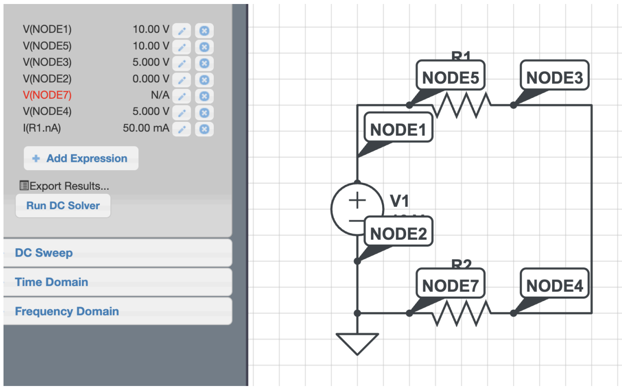
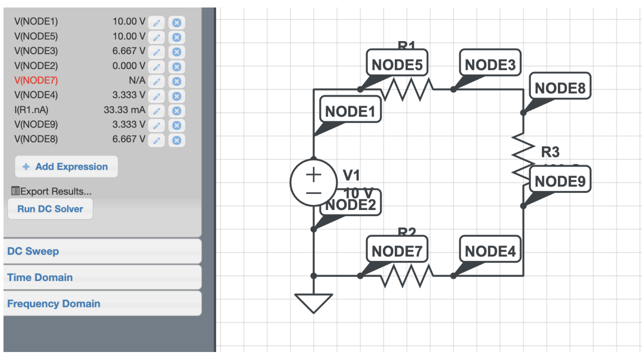
1. Resistors in series
    a. ~~Build a circuit with a 10V voltage source and two resistors in series~~
    b. ~~Define nodes on either side of the voltage source and in between the resistors~~
    c. ~~Examine the voltage values at each node and the current for the system~~

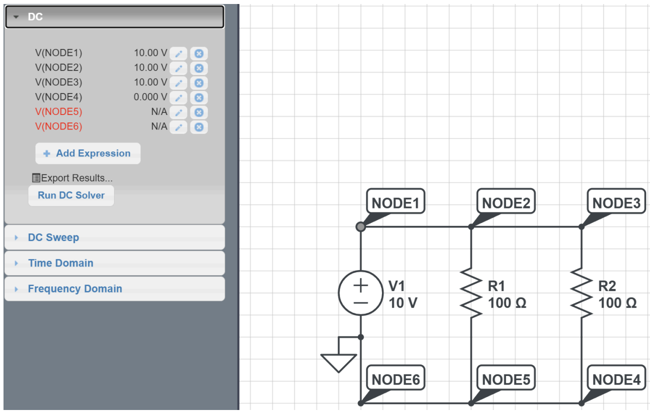


    d. ~~Add a third resistor and an additional node and make note of how this changes the voltage at each node and the current in the system.~~



The current decreased in the system and the voltage for node 3 increased while the voltage of node 4 decreased. The rest of the nodes remained the same.

2. Resistors in parallel
    a. Build a circuit with a 10V voltage source and two resistors in parallel.
    b. Define nodes on either side of the voltage source and each resistor.
    c. Examine the voltage values at each node and the current across the voltage source and each resistor.



Currents)

