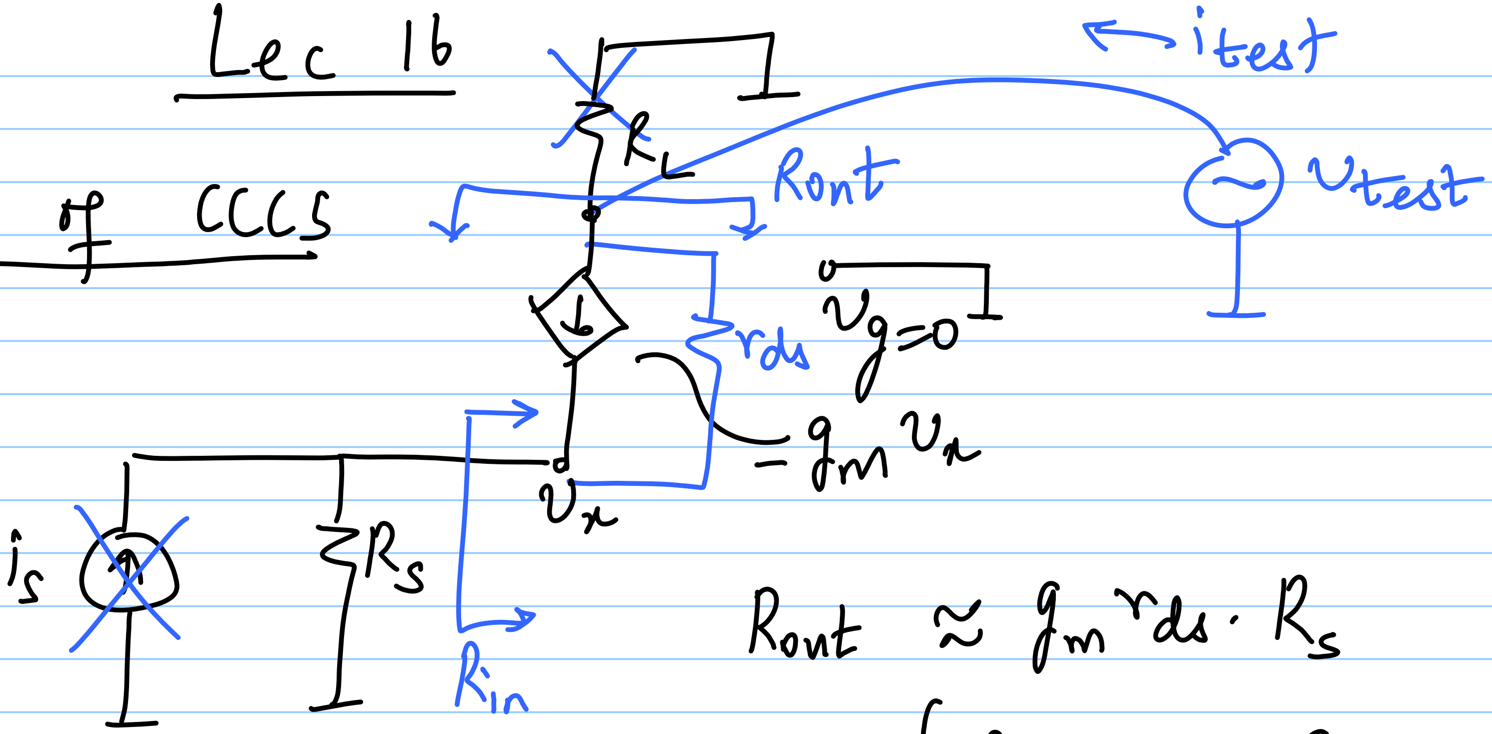
29/8/19

Lec 16

Rout of CCCS



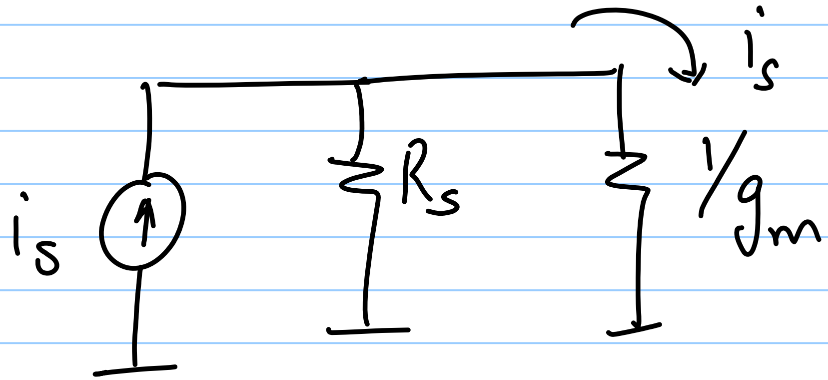
$$R_{out} \approx g_m r_{ds} \cdot R_s$$

