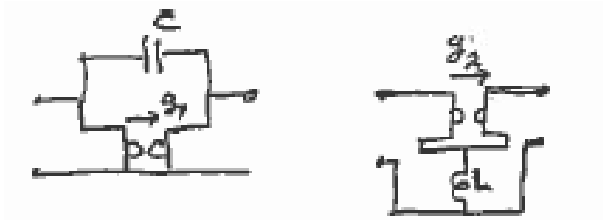


610 Fall 2015 – Homework 2 Due Th 09/17/15

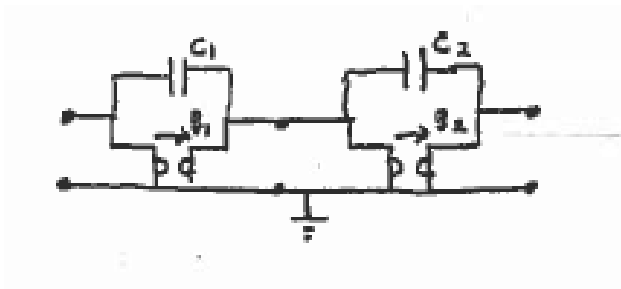
1. (20 points; Equivalent 2-ports)



- For the above two 2-ports shown that they have the same  $2 \times 2$  admittance matrix  $Y$  and thus are externally equivalent. Give the relationships of the parameters,  $g_1$ ,  $g_2$ ,  $L$ , &  $C$ , to obtain this equivalence.
- Show that these can be constant- $R$  circuits and give the parameter relationships for this to hold.

2. (30 points, Indefinite Y)

For the following circuit



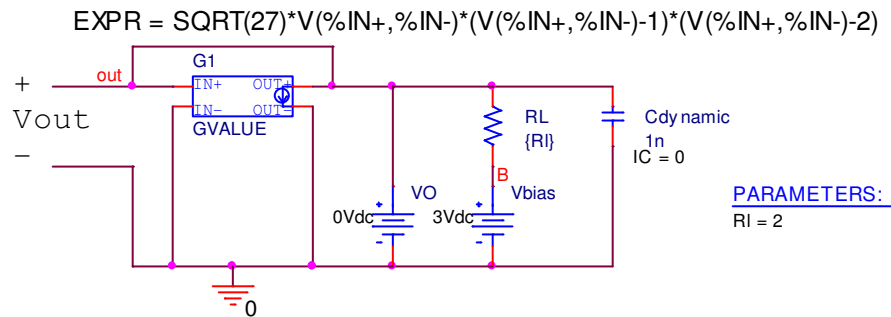
- Obtain the indefinite admittance removing the ground off the circuit and numbering the outside nodes 1 & 2 and the middle node 3.
- Move the ground to where it is giving the definite 3-terminal  $Y_{def}$ .
- Eliminate the internal node (3) to obtain the 2-port  $Y$ .

3. (50 points, Gvalue and load line)

The Gvalue part is in the abm.olb library

The PARAM part is in the SPECIAL library.

- a) 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, VO, of 0 to 7V 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 3 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].



- b) Remove VO and run a transient analysis and plot the current in the capacitor versus the voltage on the capacitor.