

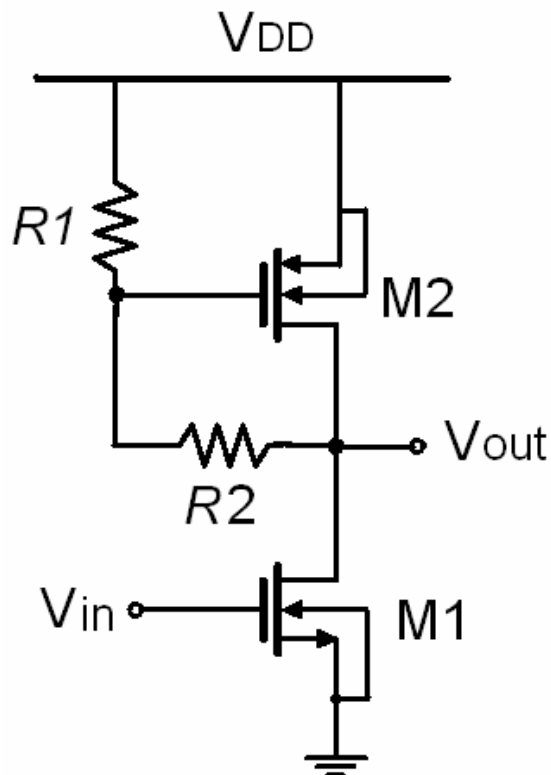
UNIVERSITY OF CALIFORNIA AT BERKELEY
College of Engineering
Department of Electrical Engineering and Computer Science

R.W. Brodersen
Jianhui Zhang

Homework #2
(Due 9/10/03)

EECS 140
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1. Sketch V_{out} versus V_{in} as V_{in} varies from 0 to V_{DD} . Indicate and calculate all the breakpoints (the values of V_{in} and V_{out}) and corresponding operation regions (cutoff, linear or saturation) of transistors M1 and M2.
Assume V_{t0} (NMOS) = 0.5V, V_{t0} (PMOS) = -0.6V, $k'W/L$ (NMOS) = 8mA/V², $k'W/L$ (PMOS) = 3mA/V². $V_{DD} = 3V$, $R1=R2=10K\Omega$.



2. For each of the two circuits below, perform the calculations (a) and (b) by hand. Assume $V_{t0} = 0.5\text{V}$, $k'W/L$ (NMOS) = 8mA/V^2 , $\lambda = 0.1\text{V}^{-1}$, $\gamma = 0.2\text{V}^{1/2}$. $R_s = 200\Omega$, $RL1 = 10\text{K}\Omega$, $RL2 = 10\text{k}\Omega$, $V_{bias} = 1.2\text{V}$ and $V_{DD} = 3\text{V}$.

- Determine the dc voltage V_{in} , so that the output V_{out} is at 1.5V . Assume that V_{in} is between 0 and V_{DD} .
- Calculate the operating point parameters I_{DS} , V_T and V_{DSAT} and the small signal parameters g_m , g_{mbs} and r_o .

