Duke University
Edmund T. Pratt, Jr. School of Engineering

**EE 61L Section 2, Fall 2001**

# Test I

Michael R. Gustafson II

Name (please print)______________________________________

In keeping with the Honor Code, I have neither provided nor received any assistance on this test. I understand if it is later determined that I gave or received assistance, I will fail the class and will be brought before the Undergraduate Judicial Board.

Signature:______________________________________

## Problem I: [15 pts] Element Table

Fill in the table below. For the **Equation** column, you can put *any* equation for the given variable in terms of other variables *except* you may only use Ohm's Law **once**.

| Name | Variable | Units | Equation |
|---|---|---|---|
| charge | | | (blank) |
| current | | | |
| work | | | (blank) |
| voltage | | | |
| power | | | |
| resistance | | | |
| conductance | | | (blank) |

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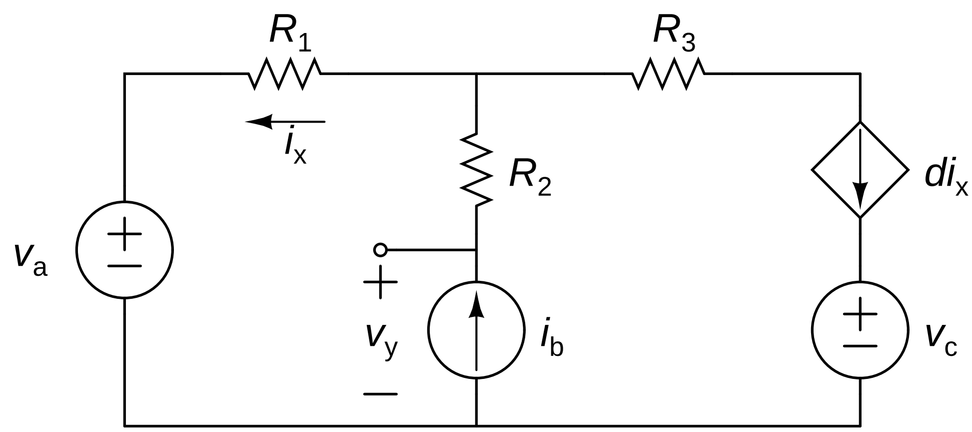
## Problem II: [15 pts] Basic Circuit Relationships

Given the following circuit:




and known values $v_a$, $i_b$, $v_c$, $d$, $R_1$, $R_2$, and $R_3$, find the following quantities in terms of the known values:

**(1)** $i_x$

**(2)** $v_y$

**(3)** $p_{abs,R_2}$

**(4)** $p_{del,i_b}$

**(5)** $p_{abs,CCCS}$

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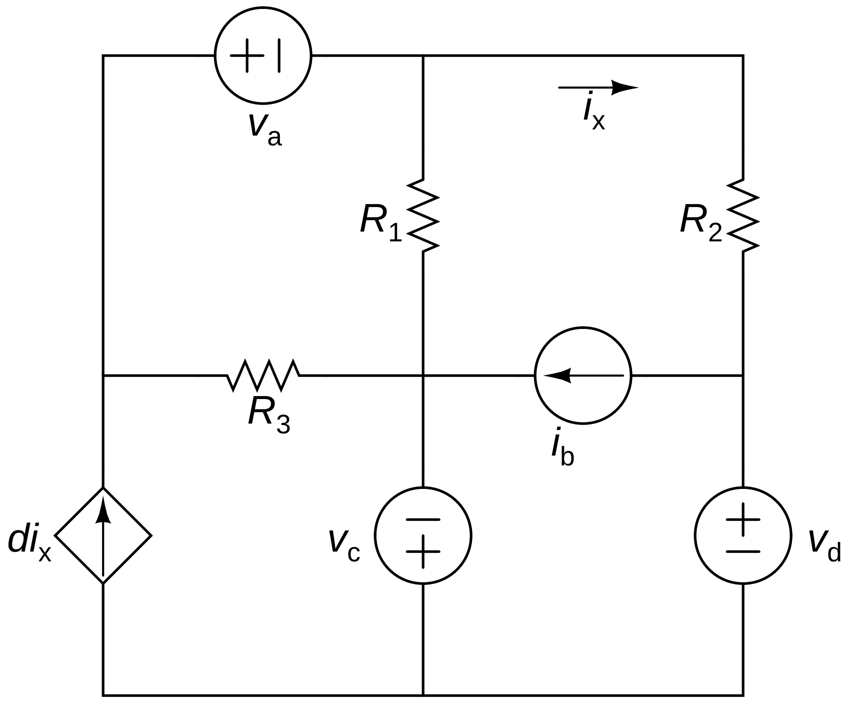
## Problem III: [30 pts] Node Voltage Method

Given the following circuit:




and known values $v_a$, $i_b$, $v_c$, $v_d$, $d$, $R_1$, $R_2$, and $R_3$, find $i_x$ in terms of the known values using the Node Voltage Method.

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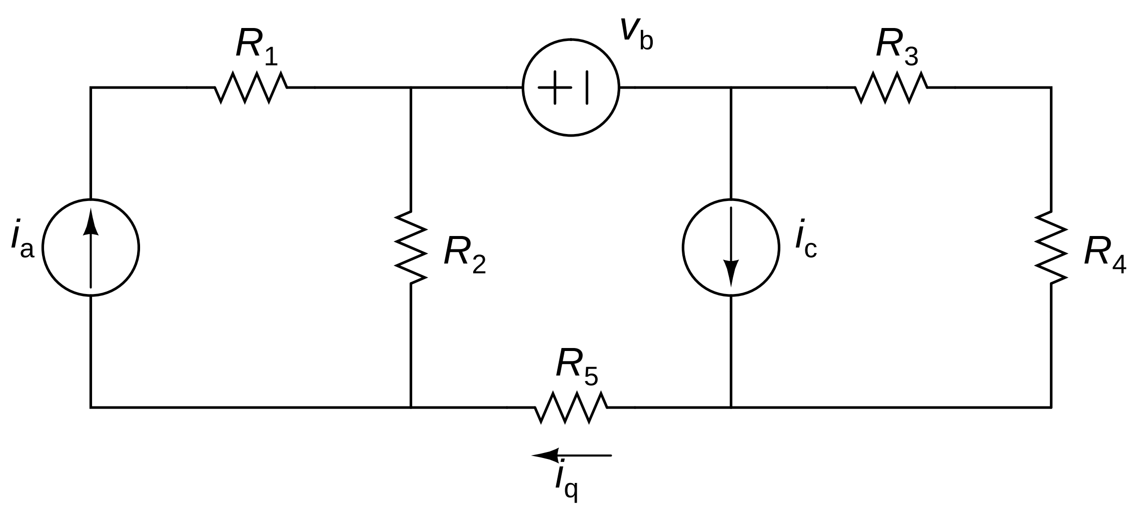
## Problem IV: [30 pts] Current Methods

Given the following circuit:




and known values $i_a$, $v_b$, $i_c$, $R_1$, $R_2$, $R_3$, $R_4$, and $R_5$, find $i_q$ and $p_{\mathrm{del},i_c}$ in terms of the known values using either the Mesh Current Method or the Branch Current Method.

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## Problem V: [10 pts] Cramer's Rule

Given the following set of three linear equations:

$$\begin{aligned} y + 2z &= 2 \\ 2x - y &= 1 \\ 3x - 2y + 3z &= 2 \end{aligned}$$

**(1)** Write the system as a matrix equation.

**(2)** Use Cramer's Rule to solve for $y$. Be sure to show your work.