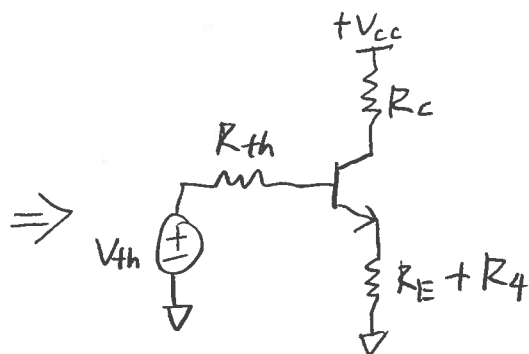
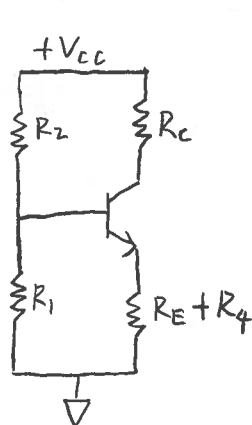


EECS 311 - fall 2008 - HW#6 sol'n's

1) a)



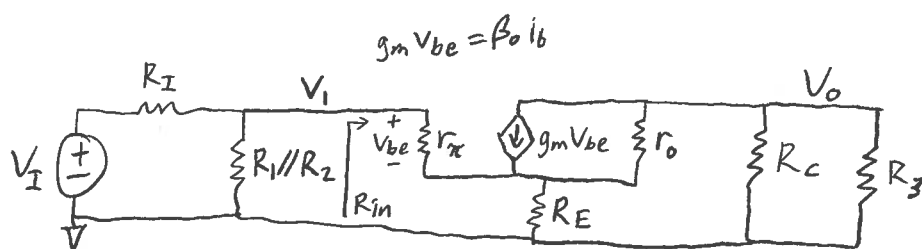
$$V_{th} = \frac{R_1}{R_1 + R_2} V_{cc}$$

$$R_{th} = R_1 \parallel R_2$$

★ for all problems

R_{out} = equiv. resistance seen at V_o

b)

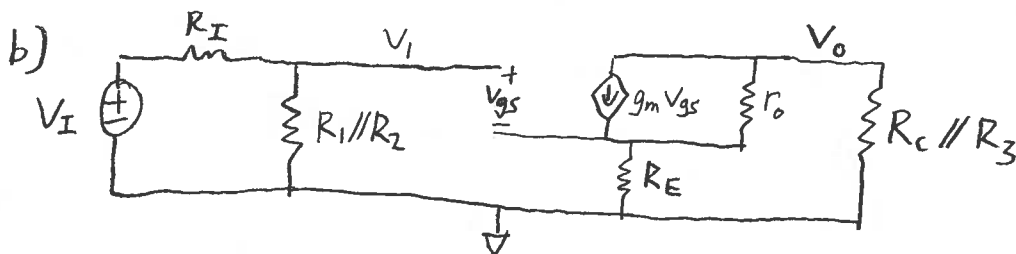


$$c) a_v = \frac{V_{out}}{V_{in}} = \frac{V_{out}}{V_i} \cdot \frac{V_i}{V_{in}} = - \frac{g_m R_{out}}{1 + g_m R_E} \cdot \frac{R_1 \parallel R_2 \parallel R_{in}}{R_I + (R_1 \parallel R_2 \parallel R_{in})}$$

