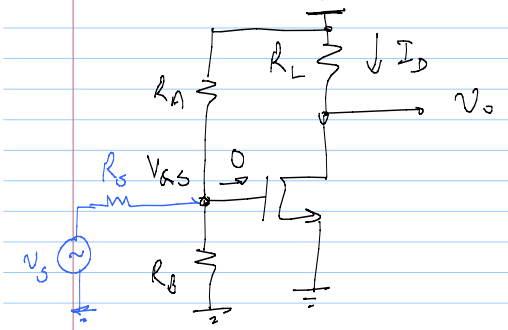
2/9/14

lec 16

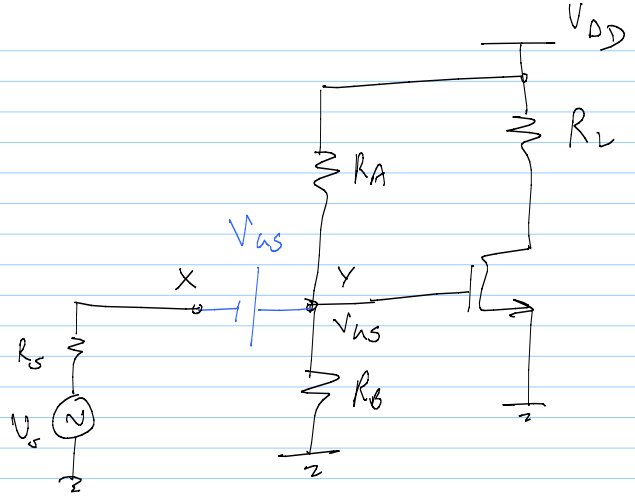
$V_{DD} = V_{DS} + I_D R_L$



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

* cannot connect $V_s - R_s$ directly to gate

$\Rightarrow$ V_{GS} will change to $\frac{R_B \| R_s}{R_A + R_B \| R_s} \cdot V_{DD}$ ✗

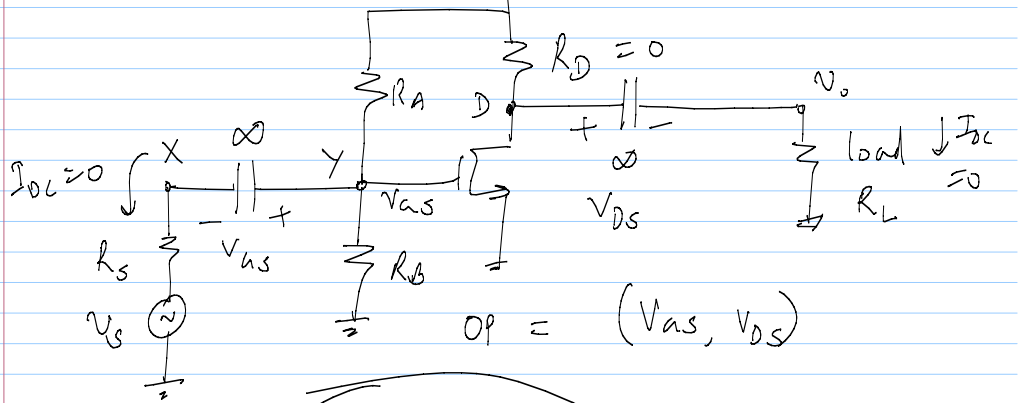


DC voltage
@ X = 0
@ Y = V_{GS}

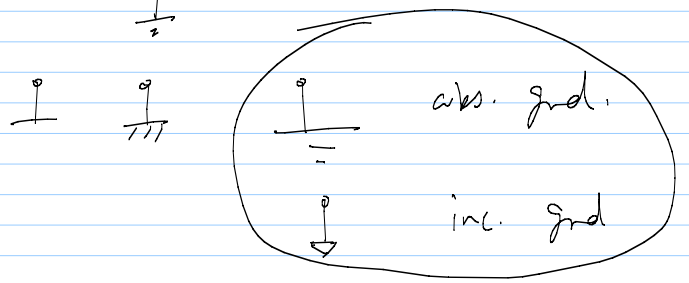
1) V_x ⊣⊢ $\equiv$ V_x ⊣⊢ C if current drawn from cap = 0

2) V_x ⊣⊢ $\equiv$ V_x ⊣⊢ ∞ even if current is drawn

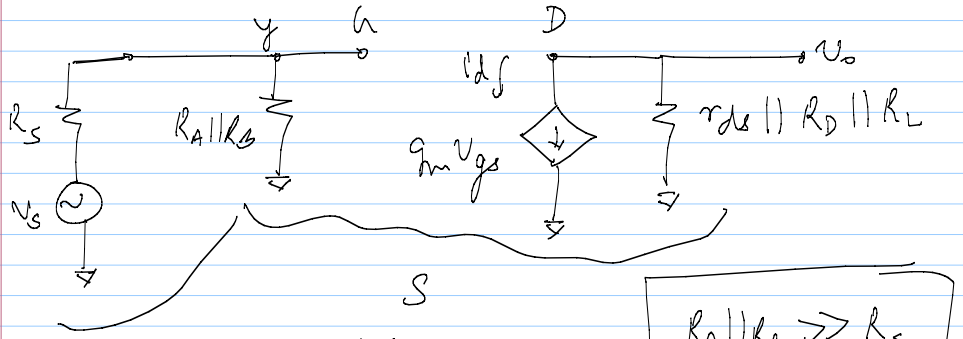
$V_{DD} = V_{DS} + I_D R_D$



OP = (V_{GS}, V_{DS})



Small-signal equivalent



$$v_y = \frac{R_A \| R_B}{R_S + R_A \| R_B} \cdot v_S$$

$R_A \| R_B \gg R_S$

So that $v_y \simeq v_S$

$$v_y = v_{gs}$$

$$i_d = g_m v_{gs}$$

$$= g_m v_S$$

$$v_o = -i_d \cdot (r_{ds} \| R_D \| R_L)$$

$$= -g_m (r_{ds} \| R_D \| R_L) \cdot v_S$$

$$\boxed{\frac{v_o}{v_S} = -g_m \cdot (r_{ds} \| R_D \| R_L)}$$