

**CPE 1140**

**Circuits / DC Circuit Fundamentals Lab**

**Fall 2021**

Laboratory Report

Lab# 7

Lab Mesh (loop) Circuit Analysis

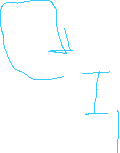
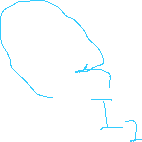
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Laboratory Date: 10/29/2021

Date of Submission: 11/2/2021

# Prelab:

# A picture containing scatter chart Description automatically generated



Loop 1 equation:

-5 + 470 i1 + 2000 (i1 – i2) + 510 i1 = 0

2980 i1 -2000 i­2­ = 5

Loop 2 equation:

15 + 1000 i2 + 2000 (i2 - i1) +620 i2 = 0

-2000 i1 + 3620 i­2­ = -15

Matrix:

(2980\*3620) – (-2000)­­2 = 6.787 \*106 = ∆

(5\*3620) – (-15\*-2000) = -11.9 \*10­­3 =

(15\*2980) – (5\*-2000) = -34.7 \*10­­3 =

∆ values:

6.787 \*106 = ∆

-11.9 \*10­­3 =

-34.7 \*10­­3 =

Looks like I messed up here in my paper calculation the rounding error in is painful.

Currents:

IR2 =-1.753 \*10-3 – 5.112 \* 10-3 = 3.359 mA

IR2 = 3.359 mA

I1 =-1.753 mA

I2 =- 5.112 mA

Voltages:

V=IR

VR1= I1 R1 = -1.753 \*10-3 \*470 = - 0.823 V

VR1= - 0.823 V

VR2 = IR2 R2 =3.359 \*10-3 \*2000 = 6.718 V

VR2 = 6.718 V

VR3= I2 R3 = -5.112 \*10-3 \*620 = -3.169V

VR3= -3.169V

VR4= I2 R4 = -5.112 \*10-3 \*1000 = -5.112V

VR4= -5.112V

VR5= I1 R5 = -1.753 \*10-3 \*510 = - 0.894 V

VR5= - 0.894 V

Simulations:

Current:

Chart, diagram

Description automatically generated with medium confidence

Voltage:Diagram, schematic

Description automatically generated

Results:

|  |  |  |  |
| --- | --- | --- | --- |
| Currents label | Currents calculated (mA) | Currents simulated (mA) | Currents measured (mA) |
| IR1 | -1.753 | -1.753 | -1.656 |
| IR2 | 3.359 | 3.359 | 3.446 |
| IR3 | -5.112 | 5.113 | -5.104 |
| IR4 | -5.112 | 5.112 | -5.105 |
| IR5 | -1.753 | -1.753 | -1.656 |

|  |  |  |  |
| --- | --- | --- | --- |
| Voltage label | Voltage calculated (V) | Voltage simulated (V) | Voltage measured (V) |
| VR1 | 0.823 | 0.824 | 0.773 |
| VR2 | 6.718 | 6.718 | 6.834 |
| VR3 | 3.169 | 3.17 | 3.1369 |
| VR4 | 5.112 | 5.112 | 5.034 |
| VR5 | 0.894 | 0.894 | 0.832 |

Lab voltage inputs:

|  |
| --- |
| E1 = 5.0029V |
| E2 =15.0035V |

Conclusion:

Using loop method was much more straight forward than using the superposition method. I did have some mistakes in my prelab in my paper version submission looks like I rounded . Which yielded a higher current. Unless it is a calculator thing? Since when I do calculations on the computer I use anaconda PowerShell, without code. I was only concerned about magnitude in the voltage measurements and that might have been a mistake. It might be worth stowing the made circuits between the superposition lab and the mesh loop lab for greater accuracy.