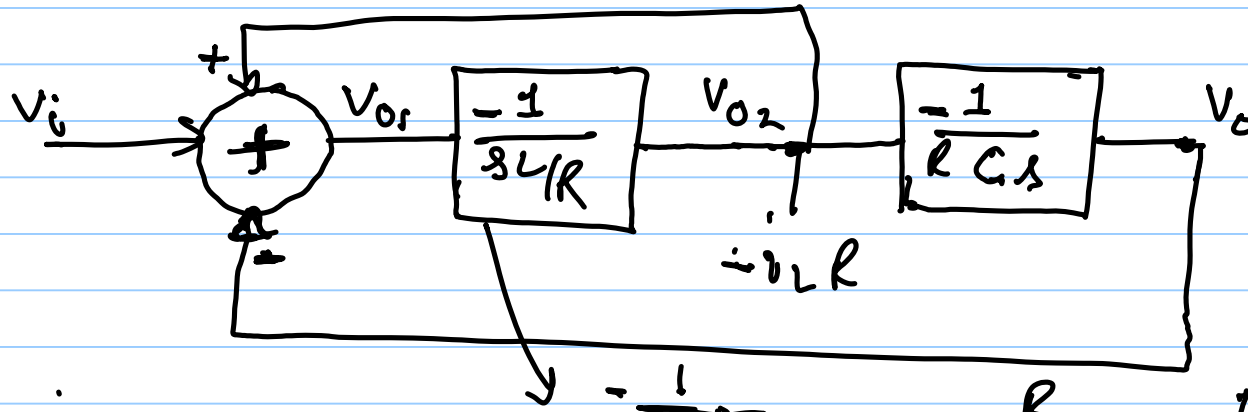
$$V_{0_2} = \frac{R_L C s}{LCs^2 + RCs + 1}$$ B.P.F.

$$V_{0_1} = \frac{LCs^2}{LCs^2 + RCs + 1}$$ H.P.F.



$$-V_o = \frac{-i_L R_L}{R C s} \quad \text{——} (1)$$

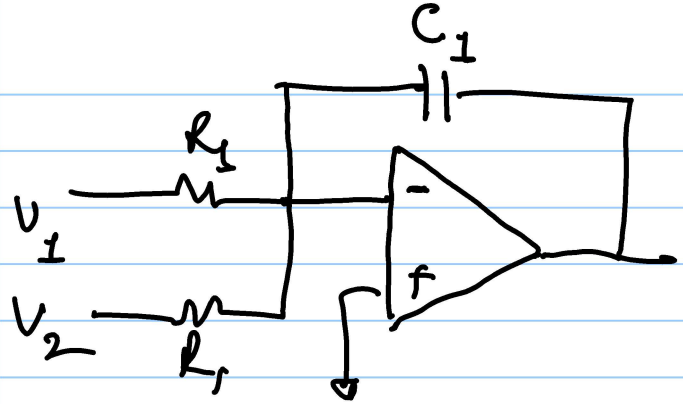
$$-i_L R_L = \frac{V_i - i_L R - V_o}{-sL/R} \quad \text{——} (2)$$



