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

EE 61 Section 2, Spring 2001

Test I

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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:_____

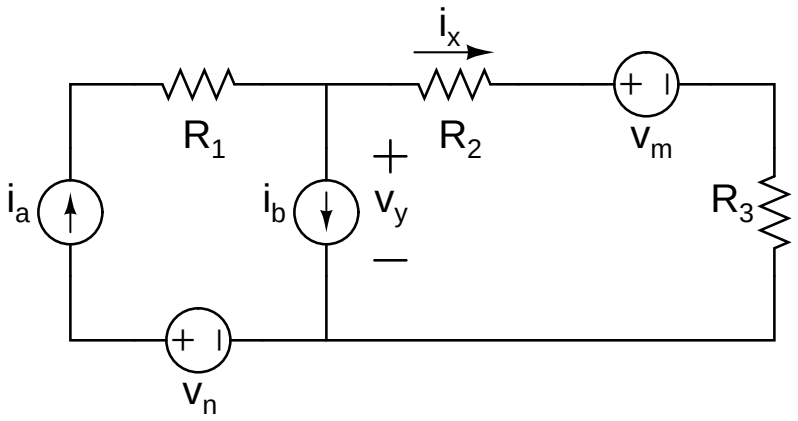
Problem I: [15 pts] Element Table

Fill in the table below. For the **Equation** column, you can put *any* equation for the given variable in terms of other variables.

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

Problem II: [15 pts] Basic Circuit Relationships

Given the following circuit:



and known values i_{a}, i_{b}, v_{m}, v_{n}, R_1, R_2, and R_3, find the following quantities in terms of the known values:

(1) i_{x}

(2) v_{y}

(3) $p_{\mathrm{abs},v_{\mathrm{n}}}$

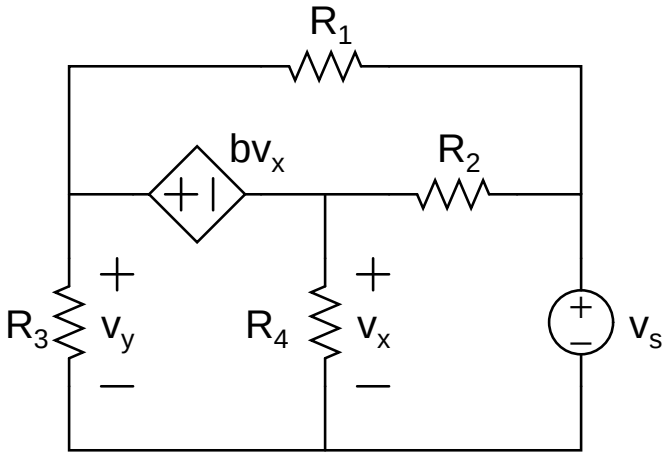
(4) p_{del,R_1}

(5) p_{abs,R_3}

(6) $p_{\mathrm{del},i_{\mathrm{b}}}$

Problem III: [30 pts] Node Voltage Method

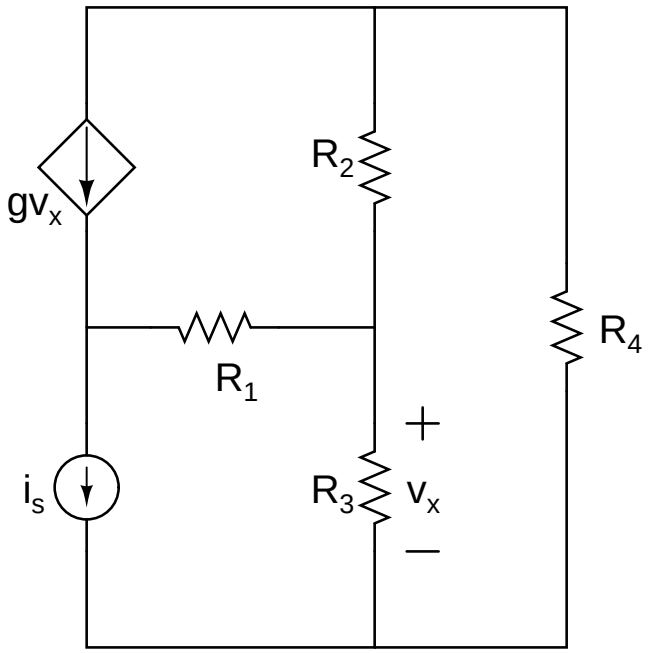
Given the following circuit:



and known values v_s, b, R_1, R_2, R_3, and R_4, find v_y in terms of the known values using the Node Voltage Method.

Problem IV: [30 pts] Mesh Current Method

Given the following circuit:



and known values i_s, g, R_1, R_2, R_3, and R_4, find p_{abs,R_4} in terms of the known values using the Mesh Current Method. *Hint: use the two simple-source equations first to get a single equation for the unknown current in the tallest mesh.*

Problem V: [10 pts] Cramer's Rule

Given the following set of three linear equations:

$$\begin{aligned} x + 5y - 7z &= 10 \\ -8x - 2y + 3z &= 11 \\ 6x + 9y - 4z &= 12 \end{aligned}$$

(1) Write the system as a matrix equation

(2) Set up, but do not solve, what you would need to do to find the value of the variable y