EE330 Lab 9

Section 5, 8:00 am

Discrete Semiconductor Amplifiers

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Part 1: Common-Emitter Amplifier

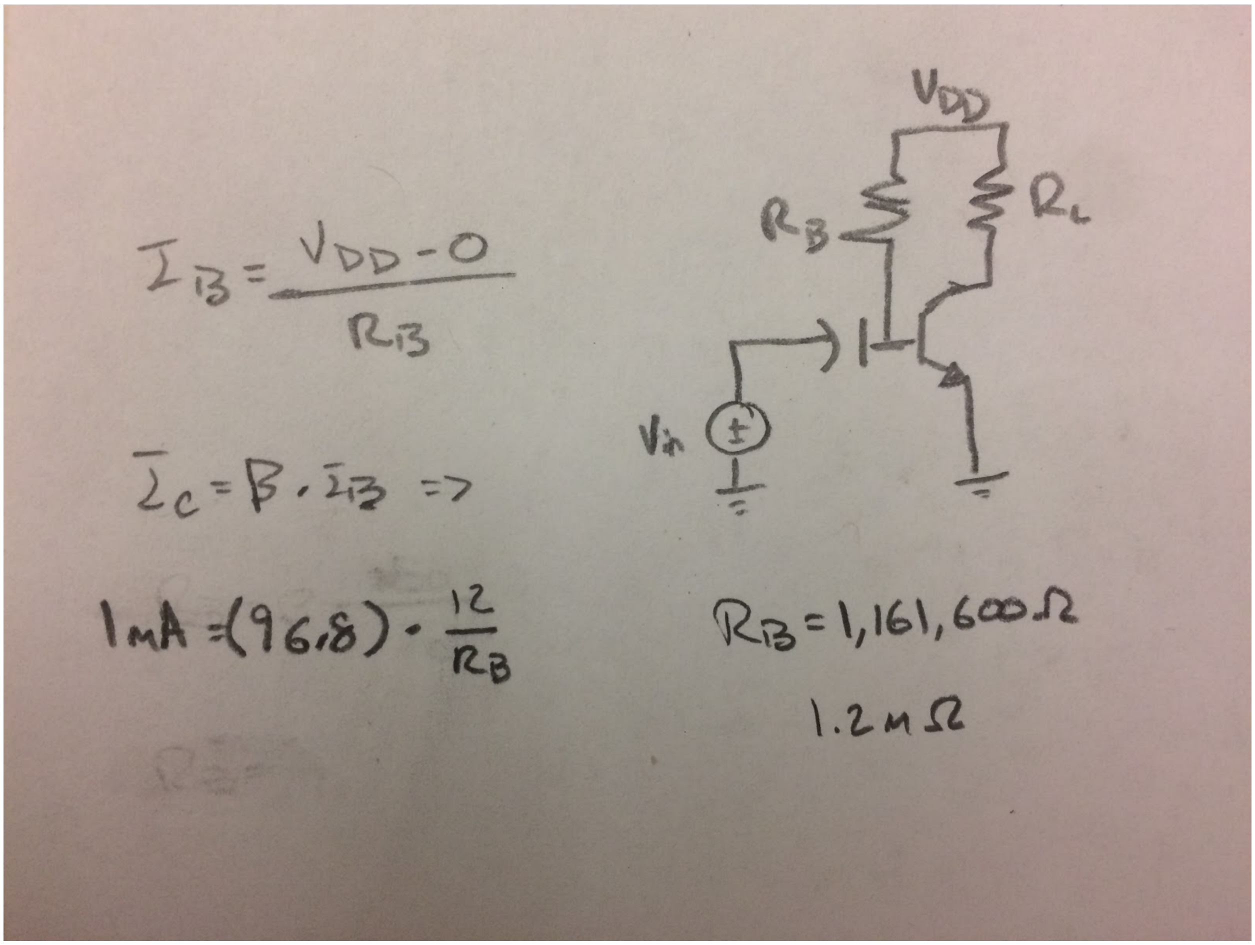
a) These values were measured using R_B = 470 kΩ