$$R_{out} = R_C \parallel R_L$$

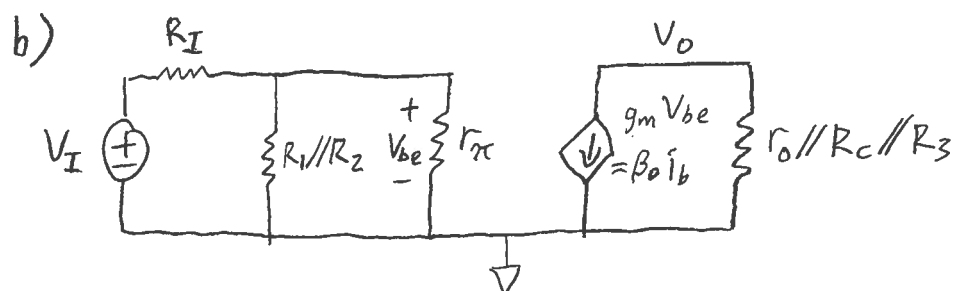
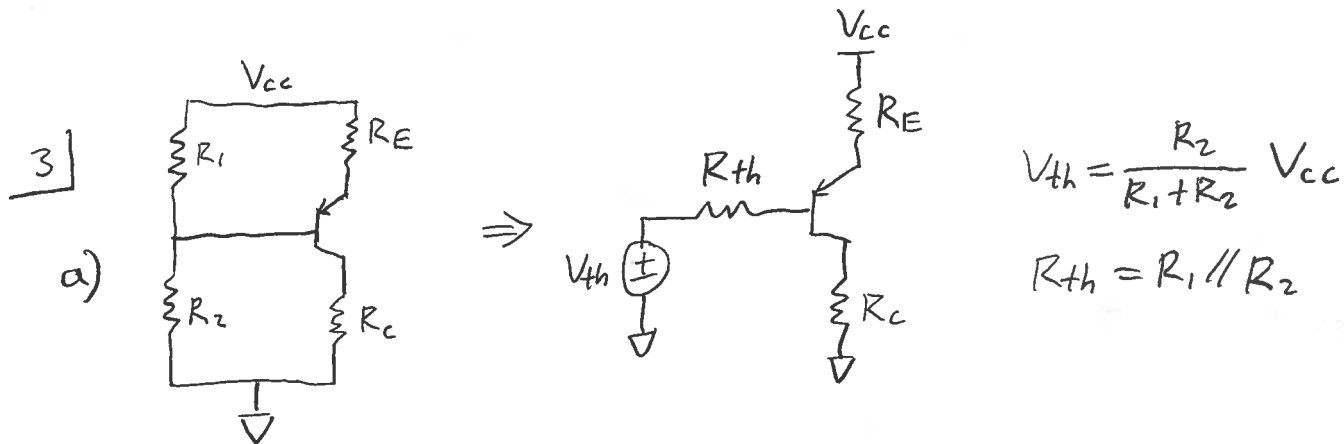
$$R_{in} = r_{\pi} + (1 + \beta_0) R_E = r_{\pi} + (1 + g_m r_{\pi}) R_E$$

2) a) same as #1a, but replace npn w/ nmos



$$c) a_v = \frac{V_{out}}{V_i} \cdot \frac{V_i}{V_{in}} = - \frac{g_m R_{out}}{1 + g_m R_E} \cdot \frac{R_1 \parallel R_2}{R_I + (R_1 \parallel R_2)}$$

$$R_{out} = R_D \parallel R_L$$

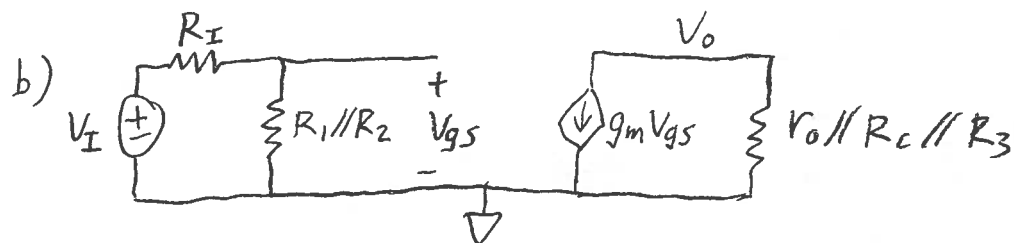


c)

$$a_v = \frac{R_1 \parallel R_2 \parallel r_{\pi}}{R_I + (R_1 \parallel R_2 \parallel r_{\pi})} \cdot (-g_m (R_C \parallel R_3))$$

