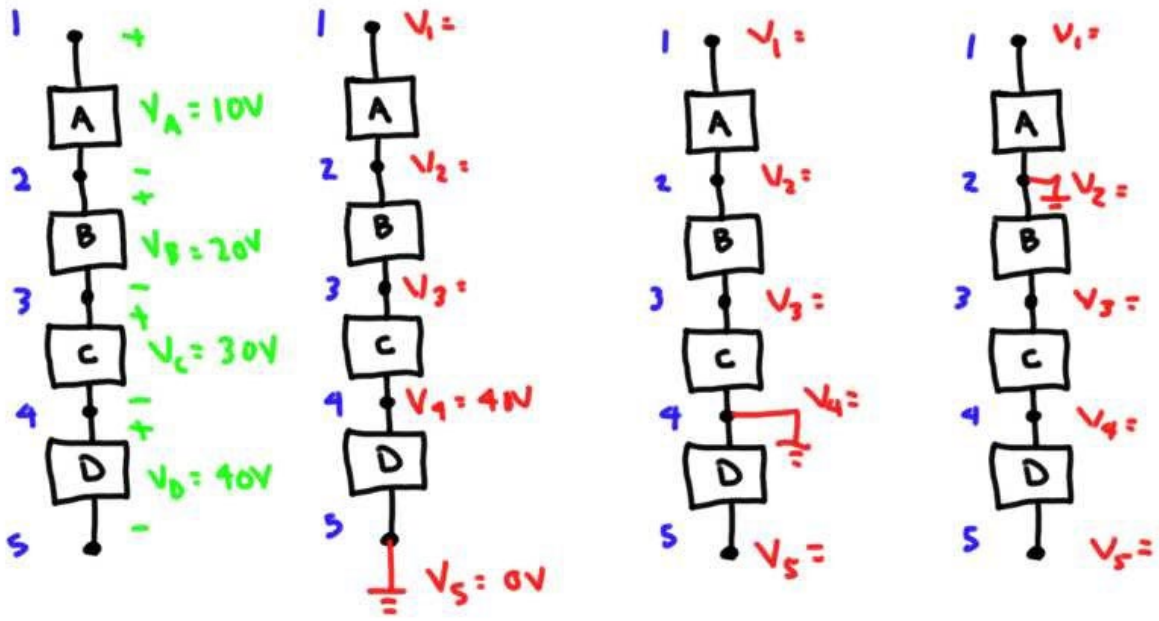
The Node-Voltage Method: This is the first of two generalized circuit analysis methods that are useful at this level. In order to use this method, there are a few new definitions that must be introduced.

Definitions:

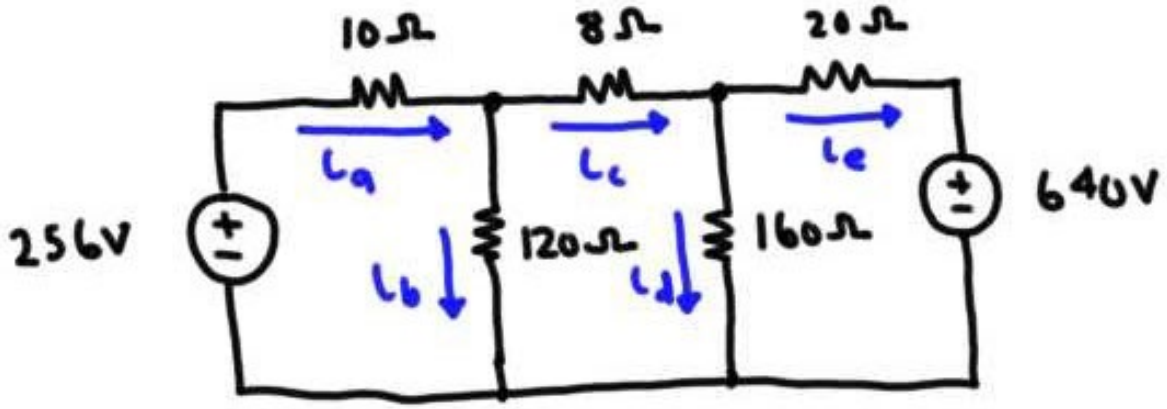
1) How is a node defined?
2) What is the difference between a node and an essential node? (This is a simple difference).
3) When using the node-voltage method, how is the ground node (or reference node) defined? What is the voltage value at this node? Can any node be chosen as the ground node or must the ground node have special properties? What happens to the node voltages if the ground node is changed?

