HOMEWORK ASSIGNMENT 8

HOMEWORK DUE MARCH 10, 2003 BEFORE CLASS:

Additional Hints of 3-8-03

1. Problem 7.11: $v_o = -7.5\exp(-50{,}000t)$V, $i_o = [3.125\exp(-50{,}000t) - 3.125]$mA
2. Problem 7.13: a) $i_o(t = 0+) = 2$A, $i_o\ (t = \infty) = 4$A, b) $[4 - 2\exp(-1{,}000t)]$A,
   c) 2,300 μS = 2.3 ms
3. Problem 7.23 a) 8.65%, b) 625Ω: 1.54%, 15kΩ: 14.42%, c) 75.38%

Note for Problem 7.23 there are typographical errors in some of the text books. The values of the resistors are 625 Ω, 15kΩ, and 25kΩ. The capacitor value is 200nF.

4. Problem 7.51 $i = 25 - 10\exp(-40t)$ A, $v = 16\exp(-40t)$ V
   Hint: construct a Thevenin equivalent that includes the sources and resistors after the switch closes. Use the initial value of current in the inductors that you solved for under the conditions before the switch closure.

5. PSPice Problem 4:
   a. Solve the Textbook Problem 7.88
   b. You may submit for your assignment, the circuit drawing and transient analysis plot. Note the time at which the amplifier saturates on your circuit diagram – please just write this value down clearly on the diagram.
   c. **You only are asked to solve part (a)**
      i. Note the supply bias values of +10V and –10V
   d. For guidance on the general analytical nature of a related circuit, please refer to Lecture 15 of March 5 – Problem 7.85.
   e. For performing Time Domain Transient Analysis, please review PSpice Tutorial II on the Web site.
   f. You should experiment with the value of the Run to Time. Hint: set the Close Time for the switch to be 100 microseconds (entered as 100us – see below). Adjust the Run to Time in order to observe the time at which the Op Amp saturates.
   g. Now, for the switch that we need in this problem, you may use this:

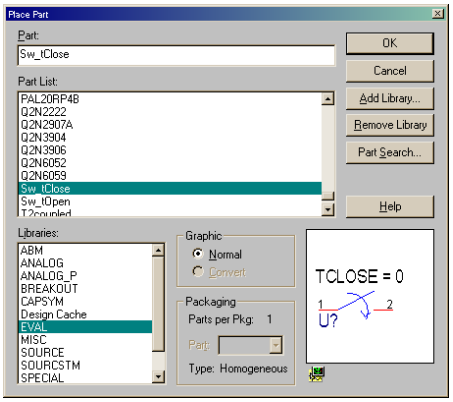

Figure 1. Selection of the Switch for 7.88

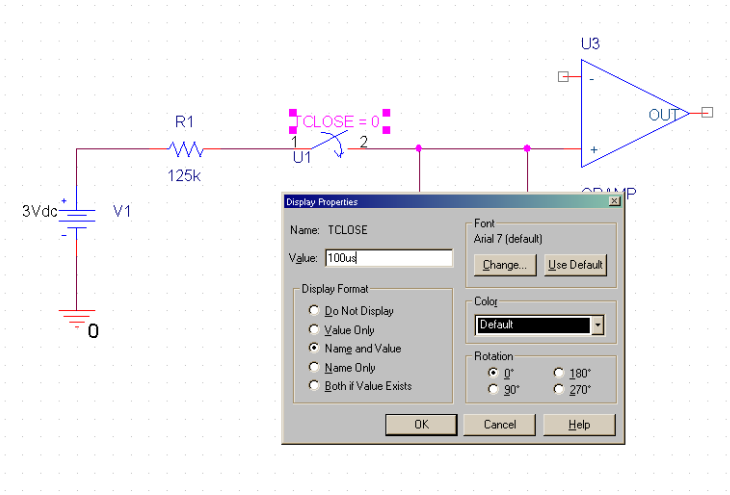

Figure 2. Setting switching time.

