File: c:\temp\courses\fall2003\610\hmwrk5.doc RWN 10/08 - 10correction/03

ENEE 610

Problems for grading, Set 5

Due at class M 10/20/03

Sensitivity and Semistate

[correction - previously written R8 should have been R6]

1. (40 points)

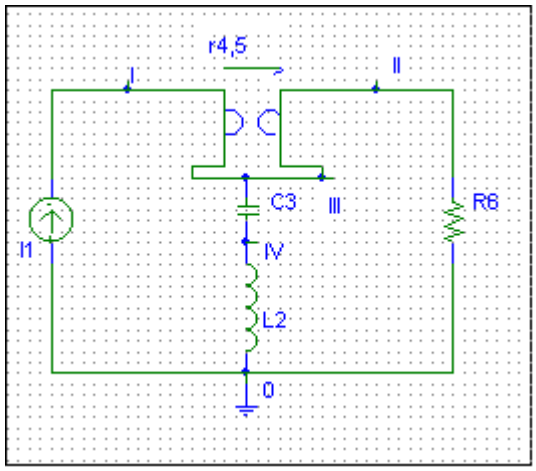
For the following circuit the current I1 is the input and the voltage on R86(positive at node II) is the output.

a) Draw the adjoint circuit for the unfed (i.e. without I1) 2-port circuit and an open circuit load (across R6 with R6 kept inside the 2-port circuit).

b) Terminate the adjoint circuit 2-port of a) so that it may be used to calculate the sensitivity to r=r4,5 of the transfer function T(s) which is the voltage across R6 (positive at the top) divided by the input current, T(s) = vII/I1.

c) Find the sensitivity of vII/I1 to r=r4,5 using the adjoint circuit $S_r^{T(s)}$.

d) Repeat c) for the sensitivity of vII/I1 to C3, $S_{C3}^{T(s)}$.



2. (40 points)

For the circuit and transfer function of problem 1. above

a) Set up the semistate equations using the voltage on the capacitor (positive at the top) and the current (down) through the inductor and the voltage across R6 (positive at the top) as the semistate vector, $x=[vC3, iL2, vII]^T$.

b) Change the output from vII to vI and use the equations of part a) to eliminate vII to get a set of state variable equations and from those find the input impedance as the transfer function.

c) Set up a PSpice schematic for these last equations using only (two) C and (as many as needed) G elements along with the driving current source. Submit a printout of your schematic.

d) Run Spice for 2secs with C3=L2=R6=r4,5=2 and I1=3sin(5πt). Plot vII(t).