**Experiment 11**: Nodal Analysis Part II (Superposition)

(Edit this document as needed)

Partner 1: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Partner 2: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Part A*

Label the nodes in the four node circuit



Place a ground on the above circuit.

Which node has voltage, V1? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which node has voltage, V2? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Provide a KCL expression for the remaining node.

Rearrange the expression to get the voltage at the node as a linear function of V1 and V2.

Which is the ‘slope’ of V1? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which is the ‘slope’ of V2? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

*Part B*

LTspice plot of the nodal voltage vs. source voltage V1 (with V2 = 0)

What is the slope of the line? \_\_\_\_\_\_\_\_\_\_\_\_\_

Is the slope consistent with the part A answer?

LTspice plot of the nodal voltage vs. source voltage V2 (with V1 = 0)

What is the slope of the line? \_\_\_\_\_\_\_\_\_\_\_\_\_

Is the slope consistent with the part A answer?

*Part C*

Measured nodal voltage for stepped V1 voltages (with V2 = 0). (3 significant digits)

|  |  |
| --- | --- |
| V1 | Vnode |
| 0V | [V] |
| 0.5V | [V] |
| 1V | [V] |
| 1.5V | [V] |
| 2V | [V] |
| 2.5V | [V] |
| 3V | [V] |
| 3.5V | [V] |
| 4V | [V] |
| 4.5V | [V] |
| 5V | [V] |

Plot of the nodal voltage vs. source voltage V1 (with V2 = 0)

What is the slope of the line? \_\_\_\_\_\_\_\_\_\_\_\_\_

Is the slope consistent with the part A answer?

Measured nodal voltage for stepped V2 voltages (with V1 = 0). (3 significant digits)

|  |  |
| --- | --- |
| V1 | Vnode |
| 0V | [V] |
| 0.5V | [V] |
| 1V | [V] |
| 1.5V | [V] |
| 2V | [V] |
| 2.5V | [V] |
| 3V | [V] |
| 3.5V | [V] |
| 4V | [V] |
| 4.5V | [V] |
| 5V | [V] |

Plot of the nodal voltage vs. source voltage V2 (with V1 = 0)

What is the slope of the line? \_\_\_\_\_\_\_\_\_\_\_\_\_

Is the slope consistent with the part A answer?

Nodal voltages with various voltage source values.

|  |  |  |
| --- | --- | --- |
| V1, V2 | Part A Equation | Measured Voltage |
| 2V, 2V | [V] | [V] |
| 1V, 3V | [V] | [V] |
| 1.5V, 2.5V | [V] | [V] |

Due: February 24th, 2022 at 11:59 pm eastern on Gradescope

One student submits on Gradescope and adds their partner using “add group members” option on Gradescope.