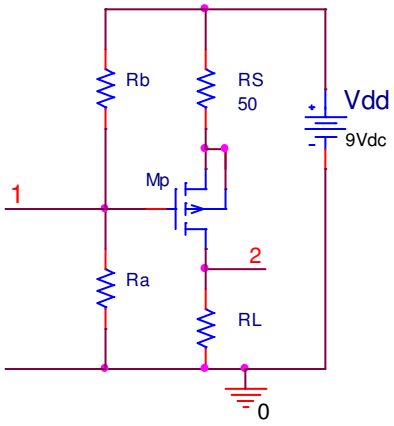
File G/coursesF13/303H/303HF13hmrk4.doc RWN 09/28/13

303H Fall 2013

Homework 4 – due 10/08/13

1. 50 points (PMOS biasing)
   Bias the PMOS 4007 in the following circuit to have a Q point at VGS=-3V, VDS=-6V. For this assume an RS=50Ohm, Vdd=9V, and one of Ra or Rb of 20MegOhm. Check using Spice. Draw the small signal equivalent circuit and give the small signal low frequency voltage gain, Av=V_{20}/V_{10} (include RS)



2. 50 points (Differential Pair amplifier)
   Using seven CMOS 4007 transistors, Vdd=-Vss=9V and a third battery V4tail for biasing (using CMOS diodes) for a tail current of 2mA, design a differential pair VCCS. Check your design using Spice (submit your Spice circuit and Iout plot). For the transistors you can use breakout transistors with the models that are on the web.

   Do this two different ways, one with the main pair being NMOS and again with them being PMOS. Discuss differences.