

INSTRUCTIONS:



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

Write your name and netid on first 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: _____

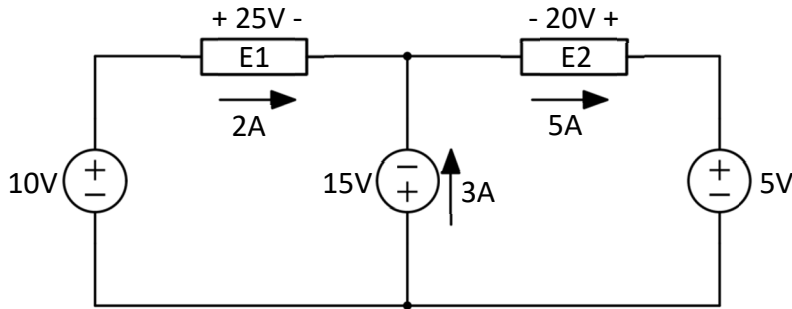
UIN: _____



Problem 1 (6 points)



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



Element	Power
E1	50W
E2	-100W
15V	45W

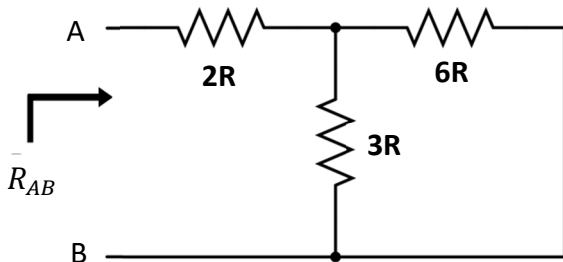
$$P_{E1} = 25 \times 2 = 50w$$

$$P_{E2} = -20 \times 5 = -100w$$

$$P_{15v} = 15 \times 3 = 45w$$

Problem 2 (6 points)

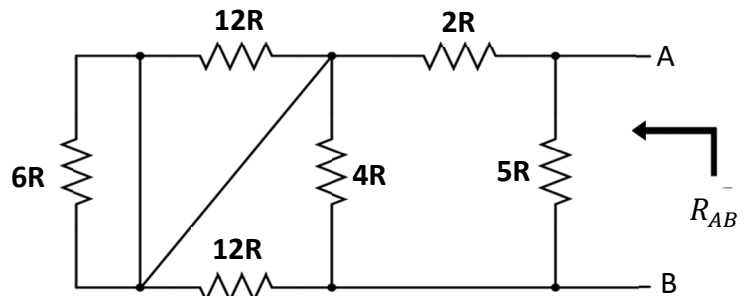
Find equivalent resistance in the circuit shown below.



(a)

$$3R \parallel 6R + 2R = 4R$$

$R_{AB} = 4R$



(b)

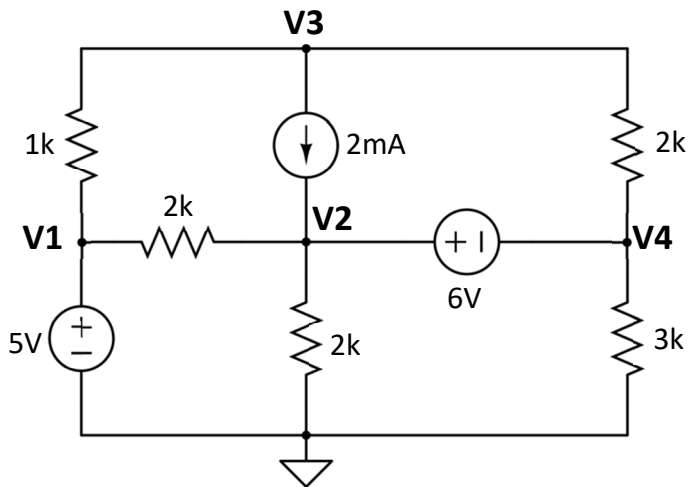
left 6R and top 12R short out

$$(12R \parallel 4R + 2R) \parallel 5R = 2.5R$$

$R_{AB} = 2.5R$

Problem 3 (6 points)

Use **node analysis** method to write a system of **at most three** equations you could use to find node voltages V_2 , V_3 and V_4 in the circuit below (DO NOT SOLVE).



