INSTRUCTIONS:

A

Begin the test when you are verbally instructed. You have **40 minutes** to complete the exam.

Write your name on every page. Sign and write your UIN on the cover page.

This is a closed book, closed notes quiz. **An equation sheet is provided at the end of the quiz.** A calculator is allowed.

No credit will be given for each problem if you do not show the complete work, even if the answer is correct. **Numerical answers must be followed by units wherever units exist.**

Re-grading policy: You must request a regrade within 5 days following the day in which the exams are returned to the class. You must clearly state the reason you are requesting a regrade.

By signing below, as the student named above, I agree that I will observe the Student Code of the University of Illinois.

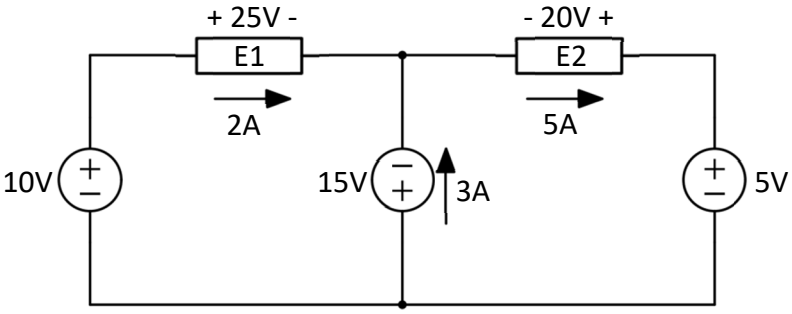
Signature: _____

UIN: _____

Problem 1 (6 points)

A

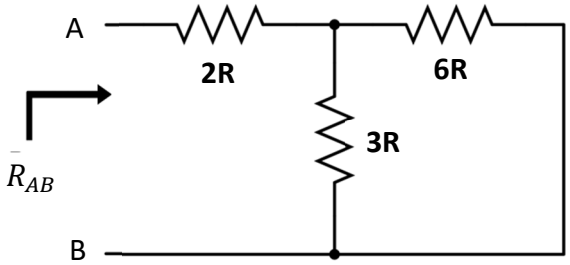
In the cirtcuit shown below, find the power consumed or supplied by each element.



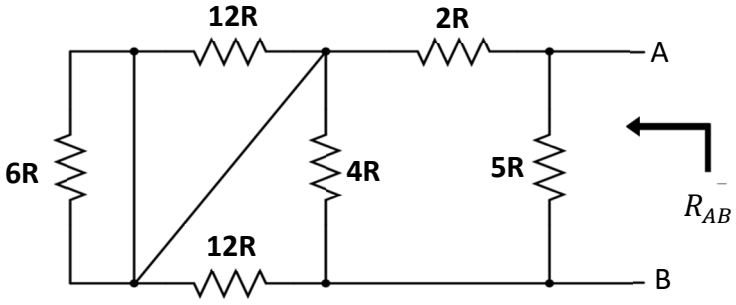
Element	Power
E1	
E2	
15V	

Problem 2 (6 points)

Find equivalent resistance in the circuit shown below.



(a)



(b)

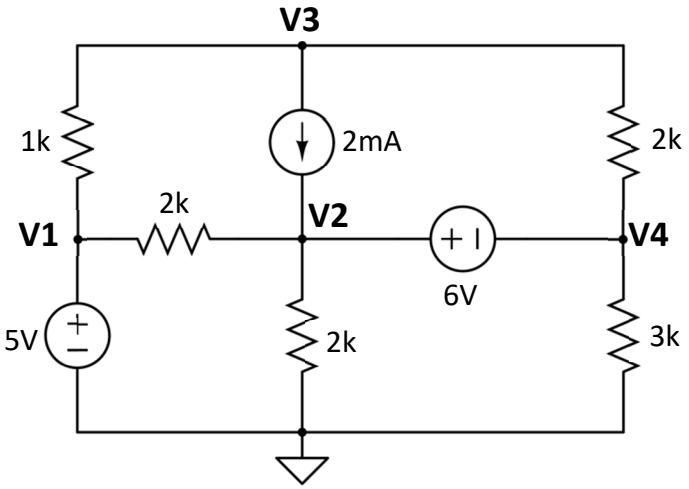
R_{AB} =

R_{AB} =

A

Problem 3 (6 points)

