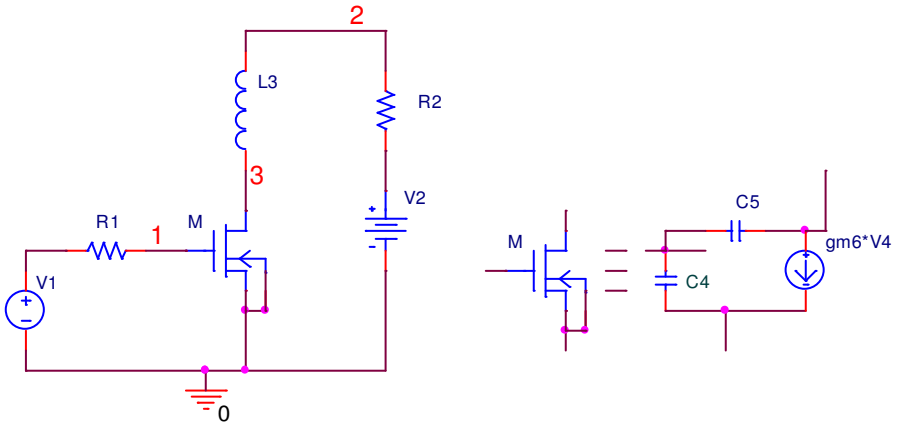
File: G:/coursesF12/610/610F12Hmwk1.doc RWN 09/02/12

610 Fall 2012 – Homework 1

1. For the circuit on the left replace the transistor by the equivalent on the right.
   a) Draw an oriented graph, combining R's with V sources, numbering branches according to the component numbers and orienting from left to right or top to bottom.
   b) Choose branches 1, 2, 3 for the tree and give the cut-set and tie-set matrices. Use the node numbers given on the circuit.
   c) Write the branch-branch admittance matrix, the source vector, and the circuit equations from which all the currents and voltages in the circuit can be found.



For the following two problems set up the augmented incidence matrix, A_a. Delete the last row to get A and calculate $\det(AA^T)$ to determine how many trees are possible (you may wish to locate a proof of this fact especially since the result stated in the book [using A_a instead of A] is in error).

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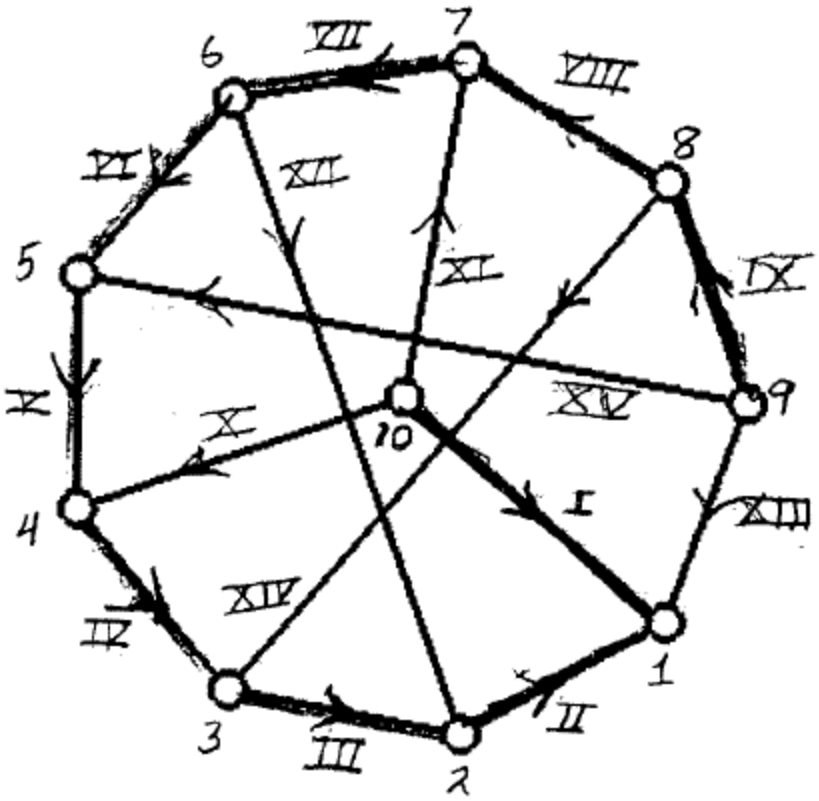
2. Show that the graph obtained in problem 1 has 13 trees and draw each of them. Discuss if any are advantageous to use in circuit anslysis.

3. The following 10 node 15 edge graph, when undirected, is known as the Petersen Graph and, due to each node having three branches, is of interest in the four color problem. Choose the numbering given (1 through 10 for nodes and I through XV for edges)

a. Choose the tree formed by the thicker edges (I through IX) and give the cut-set and tie-set matrices using the orientations given. Discuss the possibility of determining a means to obtain these from A_a.

b. Determine the number of trees (quite a large number).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VIII
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XIII
XIV
XV