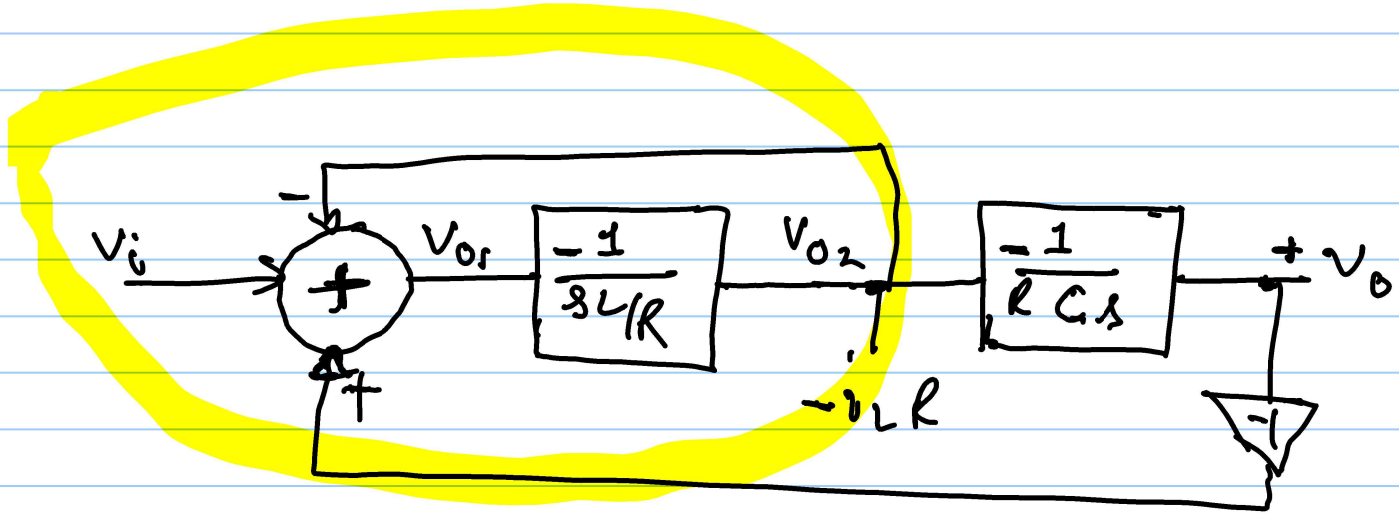
$$\Rightarrow \frac{R}{L} = \frac{1}{R_1 C_1} \Rightarrow \frac{L}{R} = R_1 C_1$$