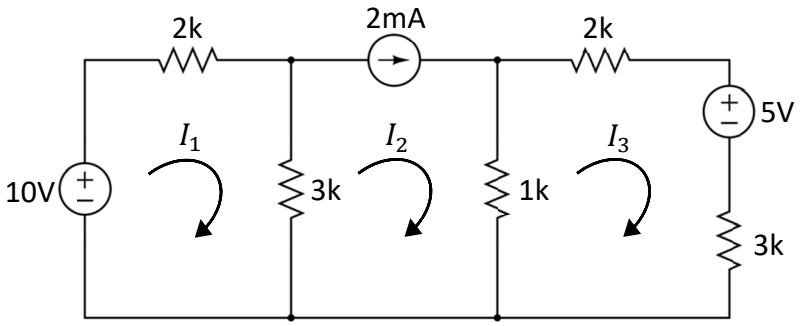
Use **node analysis** method to write a system of **<u>at most three</u>** equations you could use to find node voltages $\mathbf{V_2}$, $\mathbf{V_3}$ and $\mathbf{V_4}$ in the circuit below (<u>DO NOT SOLVE</u>).



Problem 4 (8 points)

A

(a) Use **loop analysis** and write **at most three** equations you would use to solve for currents.



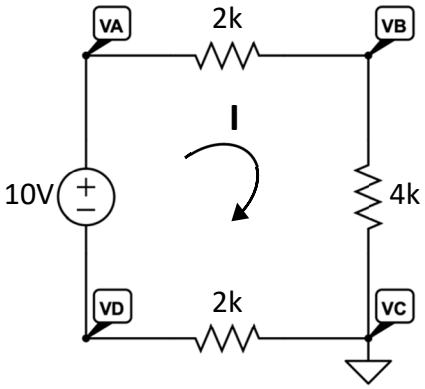
(b) Solve equations you obtained in part (a).

I_1	
I_2	
I_3	

Problem 5 (7 points)

A

In the cirtcuit shown below, (a) Find the current **I**, voltages $\mathbf{V_{AD}}$ and $\mathbf{V_C}$, (b) Find voltage $\mathbf{V_A}$ and $\mathbf{V_B}$.



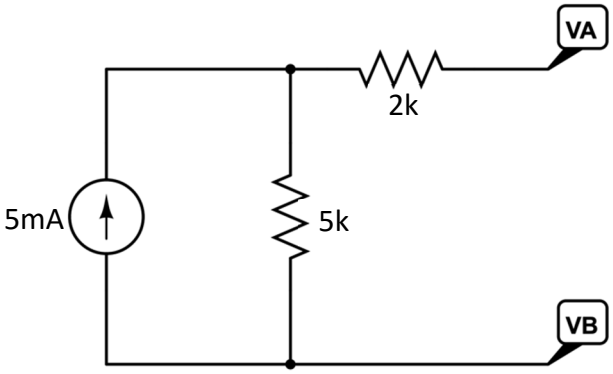
I	
$\mathbf{V_{AD}}$	
$\mathbf{V_C}$	

$\mathbf{V_A}$	
$\mathbf{V_B}$	

Problem 6 (7 points)

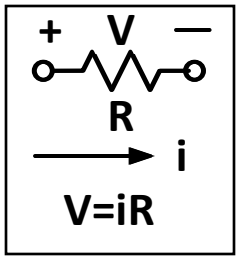
A

Draw the **Thevenin equivalent circuit** between the terminals A-B in the circuit below. You must clearly specify the **value** of Thevenin voltage and Thevenin resistance.



