File: E:/courses/spring2008/303/hmwrk1.doc   RWN   02/05/08
Homework Set 1 due Thursday 02/14/08
If not yet done, download the bicmos12 files, the 4007 (=RCA36000) CMOS models (in
Spice model file ANL_MISC.lib), and the npn Q2n3904 and the pnp Q2n3906 (both in
model file eval.lib) to use in your Spice programs. For grading purposes submit your
circuit diagrams as well as requested plots.

1. [50 points] (diode characteristics and load line.)
        In Spice connect the collector to the base of a 2n3904 to make a pn diode.
a) Plot the current versus voltage for this diode.
b) Connect a 5v DC source in series with a 1KOhm resistor and plot this load line on
        the diode characteristic. From this determine the Q point.
c) Make the resistance to be a parameter going from 500Ohms to 2KOhms in 500Ohm
        steps and give the Q point values for each.

2. [50 points] (use of DC sweeps with parameters for PMOS transistors)
Set up the following two circuits in Spice using mpmosis transistors (from the bicmos12
        library) and then do dc runs. For part a) fix Vbias1=Vbias2=2V and vary Vdd1 and
        Vdd2 from 0 to 8V in DC sweeps.
a)   For each circuit plot the drain current, ID, versus the drain voltage measured with
        respect to ground (note that ID should be non-positive).
b)   Use Vbias1 as a nested DC sweep from -4V to +4V in 2V steps, and repeat part a)
        for the left circuit.
c)   Choose the channel width, W, as a parameter, varying it from 5u to 20u in 5u steps
        (giving four curves on a plot) and repeat part a). Then also repeat part b) with W
        still a parameter.

(a)   (b)