I_B was measured to be 24.689 uA

I_C was measured to be 2.390 mA = 2390 uA

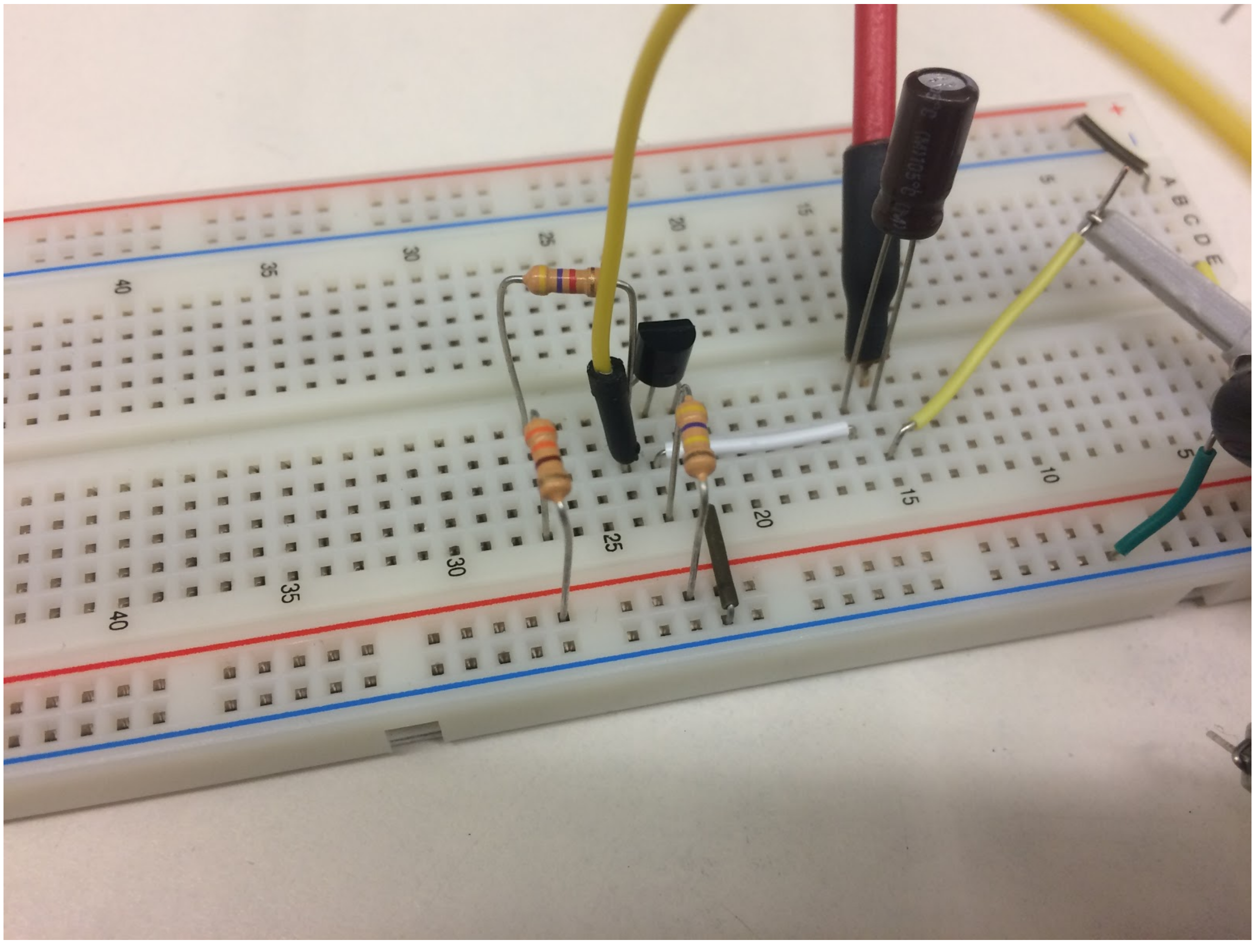
$I_C = \beta * I_B \Rightarrow \beta = I_C/I_B$ = 2390 uA / 24.689 uA = **96.8**