4

a) same as #3a, but replace pnp w/ pmos

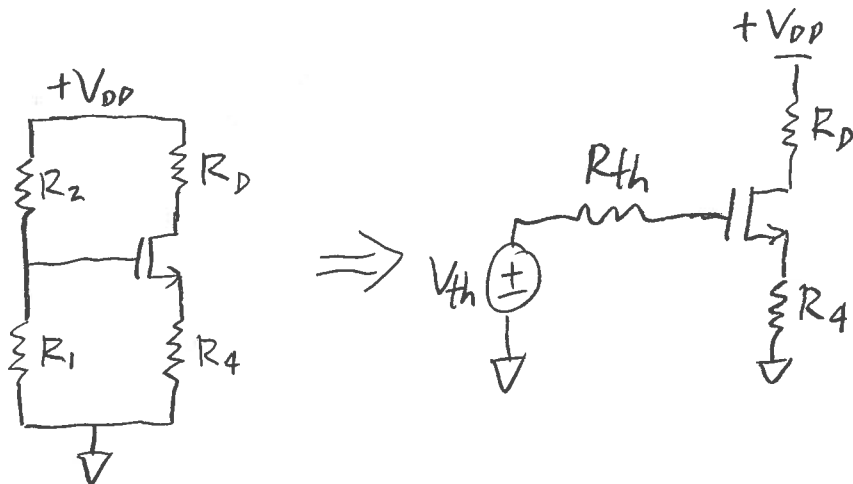


c)

$$a_v = \frac{R_1 \parallel R_2}{R_I + (R_1 \parallel R_2)} (-g_m (R_C \parallel R_3))$$

5

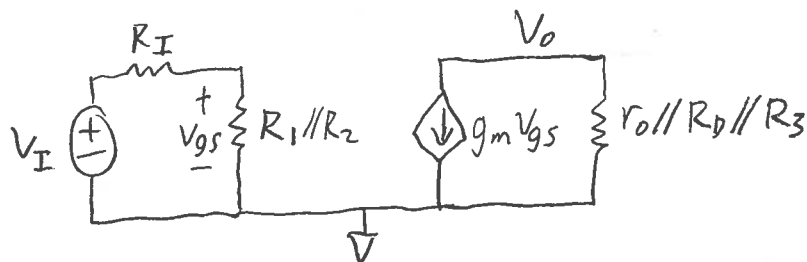
a)



$$V_{th} = \frac{R_1}{R_1 + R_2} V_{DD}$$

$$R_{th} = R_1 \parallel R_2$$

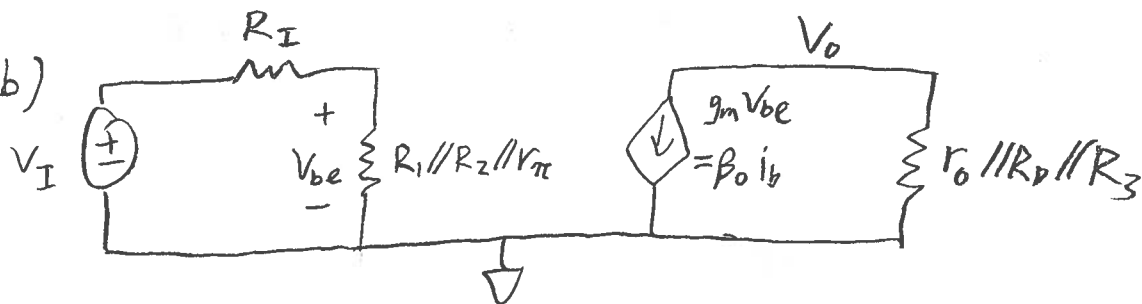
b)



$$c) a_v = \frac{R_1 \parallel R_2}{R_I + (R_1 \parallel R_2)} (-g_m (R_D \parallel R_3))$$

6) a) same as #5a, but replace NMOS w/ npn

b)



$$c) a_v = \frac{R_1 \parallel R_2 \parallel r_{\pi}}{R_I + (R_1 \parallel R_2 \parallel r_{\pi})} (-g_m (R_D \parallel R_3))$$

