

UNIVERSITY OF CALIFORNIA AT BERKELEY
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Homework #2
(Due 2/5/04)

EECS 140
Spring 2004

- 1) Given the circuit in Figure 1, $R_1=R_2=10\text{ M}\Omega$, $V_{dd}=1.8\text{V}$ and $W/L=1/1$.
 - a) Sketch V_{out} and I_d of the transistor as V_{in} varies from 0 to V_{dd} . Label the breakpoints, end points of the curve and indicate operation region of the transistor. (Hint: do the necessary approximation)
 - b) Find out dc voltage V_{in} such that V_{out} is $V_{dd}/2$. And calculate the small signal parameters, g_m , R_{out} , R_{in} at this operation point.
 - c) Use HSPICE and the following device model to verify your hand calculations for a) and b). Compare your results with SPICE simulations. Print out the results and SPICE deck. (Note: $\phi_f=0.3\text{ V}=\text{PHI}/2$)

```
.model nch nmos LEVEL=1 TOX=25 VTO=0.4 KP=100.0e-6 LAMBDA=0  
+GAMMA=0.01 PHI=0.6
```

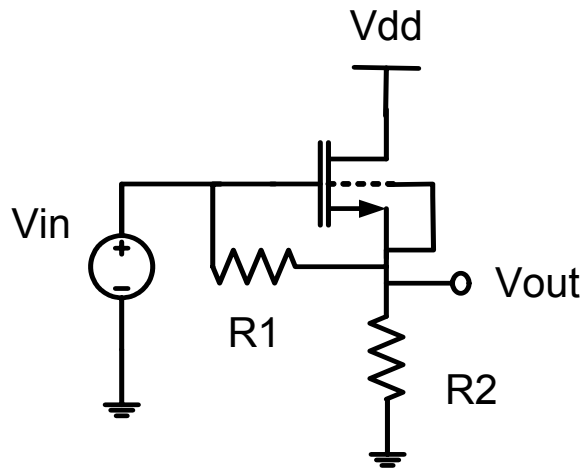


Figure 1