Node 1: -200mA

Node 2: 100mA

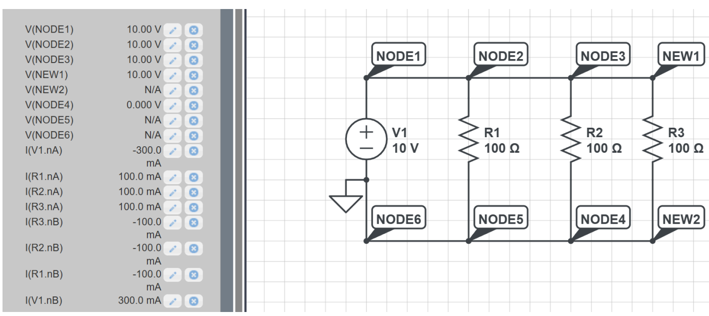
Node 3: 100mA

Node 4: -100mA

Node 5: -100mA

Node 6: 200mA

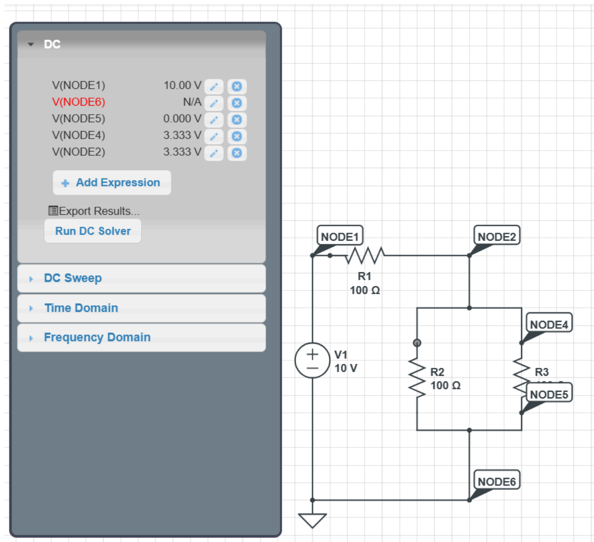
d. Add a third resistor in parallel and additional nodes. Make note of how this changes the voltage at each node and the current across each resistor.



The voltages' stay the same at their positions being 10V before the resistor and 0V after. However, the currents change, they still sum to 0 but now it is -300mA in the beginning and 300mA at the end.

3. Resistors in series and parallel

a. Build a circuit with a 10V voltage source with two resistors in parallel and a third resistor in series — the third resistor is in in series with each parallel resistor in a single loop.
b. Define nodes on either side of the voltage source and across each of the resistors



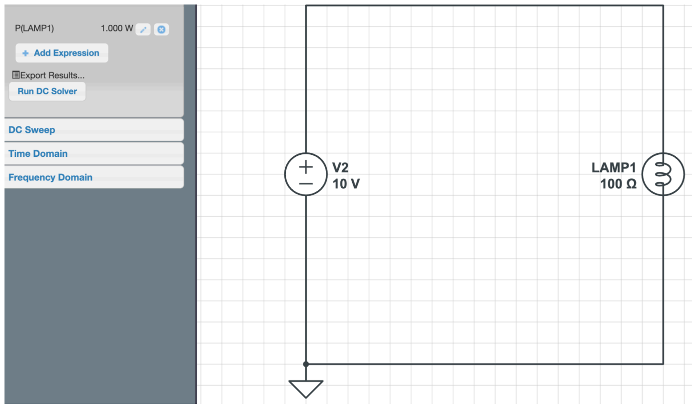
c. Examine the voltage value at each node and the current across the voltage source and each resistor. Make note of how this compares to either the case of resistors only in parallel or only in series.

d. Node 1= 10V considering it doesn't go through any resistor
Node 2 =3.33V as it goes through a resistor and reduces as much by 5V
Node 4= 3.33V as the wires splits into, it doesnt change the amount
Node 5 = 0 as the volts are redundant considering it does amount to any volts and is connected to ground
In

4. Powering light bulbs

a. ~~Build a circuit with a 10V voltage source with a single 100Ohm lightbulb connected. What will the power output be for this lightbulb?~~
P = V^2/R
P = 100V^2/100Ω
P = 1W
The power will be 1W.

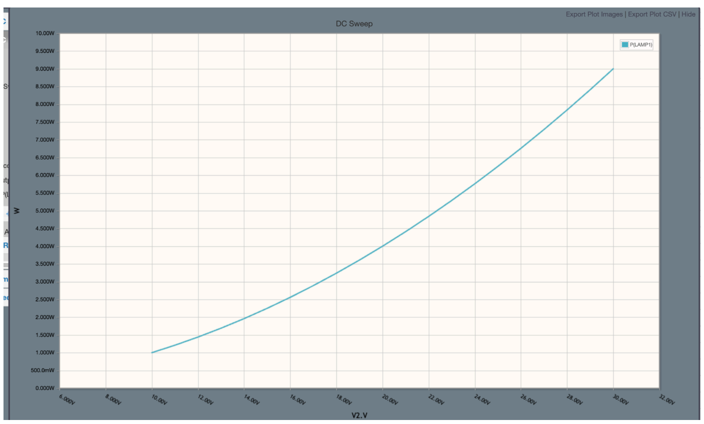
b. ~~Use the simulation DC solver to evaluate the lightbulb power and check your answer.~~



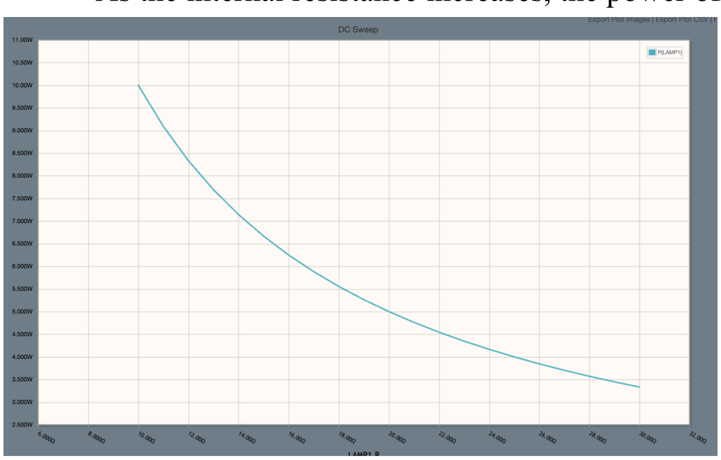
The power will be 1W.