b) For I_C to == 1 mA

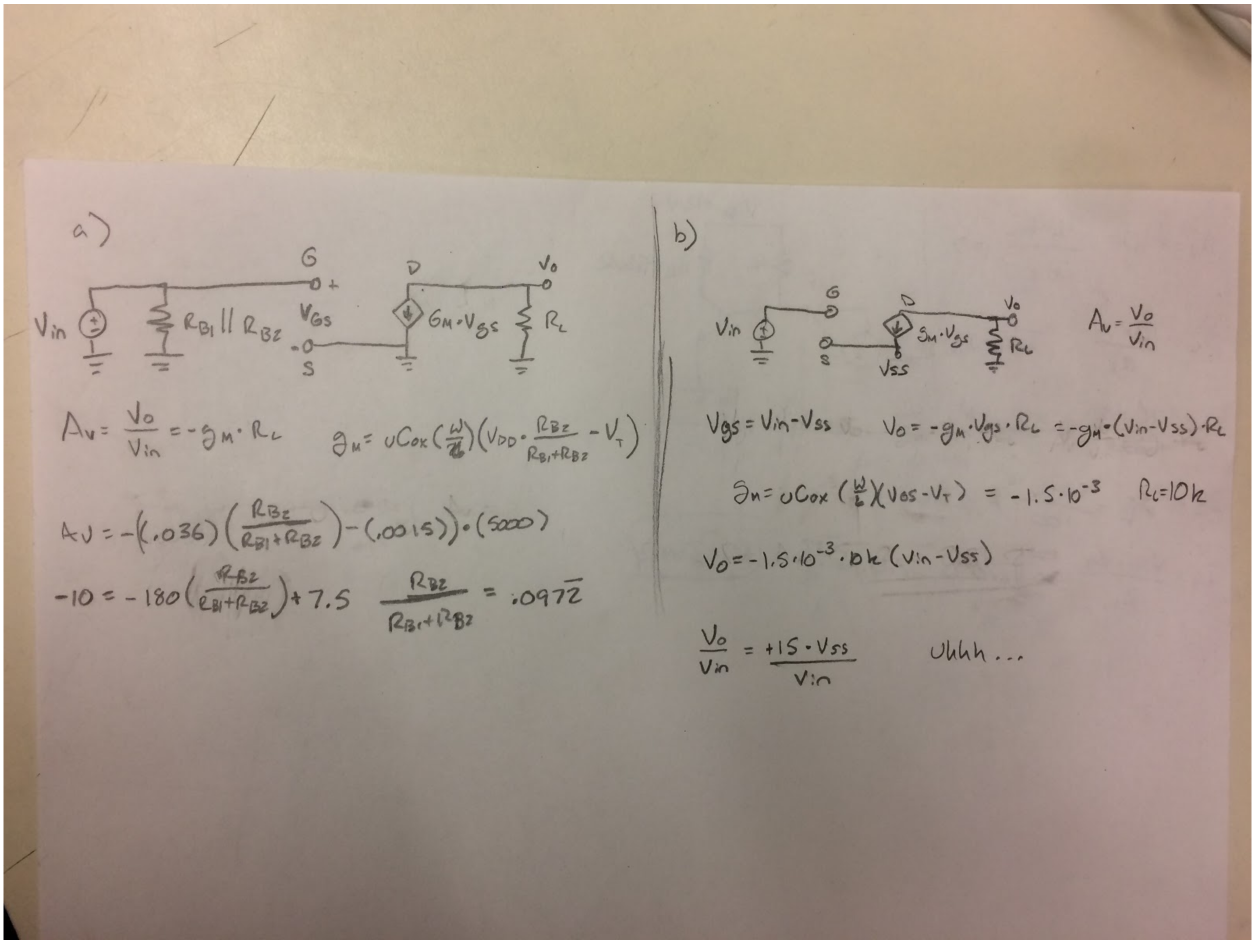


c) I'm getting output voltage == 12.9 V, .9 V higher than what I'm putting in (Vdd = 12V), so clearly I have no idea what I'm doing. However, I also have no time to correct that.

d) Yeah any voltage will do with my mess of a circuit apparently.



Part 2: Common Source Amplifier



a)

$A_v = \frac{V_o}{V_{in}} = -g_M \cdot R_L \qquad g_M = uC_{ox}\left(\frac{W}{L}\right)\left(V_{DD}\cdot\frac{R_{B2}}{R_{B1}+R_{B2}} - V_T\right)$

$A_V = -\left((.036)\left(\frac{R_{B2}}{R_{B1}+R_{B2}}\right) - (.0015)\right)\cdot(5000)$

$-10 = -180\left(\frac{R_{B2}}{R_{B1}+R_{B2}}\right) + 7.5 \qquad \frac{R_{B2}}{R_{B1}+R_{B2}} = .09\overline{72}$

b)

$A_v = \frac{V_o}{V_{in}}$

$V_{gs} = V_{in} - V_{ss} \qquad V_o = -g_M \cdot V_{gs} \cdot R_L = -g_M \cdot (V_{in} - V_{ss}) \cdot R_L$