$$\{ R_s + r_{ds} + g_m r_{ds} \cdot R_s \}$$

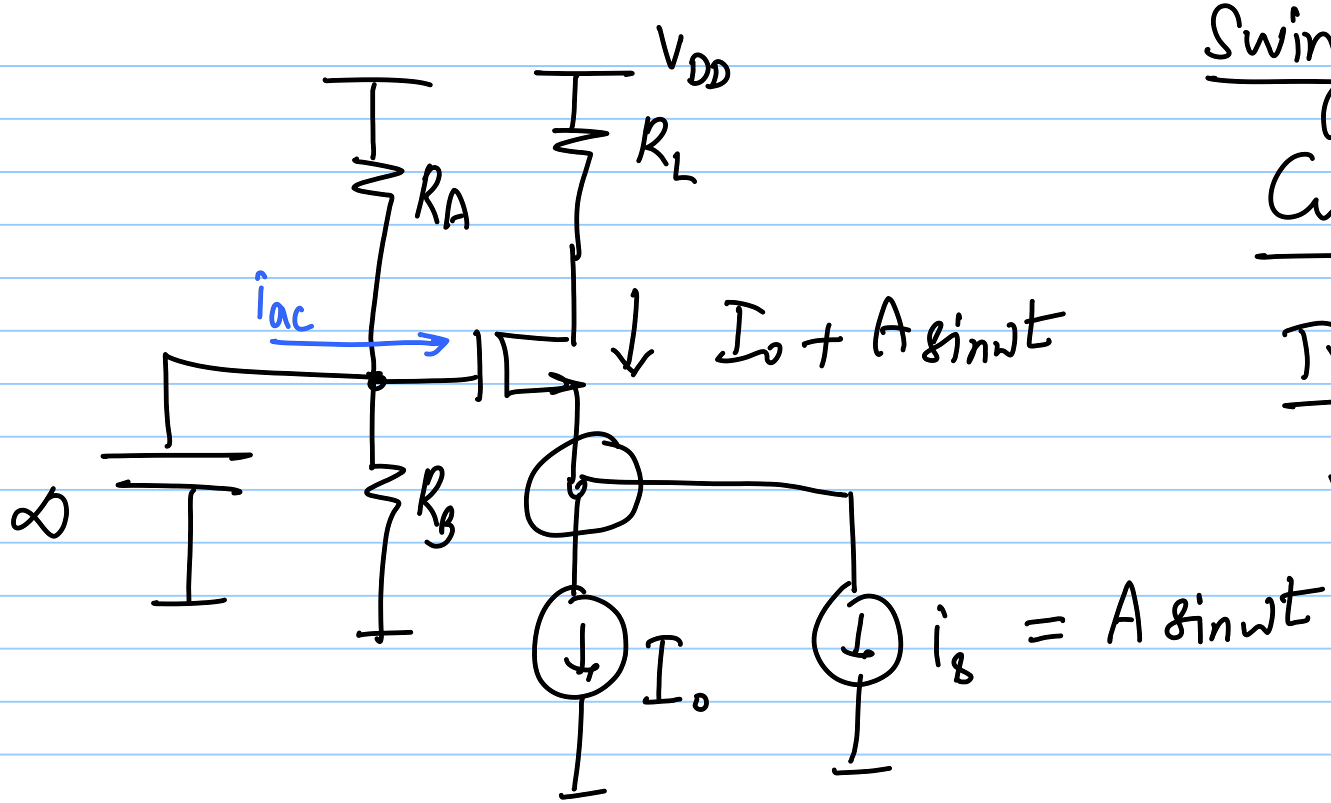
$$R_{in} = \frac{1}{g_m}$$

HW: $R_{in} = f(g_m, r_{ds}, R_L)$

$$\frac{1}{g_m} << R_s$$



$$\boxed{g_m >> \frac{1}{R_s}}$$



Swing limits

Cut off: $A_2 = I_0$

Triode: $V_D = V_G - V_T$

$$V_{DD} - (I_0 + A\sin\omega t)\cdot R_L$$

$$= \frac{R_B}{R_A + R_B}\cdot V_{DD} - V_T$$

incremental CCVS

"Trans impedance Amplifier"

