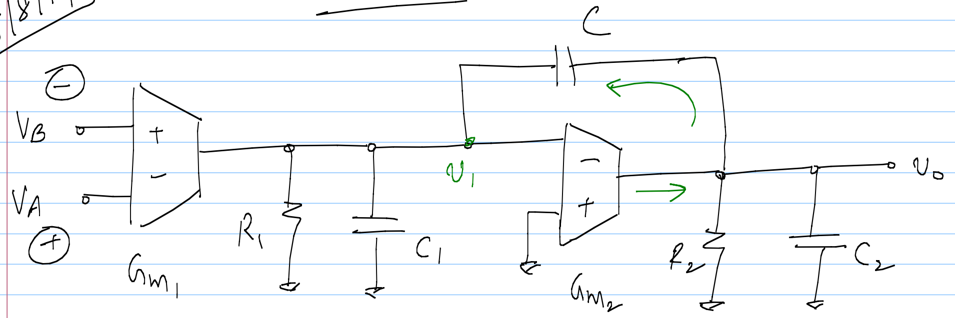
27/8/14

lec 14



$$\frac{v_o}{v_a - v_b}(s) = \frac{-G_{m_1} G_{m_2} R_1 R_2 \left[\frac{sC}{G_{m_2}} - 1\right]}{s^2\left[CC_1 + C_1C_2 + CC_2\right]R_1R_2 + s\left[C\{R_1(1+G_{m_2}R_2) + R_2\} + R_1C_1 + R_2C_2\right] + 1}$$

DC gain mag. $= G_{m_1}R_1 \cdot G_{m_2}R_2$ ✓

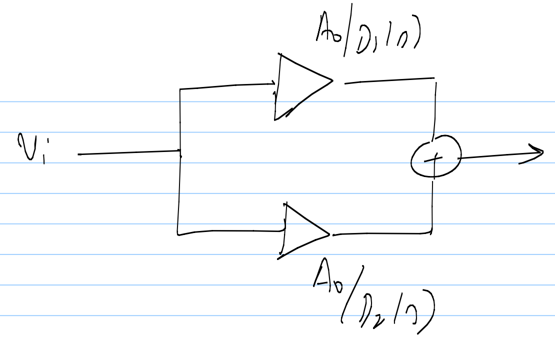
zero @ $Z_1 = +\frac{G_{m_2}}{C}$ (RHP zero) ✓

$$\frac{A_0\left(1 - \frac{s}{\omega_z}\right)}{D(s)} = A\left[\frac{1}{D_1(s)} + \frac{1}{D_2(s)}\right]$$

$D(s) = D_1(s) \cdot D_2(s)$

$D_1(s) + D_2(s) = (1 - s/\omega_z)$

@ $s = \omega_z$, $\frac{v_o}{v_i}(s) = 0$



$v_o = v_i \cdot \frac{A_0(1 - s/\omega_z)}{D(s)}$

$D_1(s) \neq D_2(s)$

quadratic eqn $ax^2 + bx + c = 0$ roots are x_1 & x_2

if $x_1 << x_2$

$x_1 \approx -\frac{c}{b}$; $x_2 \approx -\frac{b}{a}$

here p_1 = dominant pole

p_2 = 1st ND pole

$$p_1 \approx -\frac{c}{b} = -\frac{G_1 G_2}{\left[C\{G_{m_2} + G_1 + G_2\} + G_1C_1 + G_2C_2\right]}$$

$R_1 = \frac{1}{G_1}$

$R_2 = \frac{1}{G_2}$

$$\approx -\frac{G_1G_2}{G_{m_2}C} \approx -\frac{G_1}{\left(\frac{G_{m_2}}{G_2}\right) \cdot C}$$

$G_{m_{1,2}} >> G_1, G_2$

$C \sim C_1 \sim C_2$

We expected :

$$p_{1_0}\text{(initial)} = \frac{-1}{R_1 C_1} = \frac{-G_1}{C_1}$$

$$p_{1_{new}} = \frac{-G_1}{C_1 + (A)C} \approx \frac{-G_1}{\left(\frac{G_{m_2}}{G_2}\right)C}$$

$$A = G_{m_2} R_2 = \frac{G_{m_2}}{G_2}$$

$$|AC| >> |C_1|$$

$$p_2 \simeq -\frac{b}{a}$$

$$= \frac{-C\left[G_{m_2} + G_1 + G_2\right] + C_1 G_1 + C_2 G_2}{G_1 C + C_2 C + C_1 C_2}$$

$$\approx \frac{-C \cdot G_{m_2}}{C_1 C + C_2 C + C_1 C_2} = \frac{-G_{m_2}}{C_1 + C_2 + \frac{C_1 C_2}{C}}$$

before adding C,

$$p_{2_0} = \frac{-G_2}{C_2}$$