c. ~~Use the DC sweep simulation tool to examine how the lightbulb power varies with the voltage of the batter (voltage source) and how it varies with the internal resistance of the lightbulb.~~

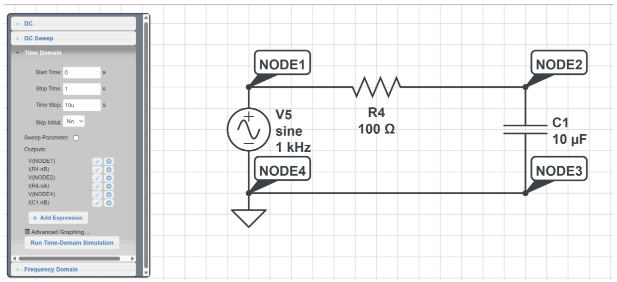
As the voltage of the battery increases, the power of the lightbulb increases significantly.

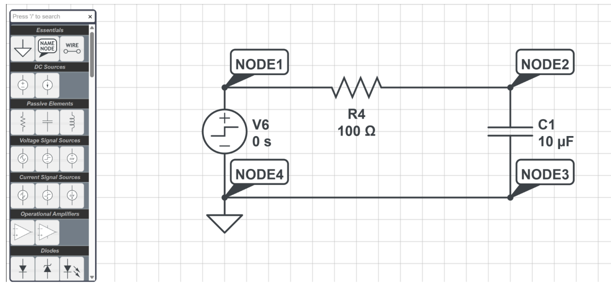


As the internal resistance increases, the power of the lightbulb decreases.



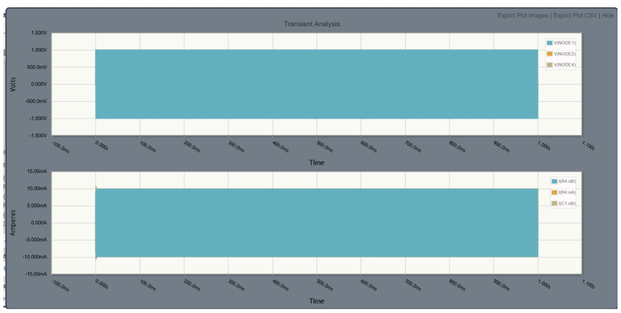
5. Capacitor circuit
   a. Build a circuit with a 10uF capacitor connected to a varying 1kHz current source (try both sine and step sources).

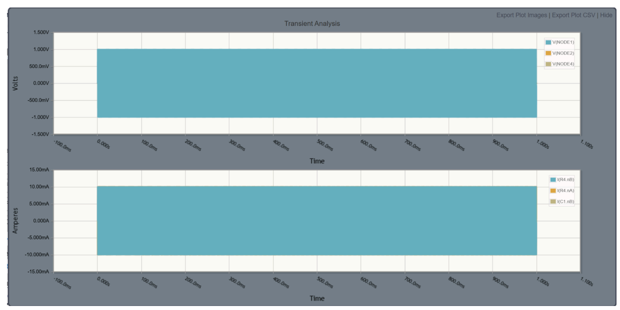


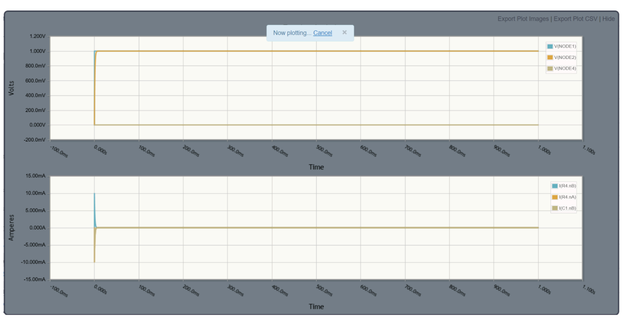


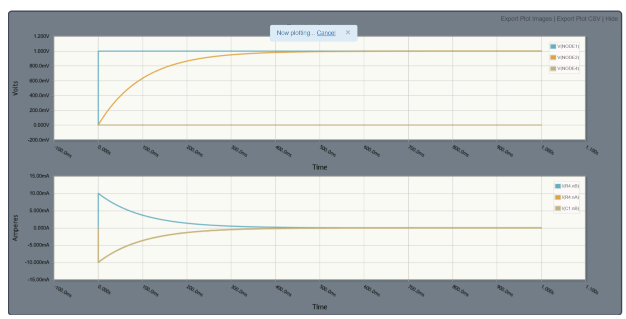
b. Use the time sweep simulation tool to examine how the voltage and current in the system varies overtime. Try a few values for the capacitor.

