303 Spring 2012– Homework 2 Due M 02/13/12 in class

In the following all the transistors are 4007s.

1. (50 points, CMOS biasing)

a) For the following circuit run curves to show the possible Q points for choices of Rg1 {use 100K ≤ RG ≤10Meg with 1 point per log step; plot ID and current in Rload on the same curves).

b) For Rg1=1Meg Ohm give the small signal gm, (use ID from a non-parametric run of PSpice) and calculate with it the corresponding voltage gain, -gmRload. Check by hand calculation of the ID using the PSpice model parameters.
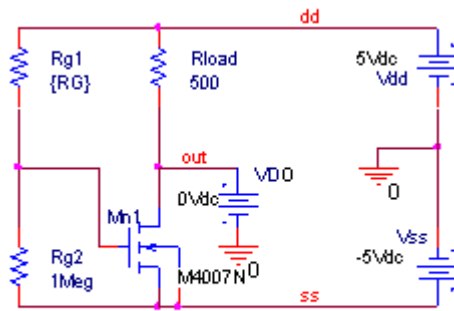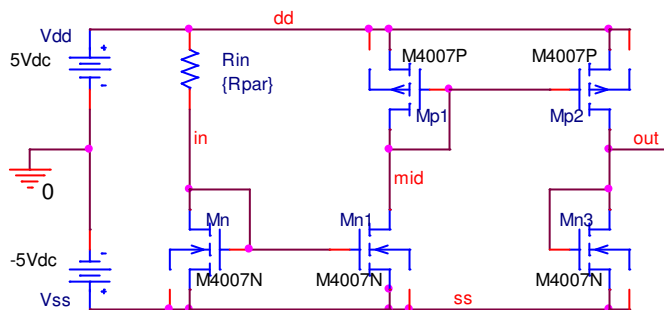

PARAMETERS:
RG = 1Meg

2. (50 points, Current Mirrors)

The following circuit illustrates two types of current mirrors. Use PSpice DC runs varying Vdd near 5V to obtain the desired results.

a) With parameterized Rin for 100≤Rpar≤100K in logarithmic steps, 1 curve per step, determine the resulting currents into Mn, and Mn2 as well as Mp1 and Mp2 (Show the IDn's in one plot and the IDp's in another)

b) Over the same range of Rin determine the voltages at in, mid, and out

c) Since the currents are supposed to be equal, explain why they are not.

PARAMETERS:
Rpar = 1K