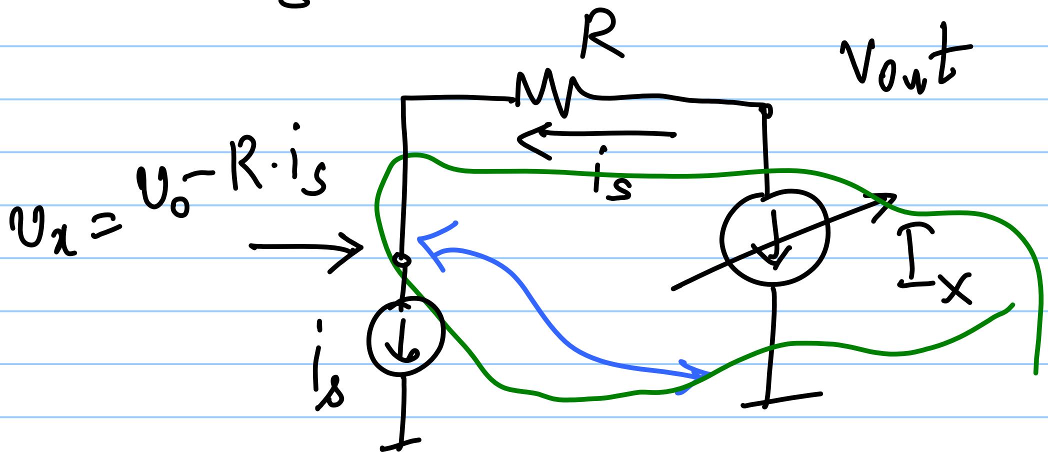
$v_o = R \cdot i_s$; $R_{in} = 0$

$R_{out} = 0$

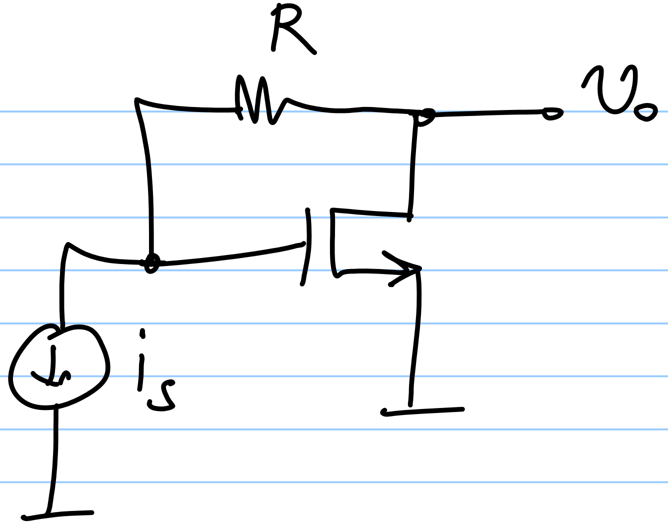
$v_o - R \cdot i_s = 0$

If $v_{out} - R i_s > 0$ ($<$)