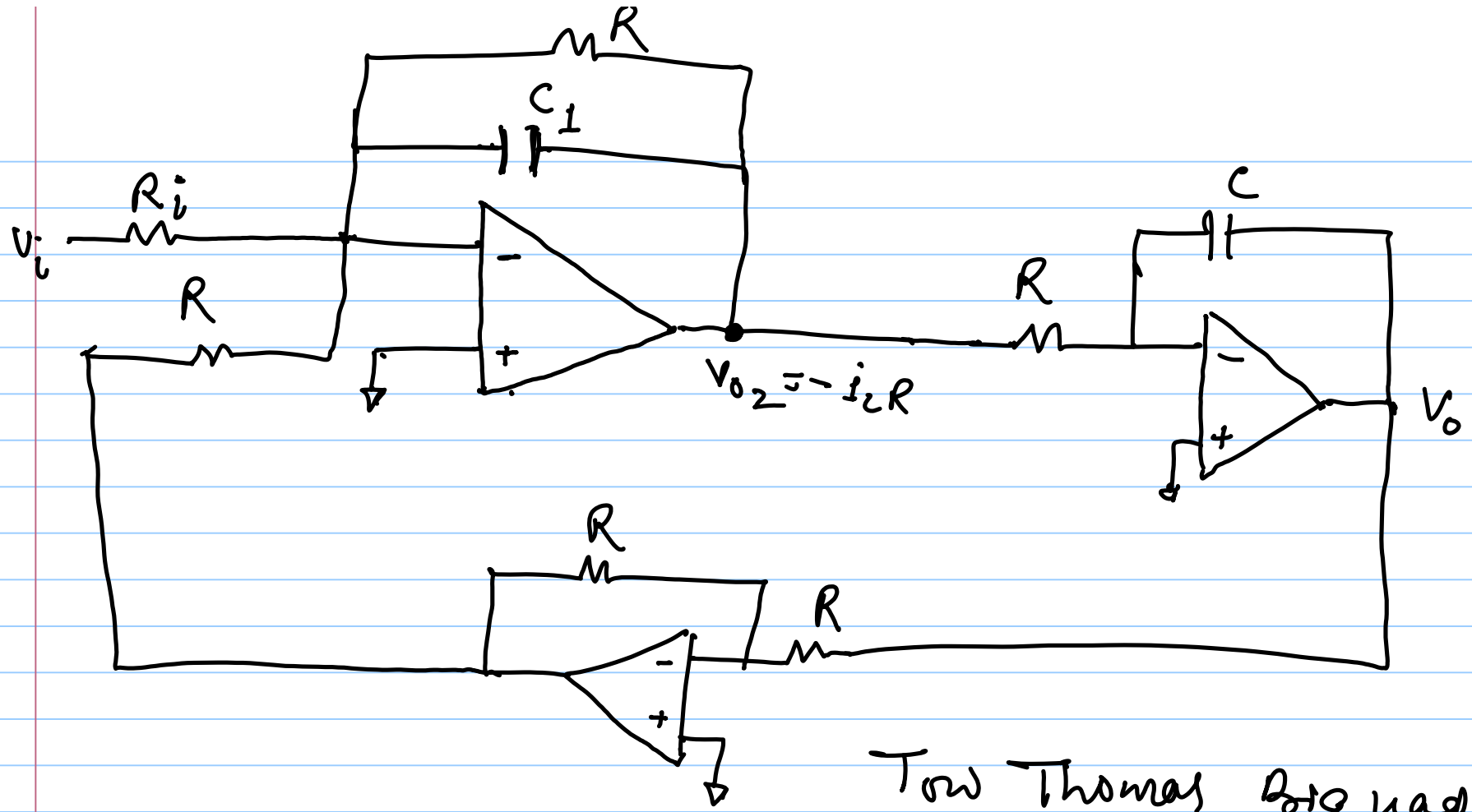
$L = R_1 R C_1$

$R_1 = R \Rightarrow L = R^2 C_1$



$$V_{o_1} = -\frac{1}{R_1 C_1 s}(V_1 + V_2)$$





Tow Thomas Biquad

$$V_0 = \frac{1}{LCs^2 + RCs + 1}$$

$$L = R^2 C_1$$

$$V_0 = \frac{R/R_i}{R^2 C_1 C s^2 + RCs + 1}$$

$$H(s)_{HP} = \frac{\omega_0^2}{s^2 + \frac{\omega_0}{Q_0} s + \omega_0^2} = \frac{1}{\frac{s^2}{\omega_0^2} + \frac{1}{\omega_0 Q_0} s + 1}$$

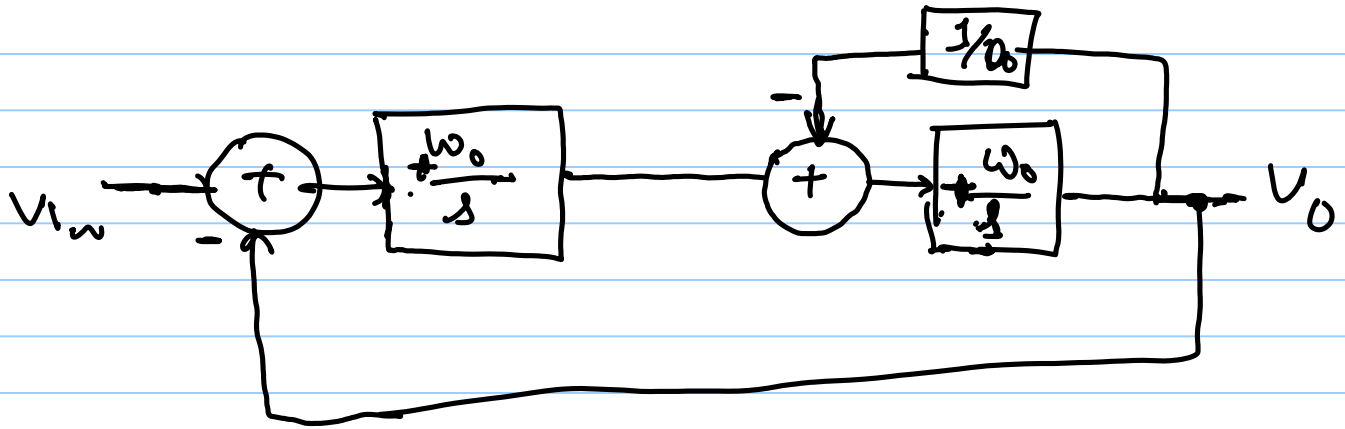
$$\frac{V_o}{V_{in}} = \frac{\omega_0^2}{s^2 + \frac{\omega_0}{Q_0} s + \omega_0^2}$$

