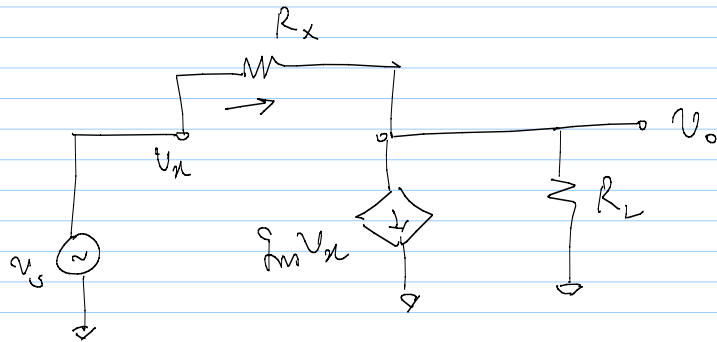


11/9/14

lec 21



$$v_x = v_s$$

$$\frac{v_s - v_o}{R_x} = g_m v_s + \frac{v_o}{R_L}$$

$$v_o (g_L + g_x) = v_s (g_x - g_m)$$

$$\frac{v_o}{v_s} = \left(\frac{g_x - g_m}{g_x + g_L} \right) = \frac{-g_m}{g_L} \left[\frac{1 - h_x/g_m}{1 + h_x/g_L} \right]$$

* $g_m \gg g_L$ for large gain

* Choose $g_x \ll g_L \Rightarrow h_x \ll g_m$

$$R_x \gg R_L$$

* Swing limits: 1) $I_D = I_0$ (cut off limit is the same)

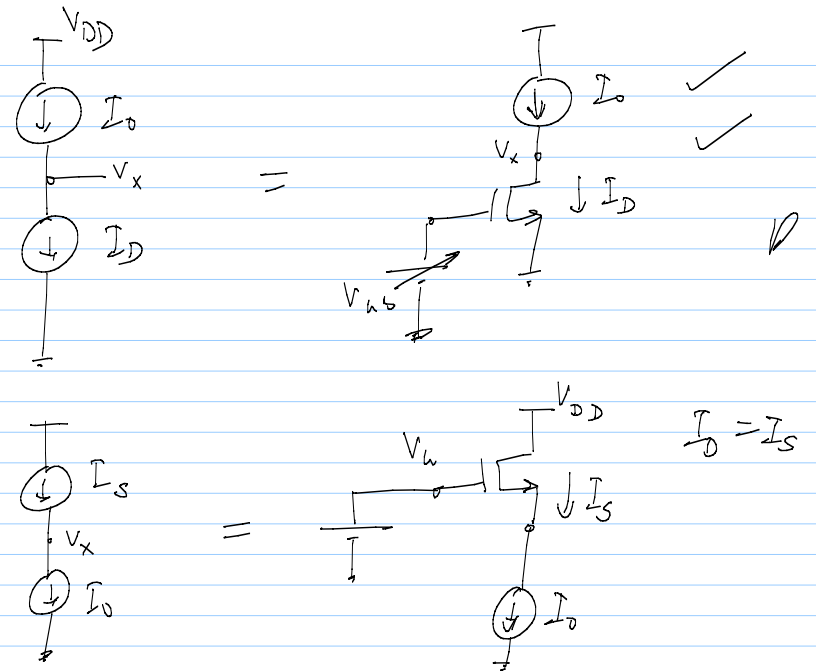
2) $V_{D,DC} = V_{A,DC} \Rightarrow$ triode limit is different (t/w)

Negative f.b. to stabilise bias point

I_{ref} = desired bias current

- 1) Measure I_D (I_S)
- 2) Compare I_D (I_S) with I_{ref}
- 3) If $I_D > I_{ref}$, reduce V_{as} (V_{in} or V_S)
- 4) If $I_D < I_{ref}$, increase V_{as} (V_{in} or V_S)

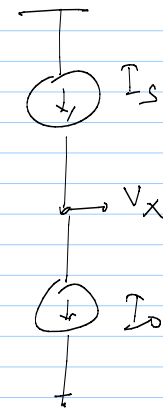
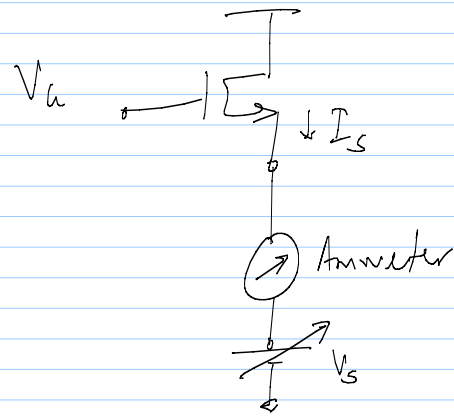
\Rightarrow 4 ways of using -ve f.b. to stabilise bias point



