EE40
Lecture 7
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2/6/08

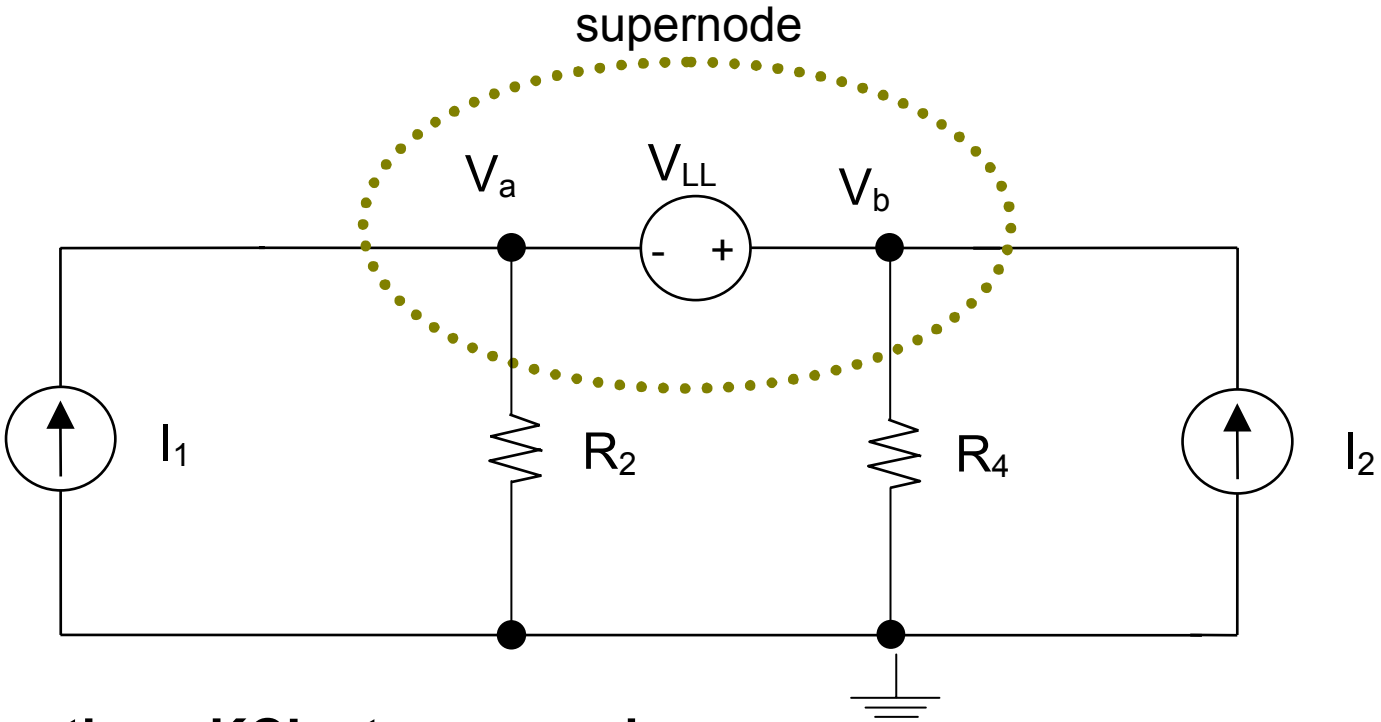
Reading: Chap. 2

Mesh Analysis

Nodal Analysis: general method

1. **Choose a reference node** (“ground”)
2. **Group the nodes that are connected by voltage sources into supernodes** (*the reference may also become a supernode*)
3. **Define unknown node/supernode voltages (***those at the nodes/supernodes that are not the reference. Relative voltages at the nodes within a supernode are determined by the voltage sources.)*
4. **Write KCL at each unknown node/supernode**, (*expressing current in terms of the node voltages using the I-V relationships of the circuit elements*)
5. **Solve the set of independent equations (***n-1-(#voltage sources) equations for n-1-(#voltage sources) unknown node/supernode voltages*
6. **Use the remaining KCL equations to find the currents through the voltage sources.** *(there will be (#voltage sources) such equations)*

Nodal Analysis: Example #3

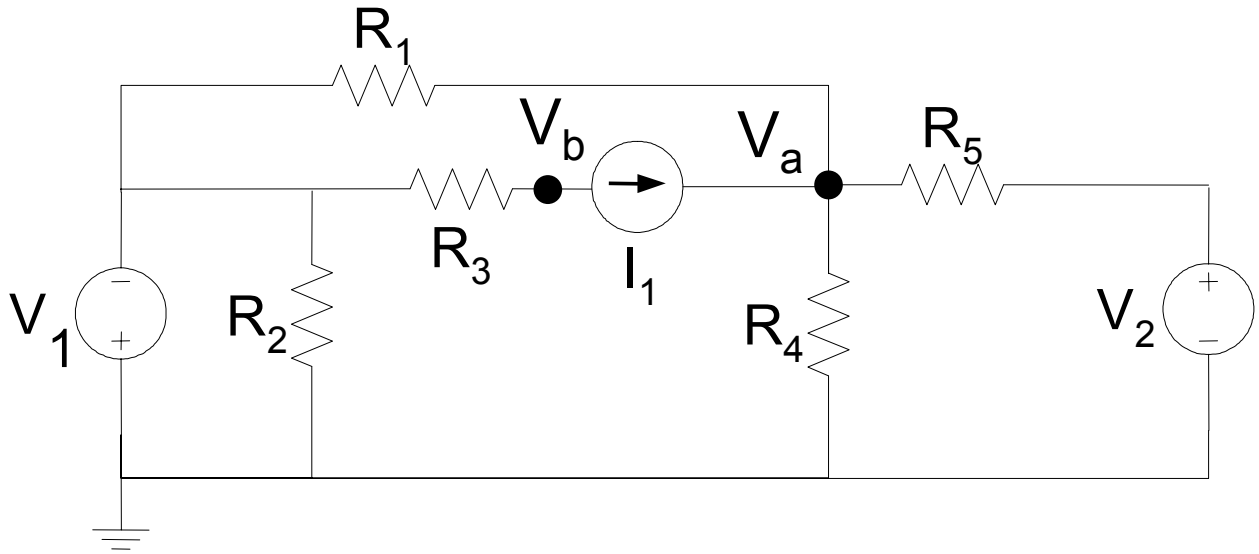


<u>One equation</u> : KCL at supernode

There is one equation in one unknown

The relative voltages of the node within the supernode are determined by the voltage source.

Nodal Analysis: Example #4



There are two unknowns.
There are two equations in these unknowns
Here there is no floating voltage source.

If you had instead chosen the reference at one of the current source terminals you would have a supernode of three nodes and another node, for again two equations in two unknowns.

Dependent Sources

Treat each dependent source (of any of the four kinds) as a new variable, associated to a ``known'' source and proceed as before. At the end, you get an extra equation from the dependency that defines the source, for each dependent source.

These extra equations will allow you to complete the solution.

Planar Graph

- The graph of a circuit is called planar if it can be drawn on a page without being forced to have any branch cross over another branch.
- An example of a graph that is not planar is the complete bipartite graph with 3 left nodes and three right nodes (6 nodes and 9 edges in total). Try drawing this on a page without branch crossings!