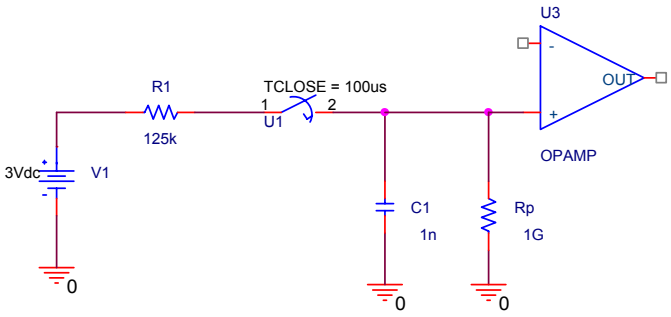

Figure 3. Partial circuit for Problem 7.88. **Please note the presence of R_p. This is required to allow PSpice to compute the initial conditions. Note that the value of R_p is 1GΩ (10^9Ω)**

Now, there is are some important hints to be made here. These are to ensure that your circuit is established with the capacitor at zero voltage at t = 0. There are two approaches. One is to add a second switch, a TOPEN switch that is in parallel with the capacitor that opens at T = 100us

A more simple solution is to simply adjust a TCLOSE switch parameter. The PSpice model for this switch actually leaves a resistance of 1 Megohm (by default) across the switch when it is open. We must ***increase*** this. We should have this value be much ***greater*** than 10^9 So, for this, you may adjust the switch Open State Resistance. This is labeled Ropen.

Just double click on the switch itself in the Schematic Editor. This will then bring up the Properties dialog.

Then, modify the Ropen value as shown below.

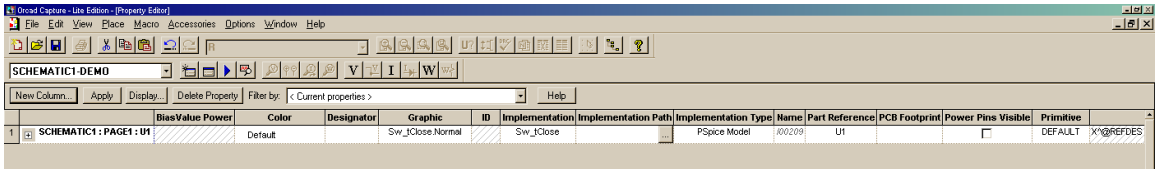

Figure 4. This is the Properties dialog

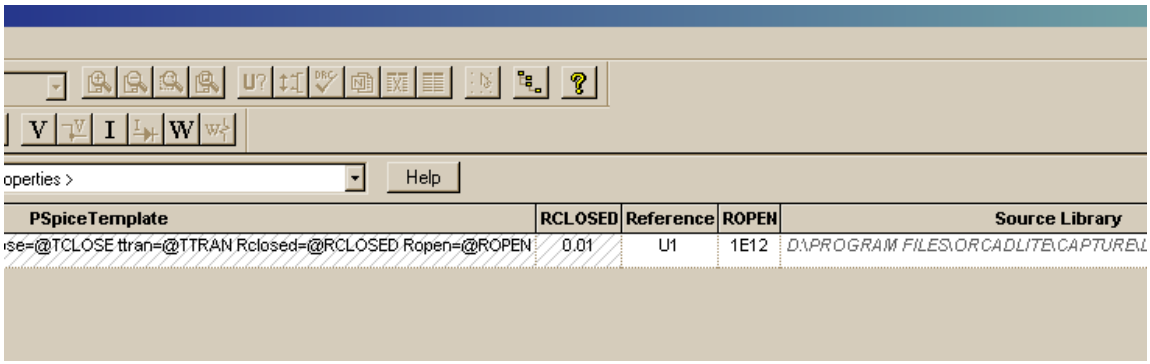

Figure 5. This is the part of the Properties listing that shows ROPEN. Set this to 1E12

Last note. If you are operating on some SEASnet machines, you may encounter a PSpice "convergence" error.

This is resolved by setting the OpAmp open loop gain to 1E4 (changed from the default value of 1E6).