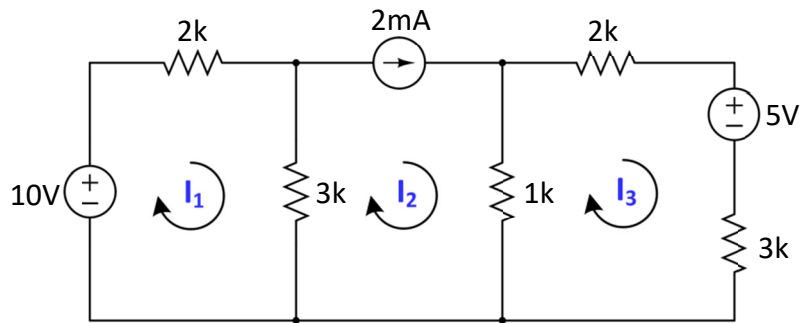
$$\text{supernode } V2, V4: \frac{V2 - 5}{2} + \frac{V2}{2} - 2 + \frac{V4 - V3}{2} + \frac{V4}{3} = 0$$

$$\text{node } V3: \frac{V3 - 5}{1} + 2 + \frac{V3 - V4}{2} = 0$$

$$V2 - V4 = 6$$

Problem 4 (8 points)

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



$$-10 + 2I_1 + 3(I_1 - I_2) = 0$$

$$I_2 = 2$$

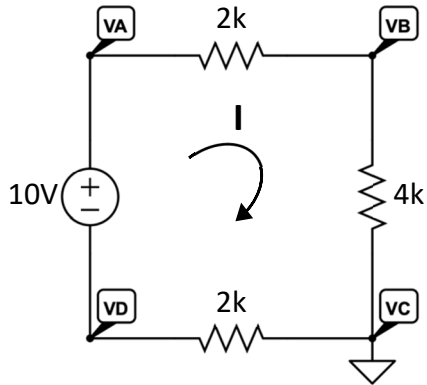
$$2I_3 + 5 + 3I_3 + 1(I_3 - I_2) = 0$$

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

I_1	3.2mA
I_2	2mA
I_3	-0.5mA

Problem 5 (7 points)**A**

In the circuit shown below, (a) Find the current I , voltage V_{AD} and V_C , (b) Find voltage V_A and V_B .

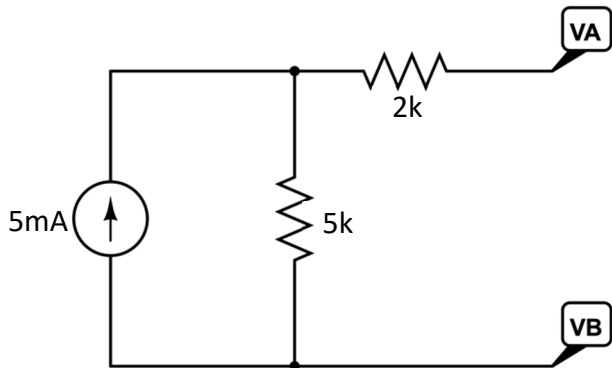


I	1.25mA
V_{AD}	10V
V_C	0V

V_A	7.5V
V_B	5V

$$V_B = V_{BC} + V_C = I \times 4k + 0 = 5V$$

$$V_A = V_{AB} + V_B = I \times 2k + 5 = 7.5V$$

Problem 6 (7 points)Draw the **Thevenin equivalent circuit** between the terminals A-B in the circuit below.**A****Equivalent Circuit:**

$$R_{eq} = 5 + 2 = 7k$$

$$V_{th} = 5mA \times 5k = 25V$$