Equivalent Circuit:

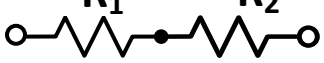
Ohm's Law:



Resistor Combinations:

(a) Series:

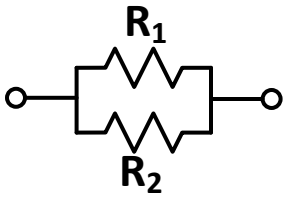
$$R_{eq} = \sum_{k=1}^{N} R_N$$



$R_{eq} = R_1 + R_2$

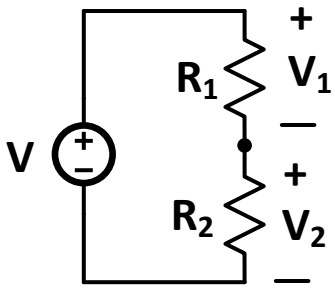
(b) Parallel:

$$\frac{1}{R_{eq}} = \sum_{k=1}^{N} \frac{1}{R_k}$$



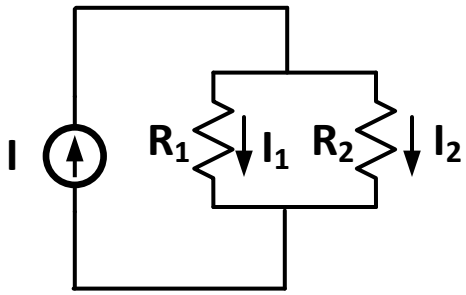
$$R_{eq} = \frac{R_1 R_2}{R_1 + R_2}$$

Voltage and Current Dividers:



$$V_1 = \frac{VR_1}{R_1 + R_2}$$

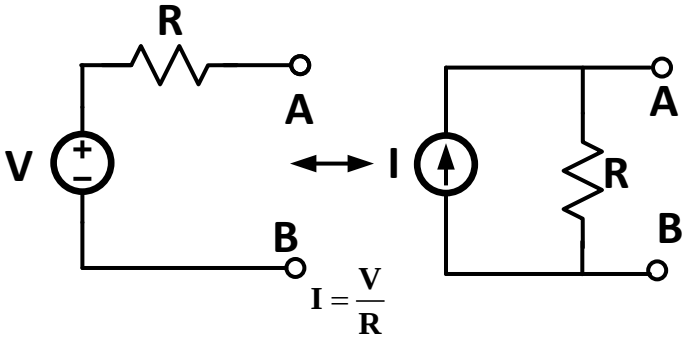
$$V_2 = \frac{VR_2}{R_1 + R_2}$$



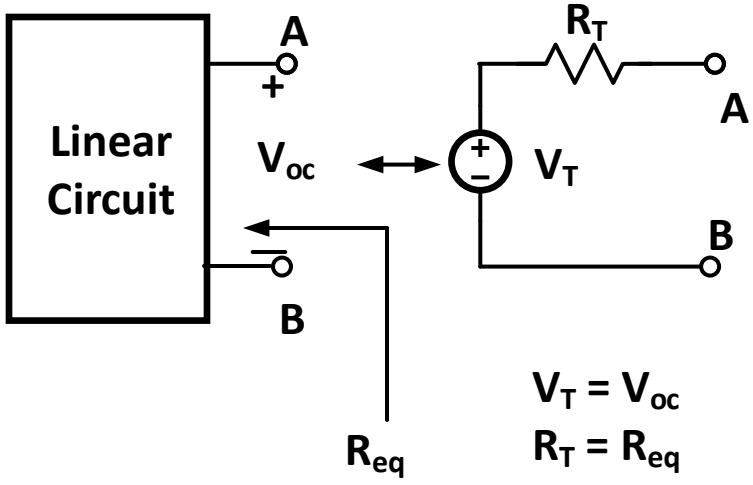
$$I_1 = \frac{IR_2}{R_1 + R_2}$$

$$I_2 = \frac{IR_1}{R_1 + R_2}$$

Source transformation



Thevenin Equivalent



$V_T = V_{oc}$

$R_T = R_{eq}$