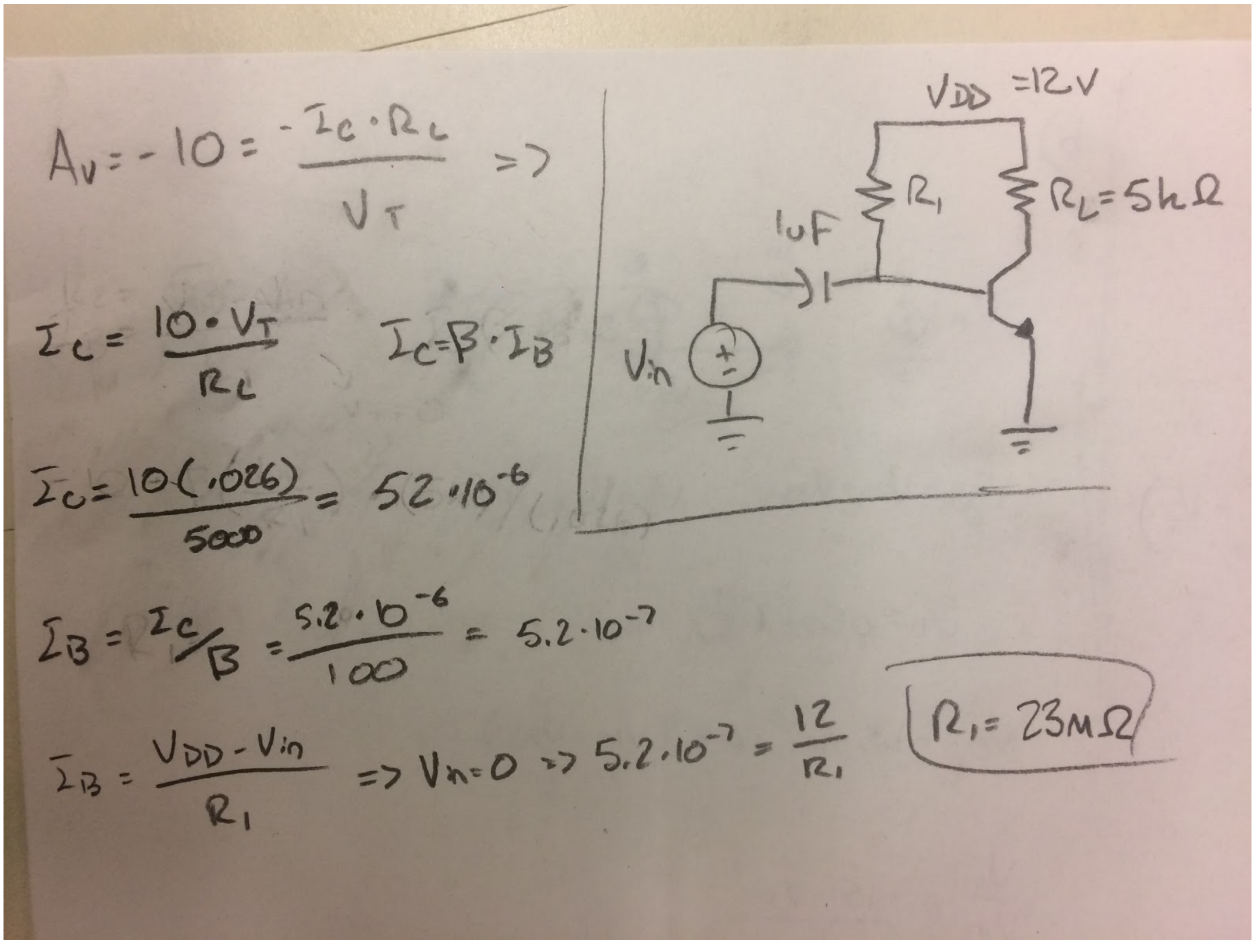
$g_M = uC_{ox}\left(\frac{W}{L}\right)(V_{GS} - V_T) = -1.5 \cdot 10^{-3} \qquad R_L = 10k$

$V_o = -1.5 \cdot 10^{-3} \cdot 10k\,(V_{in} - V_{ss})$

$\frac{V_o}{V_{in}} = \frac{+15 \cdot V_{ss}}{V_{in}}$ Uhhh...

I seem to not know how to do this, but I don't have time to learn because I have homework to do so this is how it will stay.

Part 3: Amplifier Design



When building the circuit, to provide a 5k resistor I used a 330 and a 4.7k in series.