Node-Voltages versus Terminal Voltages: In the figure below, all the terminal voltages across the circuit elements have been given. Determine the node-voltages based on the choice of the ground node.



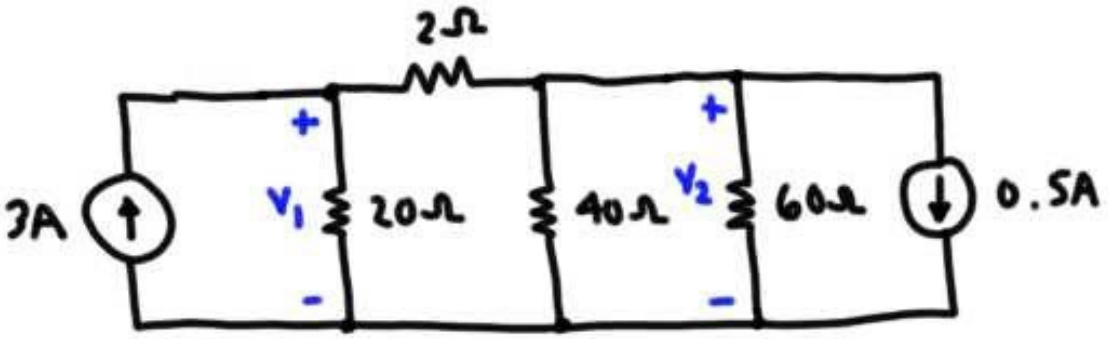
Voltage Sources and the Node-Voltage Method: Using the node-voltage method answer the following questions.

a) For the circuit below determine the branch currents $i_a - i_e$ shown.
b) Determine the total power developed by the circuit.



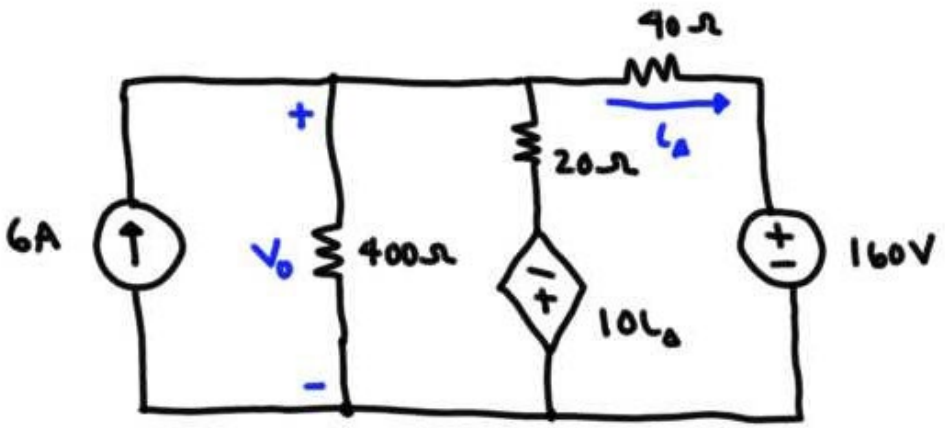
Current Sources and the Node-Voltage Method: Using the node-voltage method answer the following questions.

a) Find the voltages v_1 and v_2 shown in the figure below.
b) Find the power associated with the 6A source.
c) Find the power associated with the 0.5A source.



Dependent Sources and the Node-Voltage Method: Using the node-voltage method answer the following questions.

a) Find the voltage v_0 shown
b) Find the power associated with the dependent source. Is the source providing or absorbing power?
c) Find the total power developed by the independent sources.



Changing the Ground Node: Using the node-voltage method answer the following.

a) Find the power associated with the 2 A source when node A is chosen as the ground node.
b) Find the power associated with the 2 A source when node B is chosen as the ground node. (The answers should be the same)