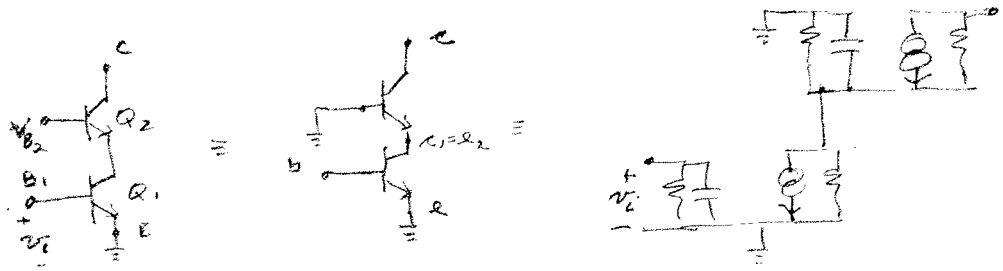
02/20/12
RWN
computer failure

BJT cascode, p. 521



$$v_{oc} = -g_{m_2} v_{e_{2oc}} \cdot r_{o_2}$$
$$= -g_{m_2} \left(g_{m_1} v_i \right) \left[\frac{r_{o_2}}{g_{\pi_2} + g_{o_1} + sC_{\pi_2}} \right]$$
$$= -\frac{g_{m_1} g_{m_2} r_{o_2}}{g_{\pi_2} + g_{o_1} + sC_{\pi_2}} \cdot v_i$$

$$-i_{sc} = g_{m_2} v_{e_{2sc}} + g_{o_2} v_{e_{2sc}}$$
$$= (g_{m_2} + g_{o_2}) \left[\frac{g_{m_1} v_i}{g_{o_1} + g_{\pi_2} + g_{m_2} + g_{o_2} + sC_{\pi_2}} \right]$$

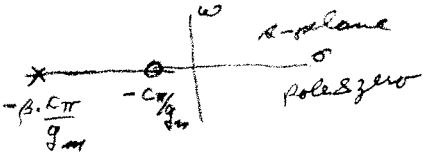
$$\Rightarrow z_{th} = \frac{v_{oc}}{+i_{sc}} = \frac{g_{m_1} g_{m_2} r_{o_2}}{g_{\pi_2} + g_{o_1} + sC_{\pi_2}} \cdot \frac{g_{o_1} + g_{o_2} + g_{m_2} + g_{\pi_1} + sC_{\pi_2}}{g_{m_1} (g_{m_2} + g_{o_2})}$$

Assume $g_{o_1} = g_{o_2} = I_C / V_A$, $g_{m_1} = g_{m_2} = I_C / V_T$, $g_{\pi_2} = g_m / \beta$

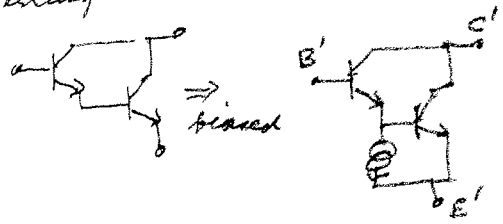
$$z_{th}(s) = \frac{g_m \left(2 g_o + g_\pi + g_m + sC_{\pi_2} \right) r_{o_2}}{(g_o + g_m)(g_\pi + g_o + sC_{\pi_2})}$$

$$\approx \frac{g_m + sC_{\pi_2}}{g_\pi + sC_{\pi_2}} = \frac{g_m}{g_\pi} \cdot r_{o_2} \left(\frac{1 + sC_\pi / g_m}{1 + sC_\pi \beta / g_m} \right) = \beta r_o \left(\frac{1 + s \frac{C_\pi}{g_m}}{1 + s \frac{C_\pi}{g_m} \beta} \right)$$

$$z_{th}(0) = r_{th} = \beta r_{o_2}$$



p. 545 use in current mirrors
p. 549 Darlington



Have Y, $h_{21} = \frac{i_2}{i_1}$, $y_{21} = \frac{i_2}{v_1}$