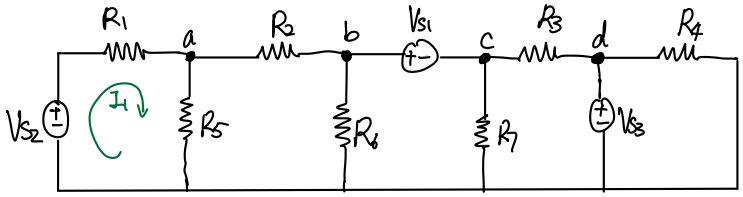
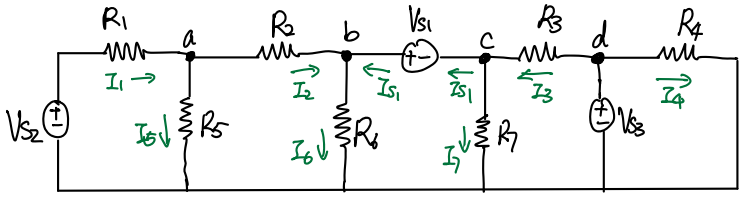
ELEN 50L Lab 5 Hints. 22OCT2022. Fred Chen. zchen7@scu.edu

Mesh Method: set up arbitrary currents and strictly follow the defined current directions in each loop.

- when seeing a voltage source, if the defined current enters the voltage source from the negative terminal. the voltage will be deemed to be "negative". For example, in Loop 1. I_1 enters the voltage source from its negative terminal. Therefore, we should write $-V_{S_1} + I_1R_1 + (I_1 - I_2)R_5 = 0$



Nodal Analysis Method: set up KCL / KVL equations at each node.



- When it gets to the voltage sources V_{S_1} and V_{S_3}, it's impossible to apply Ohm's law to find their currents.
- Assume V_{S_1} current as I_{S_1}, V_{S_3} current as I_{S_3} as placeholders to solve for current.
- It would be safe to assume the placeholding currents are coming out from the voltage sources.
- If still confused, go read the definitions of KCL and KVL. I believe the canonical definition of KCL is only an one-line statement.

Superposition: assume all sources were turned off and then turn one source at a time to solve for currents and voltages due to that source. Circuit simplification can most likely be performed.

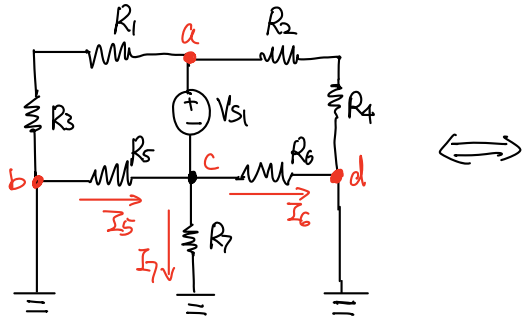
Consider 2 basic questions:

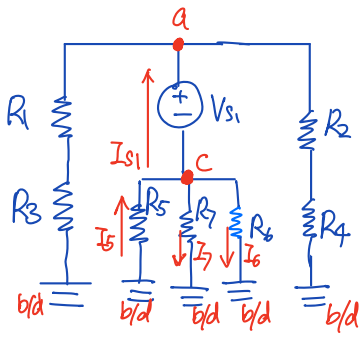
a) if I turn off a voltage source (V_s = something → $V_s = 0$), what does the circuit look like?

b) if I turn off a current source (I_s = something → $I_s = 0$), what does the circuit look like?

As an example, I just feel like turning off V_{s2} and V_{s3} for the reason of ... because I can.

Here is what it leads to:





(isn't this a much simpler circuit to solve?)

(I've answered question (A) implicitly for you and you are welcome)

Note the directions of currents! You have to stick with the same set of directions to make the superposition work across each activated source. Otherwise, when you add up the results, it'd be garbage.