$\Rightarrow \uparrow\downarrow I_x$

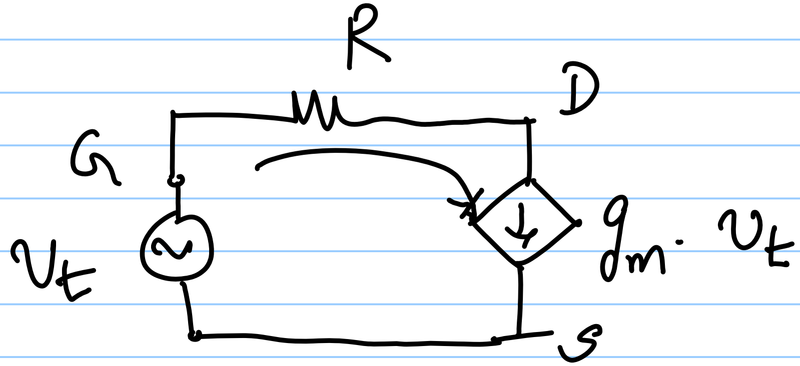


$= g_m (v_x - 0)$



inc. CCVS

R_{in}

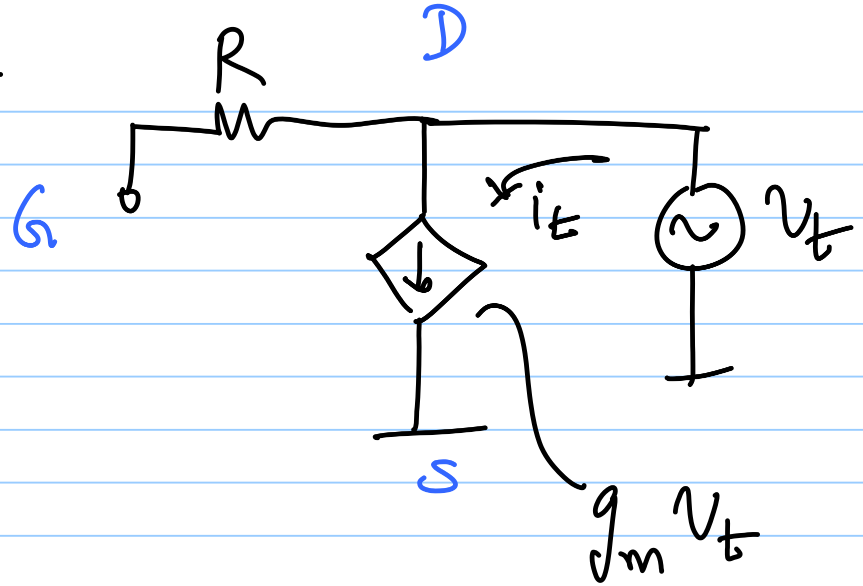


$$i_t = g_m \cdot v_t$$

$$R_{in} = \frac{1}{g_m}$$

