303H Fall 2016 – Homework 1 Due Tu 09/13/16

The PARAM part is in the SPECIAL library
1. (40 points, Diode DC curves) [note some data will be used in problem 2]
   a) In Spice do a DC run to get the DC diode curves of iD versus vD for the
   1N4001 diode, submitting your curve. Compare the 1N4001 model with that of
   the 1N4007.
   b) Repeat the curves for the npn transistor 2N3904 formed into a diode by
   connecting the collector to the base.
   c) Repeat part b) but with the diode formed by connecting the emitter to the base.
   d) Comment on differences and why they come about.

2. (60 points, Diode biasing and ac & transient analysis).
   Set up the following circuit in Spice (but first with a DC source). Then do a DC
   run on Vin (about 0 to 3V) along with a parametric run to find RL to give a diode
   current of 2mA when Vin=2V DC.
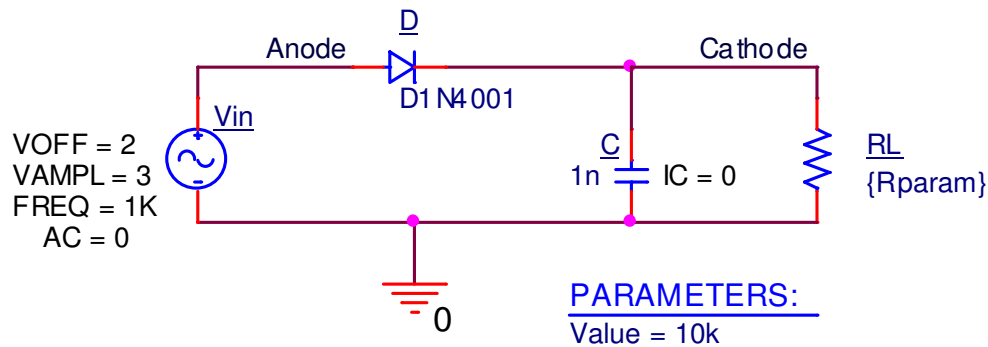
   a) Record 1) the resistance RLbias of the resistor RL for the diode current to be
   2mA, when the input DC voltage is 2V, 2) the diode voltage, Vdio, at this
   diode current Q point, and 3) the conductance (slope), gd, of the diode current
   vs diode voltage at this Q point (use the curves of problem 1)..
   .
   b) Make RL the value found for the above Q point. Set up, and submit, the small
   signal differential equation when the initial value of the capacitor voltage is
   2+Vdio.
   c) Do a transient analysis for about 4mSec in PSpice with a 3V amplitude sin
   input at 1KHerz with the capacitor IC value = 0. Submit your transient
   analysis curves of diode cathode voltage (with respect to ground) and diode
   current [best obtained as two plots of one run].