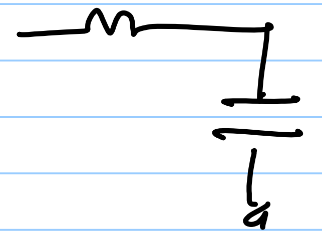
$$\omega_0^2 V_{in} = V_o \left(s^2 + \frac{\omega_0 s}{Q_0} + \omega_0^2 \right)$$

$$\omega_0^2 \frac{V_{in}}{s^2} = V_o \left(1 + \frac{\omega_0}{Q_0 s} + \frac{\omega_0^2}{s^2} \right)$$

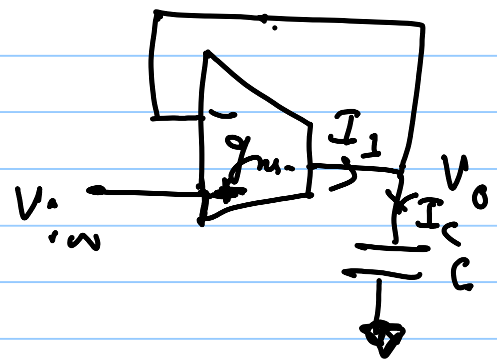
$$V_o = \frac{\omega_o^2}{s^2} V_{in} - \frac{\omega_o}{Q_o s} V_o - \frac{\omega_o^2}{s^2} V_o$$

$$V_o = \frac{\omega_o^2}{s^2} (V_{in} - V_o) - \frac{\omega_o}{(Q_o) s} V_o$$





$\Rightarrow$



$$I_1 = (V_{in} - V_0) g_m$$

$$I_c = V_0 sC$$

$$I_1 = I_c$$

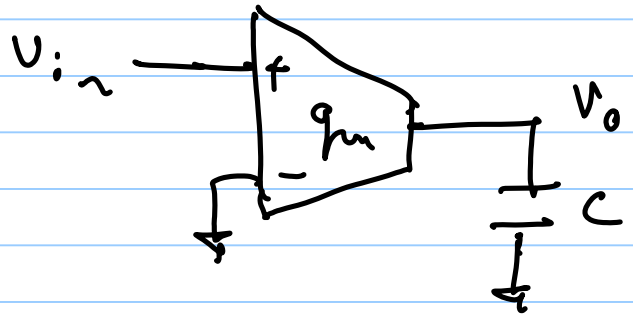
$$(V_{in} - V_0) g_m = V_0 sC$$

$$V_{in} g_m = V_0 g_m + V_0 sC$$

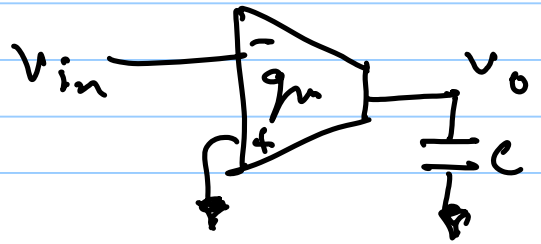
$$V_0 (g_m + sC) = V_{in} g_m \Rightarrow \frac{V_0}{V_{in}} = \frac{g_m}{g_m + sC} = \frac{1}{1 + \frac{C}{g_m} s}$$

$$\frac{1}{1+RCs} \Rightarrow \frac{1}{1+\frac{C}{g_m}s}$$

$R \to \frac{1}{g_m}$



$$v_o = \frac{g_m}{Cs}$$



$$v_o = -\frac{g_m}{Cs}$$