303H Fall 2014 – Homework 2 Due Th 09/18/14

The Gvalue part is in the abm.olb library
The PARAM part is in the SPECIAL library.
The transistors are in the bicmos12 library; you will need to load the .lib file in the configuration set.

1. (50 points, Gvalue and load line)
   Set up the following circuit in Spice and use that to plot the DC curves of the diode connected Gvalue and its load line over the Gvalue voltage source, V0, of 0 to 5 V and again, by "zooming" with the x-axis setting, over 0 to 2.2 V. Use the parameter and vary RL from 1 Ohm to 7 Ohms in 2 Ohm steps. Change all traces to black and submit your curves along with your circuit diagram. [note that the diode curve is designed to be a cubic with zeroes at v=0,1,2 and a max of 2 between the first two zeroes].

   EXPR = SQRT(27)*V(%IN+,%IN-)*(V(%IN+,%IN-)-1)*(V(%IN+,%IN-)-2)
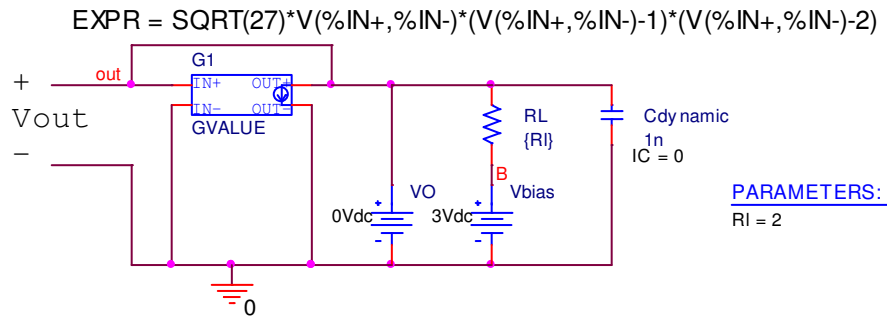
2. (40 points, transistor curves)
   The level 3 and level 4 models (AMI12L3N and AMI12L4N) are for the same transistor.
   a) Plot the transistor curves for AMI12L3N & AMI12L4N transistors (in the bicmos12 set); that is run Spice to obtain the i_D curves versus v_{DS} for different v_{GS}. Compare the two sets of curves for a given W/L and comment on any differences. Take a look at the models and note the effects of choosing small L's
   b) Repeat for AMI12L3P and AMI12L4P.

3. (10 points, NMOS small signal parameters)
   Give the low frequency small signal equivalent circuit for the NMOS transistor described in the saturation region by
   $$i_D = 2*10^{-5}(v_{GS}-0.15)^2(1+0.02v_{DS})$$
   when biased at $V_{GS}=2$, $V_{DS}=4$.