First 2 are from the voltage sine function generator and the last 2 are from the voltage step. As you can see the 2 different graphs of current and voltage vs time for each of the voltage signal sources used the value of the capacitor has very little difference as graphs 1 and 3 were with respect to a 10uF capacitor and graphs 2 and 4 were with respect to a 1000uF capacitor. Most of the difference was seen in the voltage step as it resulted in there being current and voltage for a little longer before going to 0. My graphs from pictures 1 and 2 look like solid squares because of how frequent the oscillations are happening in comparison to the time scale I am looking at.



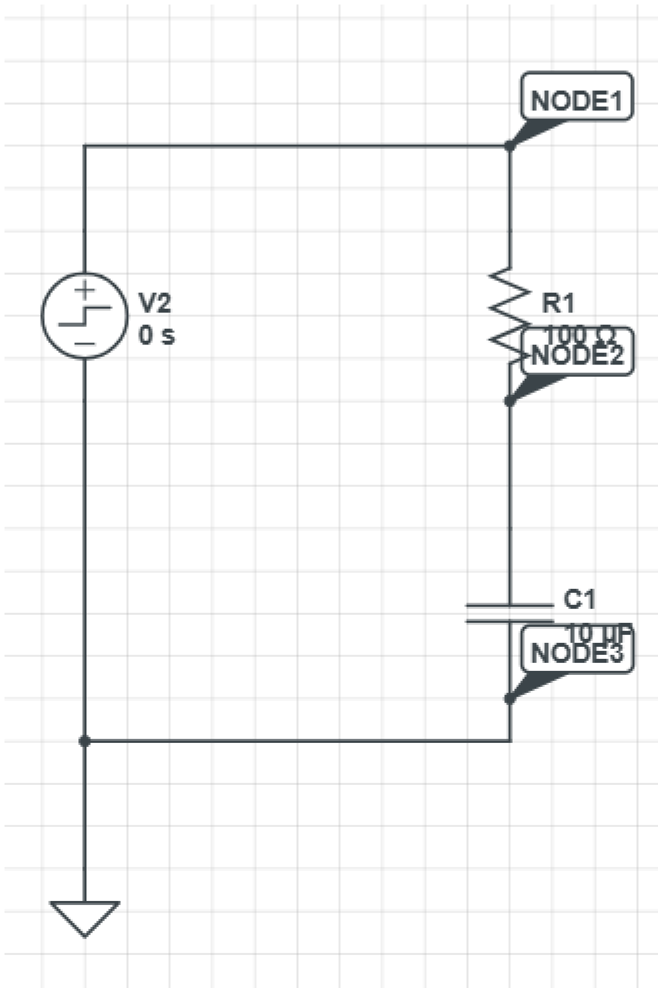




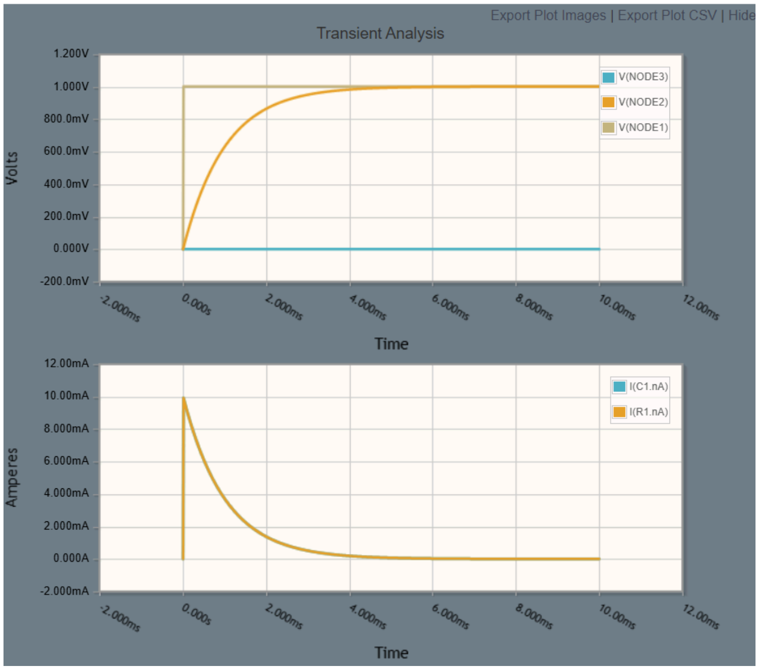


6. RC circuit

a. Build a simple RC circuit with a step function voltage supply, a 100 Ohm resistor and 10uF capacitor. Add voltage in and out nodes on either side of the resistor.



