Spice Homework #2

ELE504E, Spring 2025

1 DC Sweep

Figure 1.1 contains twelve resistors each having a value of "*R*" formed in a cube shape. Find the equivalent resistance:

- Between the points a-d.
- Between the points a-c.
- Between the points a-f.

in terms of "*R*". For simulation, please follow the steps below:

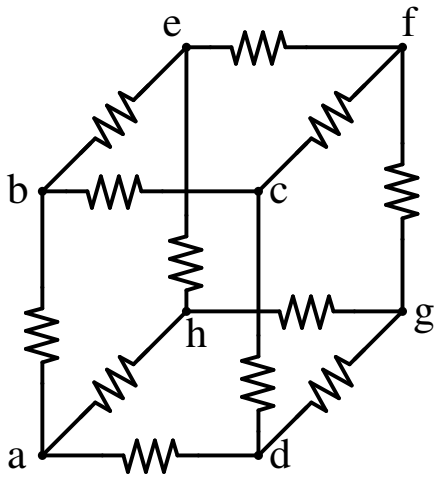

Figure 1.1. Resistor Cube.

- Select an appropriate resistor value (i.e. $R = 1k\Omega$).
- Write the netlist of the circuit in Figure 1.1.
- Define a DC voltage source between the points where the resistance is to be calculated.
- Place a wire (a zero-ohm resistor) from the minus terminal of the voltage source to the ground (node-0)
- Perform a DC-Sweep from 0.1V to 1V with 10mV steps.
- Plot the equivalent resitance by dividing the voltage between the terminals of the voltage source and the current drawn from the voltage source.
- Find the equivalent resistance in terms of "*R*".

2 Transient Analysis

Find the time-constant of the RC circuit in Figure 2.1 in terms of parameters "*R*" & "*C*". For simulation, please follow the steps below:

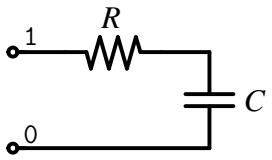

Figure 2.1. Simple RC Circuit.

- Select $R = 1k\Omega$ and $C = 1n$F.
- Write the netlist of the circuit in Figure 2.1.
- Define a pulse voltage source between the nodes 1 and 0 with the following parameters:

  $V_1 = 0$V.

  $V_2 = 1$V.

  $T_D = 1\mu$s.

  $T_R = 10$n.

  $T_F = 10$n.

  PW$= 5\mu$s.

  PER$= 10\mu$s.
- Perform a transient Analysis with 10ns timesteps up to 20μs.
- Plot the voltage across the capacitor and measure the time constant τ using Figure 2.2.
- Express τ in terms of parameters "*R*" & "*C*"

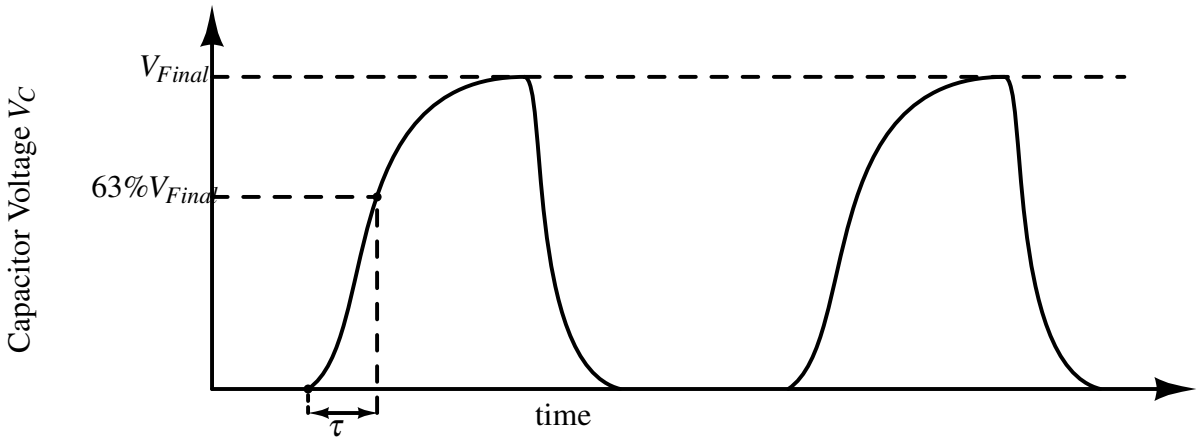

Figure 2.2. Measuring Time Constant "τ".

Take 2 screenshots (one for DC Sweep and the other for Transient Analysis) showing the netlist and the graph clearly. Combine your images in a single folder and upload the folder as a zipped-file format to ninova.