choose $g_m \gg 1/R_S$

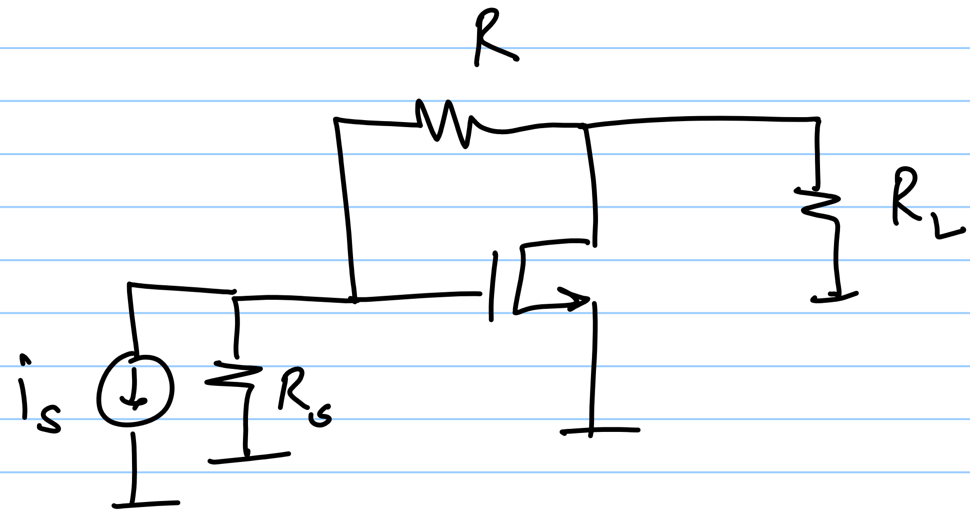
R_{out}



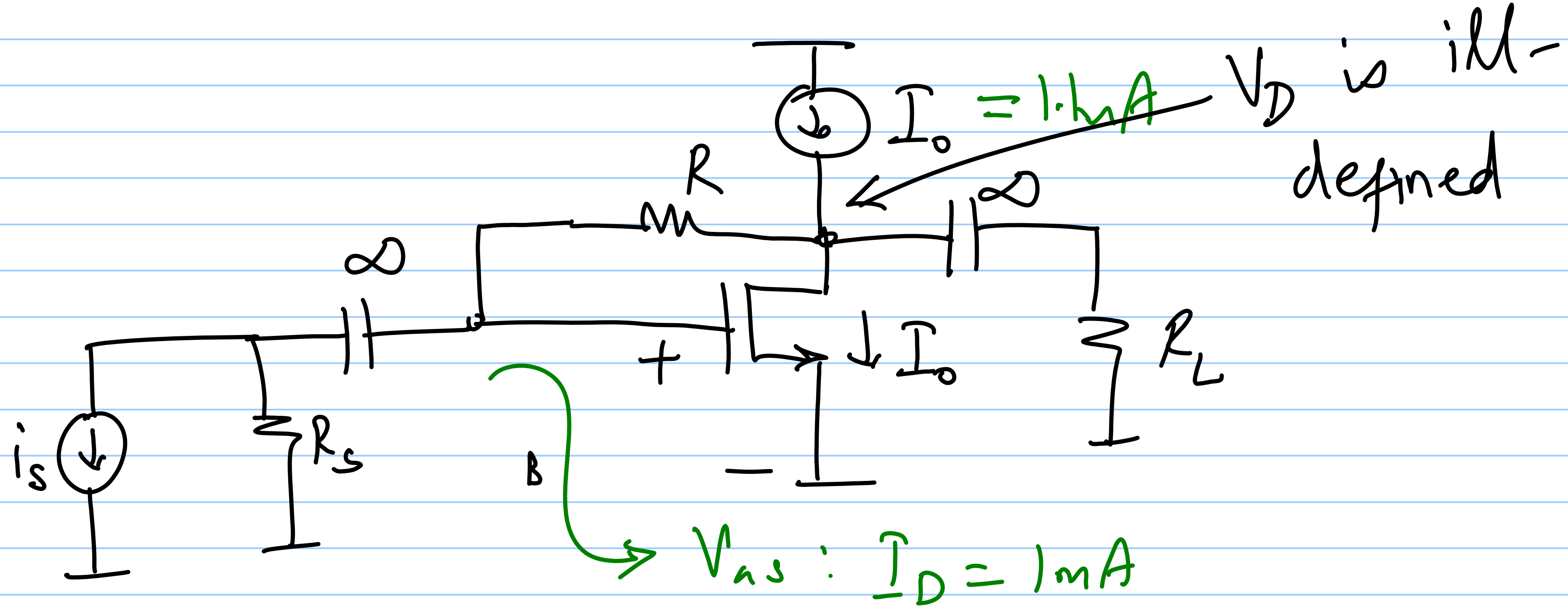
$$i_t = g_m \cdot v_t$$

$$R_{out} = \frac{1}{g_m}$$

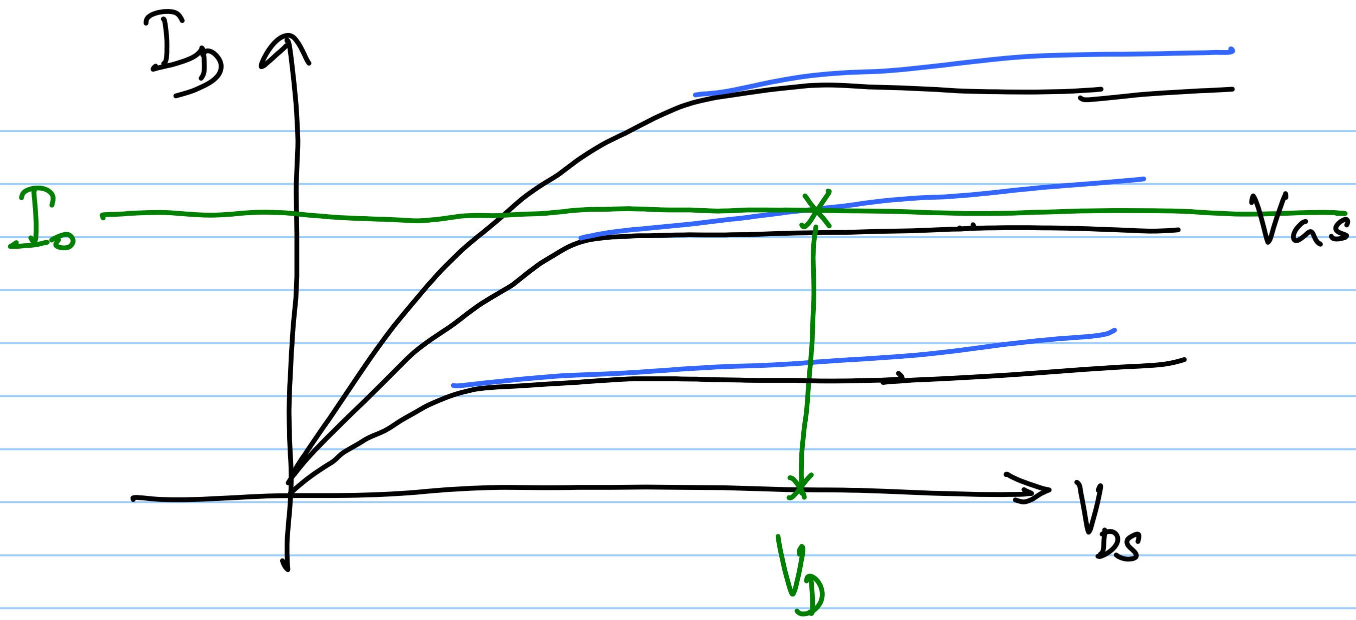