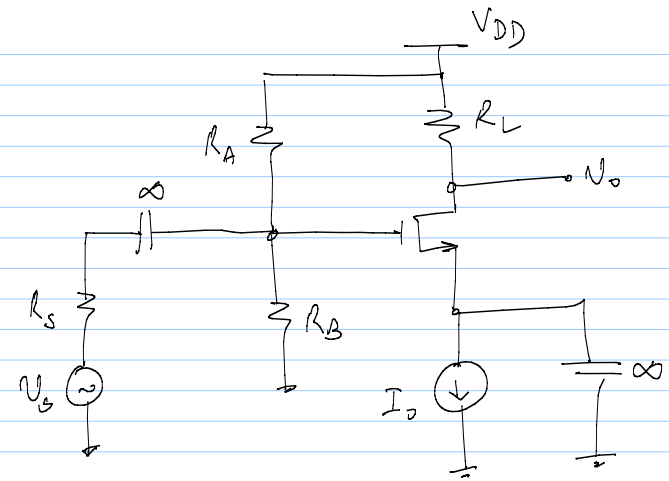
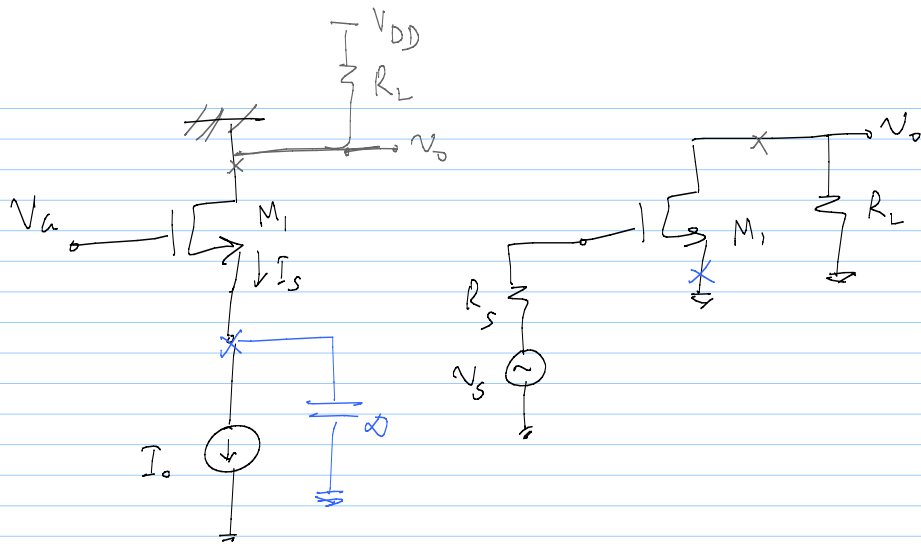
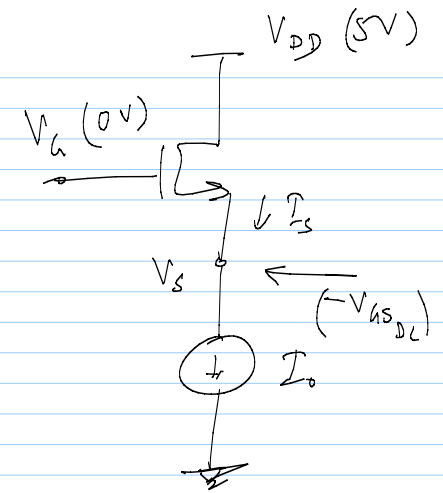
* V_{as} tunes I_D (or I_S)

\Rightarrow keep V_S constant & tune V_a (or)

keep V_a constant & tune V_S



If $I_s > I_o \Rightarrow V_x \uparrow \left\{ \begin{array}{l} \text{want} \\ V_s \uparrow \end{array} \right\}$
 $I_s < I_o \Rightarrow V_x \downarrow \left\{ \begin{array}{l} \text{want} \\ V_s \downarrow \end{array} \right\}$



$$V_{a,DC} = \frac{R_B}{R_A + R_B} \cdot V_{DD}$$