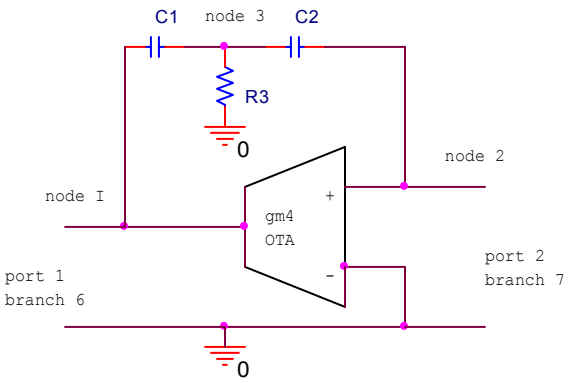
File:G:/coursesF08/610/610F09Hmwk2.doc RWN 09/13_17/09 clarifications 09/18/09b

610 Fall 2009 – Homework 2 Due ~~Tu~~ Th 09/~~22~~ 24/09

1. [50 points] [graphs and admittances]



For the above circuit number the branches by the numbers of the components with the OTA having two branches, number 5 on the left. Choose a tree as branches 1,2, & 3.

a). Insert current sources as the port branches and draw the circuit graph, pointing branches down or to the left. From this obtain the cut set, tie set matrices, the source matrices and the branch by branch admittance matrix.

b). Calculate the Norton's equivalent sources and set up the resulting tree branch, 3x3, matrix equations and solve them.

c) Eliminate the internal node and from the result give the 2-port admittance matrix.

2. [50 points] [2-ports & their loads]

In the circuit of problem 1 above replace C2 by a resistor R2. To simplify notation change the name of C1 to C and gm4 to g.

a). By adding 2-port admittances, one for the top RC circuit, of C, R2, R3, and one for the OTA, give the new 2-port admittance.

b). Give necessary and sufficient conditions that a 2x2 Y(s) be realizable by this new 2-port.

c). Load ~~on~~ port 2 in a generic 1-port load of admittance yL(s) and find the input admittance seen looking into port 1, yin(s), in terms of yL(s), C, g, R2 & R3.

d). Solve the result of b) to give yL(s) in terms of yin(s), C, g, R2 & R3.