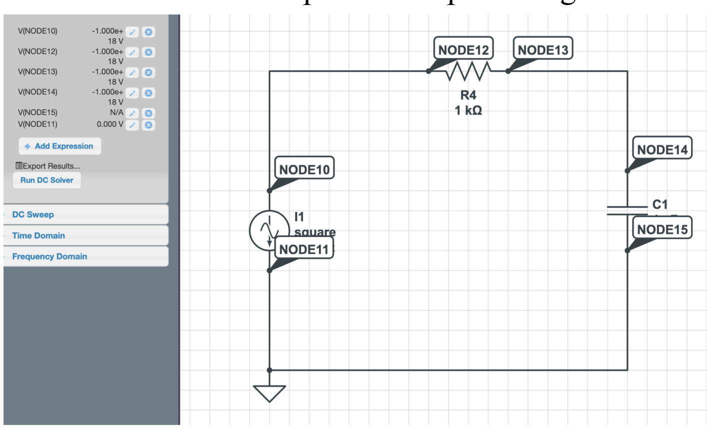
b. Us the time domain simulator to examine how the voltage and current change over time.



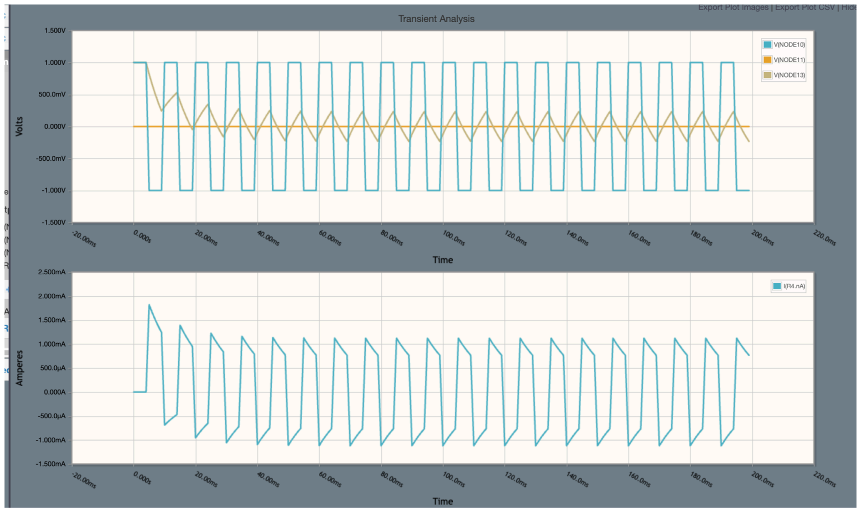
c. Explore how the time dependence of the system changes as you vary the resistance and capacitance in the system.
Increasing Resistance or Capacitance means slower charging/ discharging. While a Decreasing Resistance or Capacitance means faster charging/ discharging.

7. RC filter

~~a. Build a circuit with an oscillating square wave (this is a parameter you can set) voltage supply, initially with a 100 Hz frequency. Include a 1kΩ resistor and a 1uF capacitor. Add nodes to examine the input and output voltage.~~



b. Use the time domain simulator to examine how changes to the resistance (and/or capacitance) effects the output voltage. Try out difference input voltage frequencies.



Export Plot Images | Export Plot CSV | Hide
Transient Analysis
V(NODE10)
V(NODE11)
V(NODE13)
Volts
1.500V
1.000V
500.0mV
0.000V
-500.0mV
-1.000V
-1.500V
-20.00ms
0.000s
20.00ms
40.00ms
60.00ms
80.00ms
100.0ms
120.0ms
140.0ms
160.0ms
180.0ms
200.0ms
220.0ms
Time
I(R4.nA)
Amperes
2.500mA
2.000mA
1.500mA
1.000mA
500.0µA
0.000A
-500.0µA
-1.000mA
-1.500mA
-20.00ms
0.000s
20.00ms
40.00ms
60.00ms
80.00ms
100.0ms
120.0ms
140.0ms
160.0ms
180.0ms
200.0ms
220.0ms
Time