**Experiment 10**: Nodal analysis and matrix solutions

(Edit this document as needed)

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

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

*Part B*

Label the nodes in the four node circuit



Which node did you assign as ground (0V)?

Applying voltage difference concepts to the source, which node has a known voltage and what is that voltage?

What are the remaining unknown nodes?

Determine the linearly independent equations associated with each of the unknown nodes.

Determine the matrix expression associated with the above equations.



Using the techniques developed in the laboratory, use matrix manipulation to find the unknown nodal voltages. Show your work.

Use Matlab to verify your above answer. Include a screenshot from your Matlab work.

Use LTspice to verify your answers with simulation results. Include a screenshot of your circuit and your DC operating point values.

Label the nodes in the five node circuit



Which node did you assign as ground (0V)?

Applying voltage difference concepts to the source, which node has a known voltage and what is that voltage?

What are the remaining unknown nodes?

Determine the linearly independent equations associated with each of the unknown nodes.

Determine the matrix expression associated with the above equations.



Using the techniques developed in the laboratory, use matrix manipulation to find the unknown nodal voltages. Show your work.

Use Matlab to verify your above answer. Include a screenshot from your Matlab work.

Use LTspice to verify your answers with simulation results. Include a screenshot of your circuit and your DC operating point values.

Label the nodes in the six node circuit



Which node did you assign as ground (0V)?

Applying voltage difference concepts to the source, which node has a known voltage and what is that voltage?

What are the remaining unknown nodes?

Determine the linearly independent equations associated with each of the unknown nodes.

Determine the matrix expression associated with the above equations.



Use Matlab to determine the ucknown nodal voltages. Include a screenshot from your Matlab work.

Use LTspice to verify your answers with simulation results. Include a screenshot of your circuit and your DC operating point values.

For the ladder networks (with the given resistor ‘pattern’), what trend do you notice as we add successive ladder ‘rungs’?

*Part C*

For the resistors values,

R1 = 470Ω

R2 = 1kΩ

R3 = 1kΩ

R4 = 470Ω

RM = 100Ω

Determine the calculated nodal voltages for each ‘side’ of RM and determine the voltage across RM. Show your work.

What is the measured voltage across RM (100Ω)?

Do the measured results and the calculated results agree?

What is the measured voltage across RM (100kΩ)?

For the resistors values,

R1 = 470Ω

R2 = 1kΩ

R3 = 4.7kΩ

R4 = 10kΩ

RM = 100Ω

Determine the calculated nodal voltages for each ‘side’ of RM and determine the voltage across RM. Show your work.

What is the measured voltage across RM (100Ω)?

Do the measured results and the calculated results agree?

What is the measured voltage across RM (100kΩ)?

Due: February 22nd, 2022 at 11:59 pm eastern on Gradescope

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