$$g_m \gg \frac{1}{R_L}$$



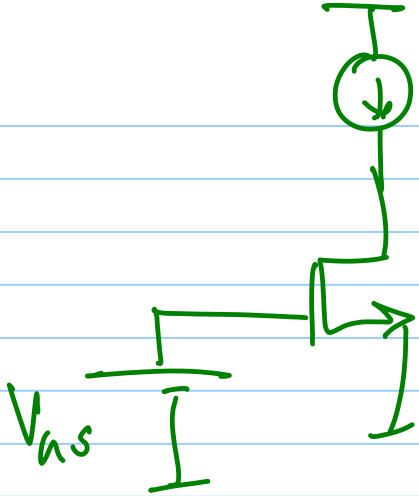
Rin & Rout : HW



Swing limits : HW

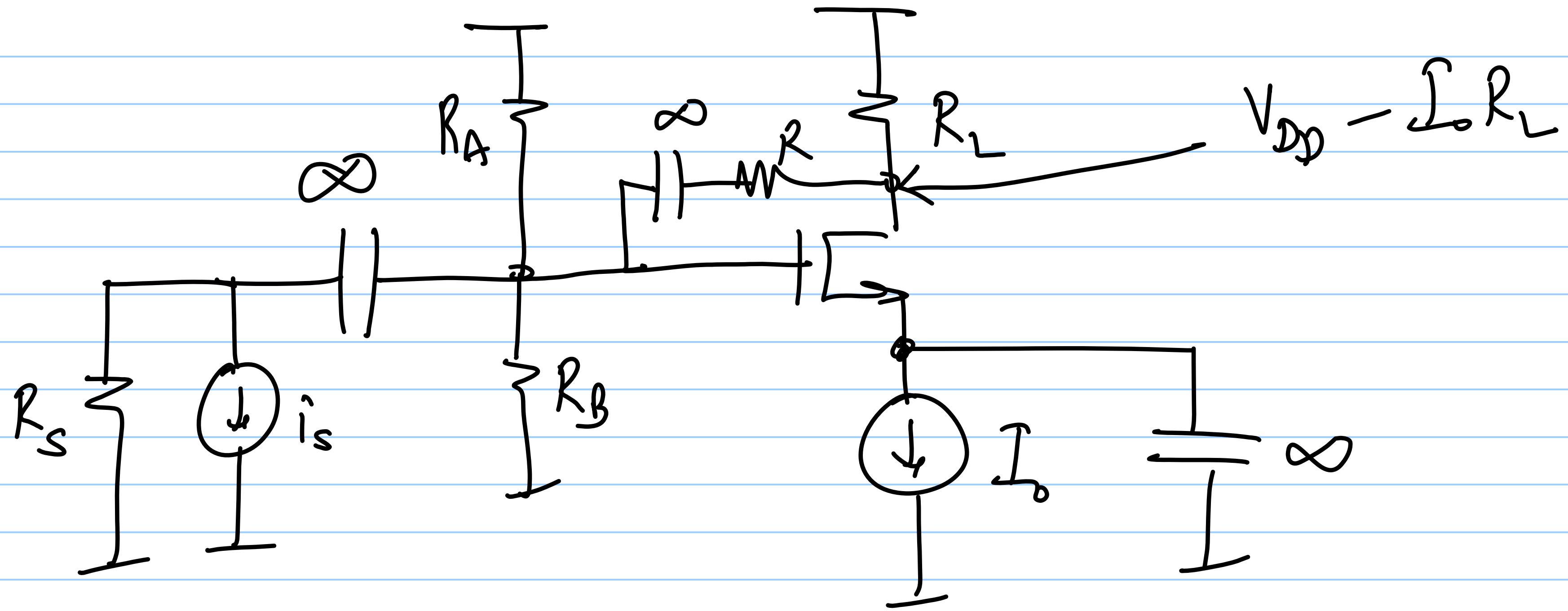


I_D
I_o
V_{GS}
V_{DS}
V_D



$I_0 = 2mA$ / $0.5mA$

$I_D = 1mA$



Swing limits : HW