

Your name: \_\_\_\_\_

**EECS 215.**  
**Midterm Exam #1**  
**February 9, 2016**

---

**This text consists of 8 problems with points as indicated to total 100 points.**

Read through the entire exam before beginning.

**Show all work** (on the pages provided in this booklet) to earn partial credit.

Do not unstaple the pages.

Briefly explain major steps, include units, and write your final answers in the areas provided.

**No credit will be given if no work is shown.**

- **Exam policies**
  - No food allowed during exam
  - No books allowed (closed book exam)
  - One, 8.5x11 inch notes page (ONE SIDED) allowed
  - Calculators allowed (But scientific calculator only for future exams)
  - College of Engineering Honor Code is followed: No communication of any kind is allowed. No use of cell phones, computers, or any devices besides scientific calculators. Violation of this will be treated as an honor code violation. No credit will be given for this exam without a signed honor pledge.

Write and sign the honor pledge:

Signed:

\_\_\_\_\_

Do not write in this space

Problem 1: [    ]/10

Problem 2: [    ]/10

Problem 3: [    ]/10

Problem 4: [    ]/10

Problem 5: [    ]/15

Problem 6: [    ]/15

Problem 7: [    ]/15

Problem 8: [    ]/15

**Total score [    ]/100**

1. (10 points). Given  $i(t) = \begin{cases} 12 e^{-2t} A, & t \geq 0 \\ 0, & t < 0 \end{cases}$ , find the **total charge delivered**. Additional work space on next page.

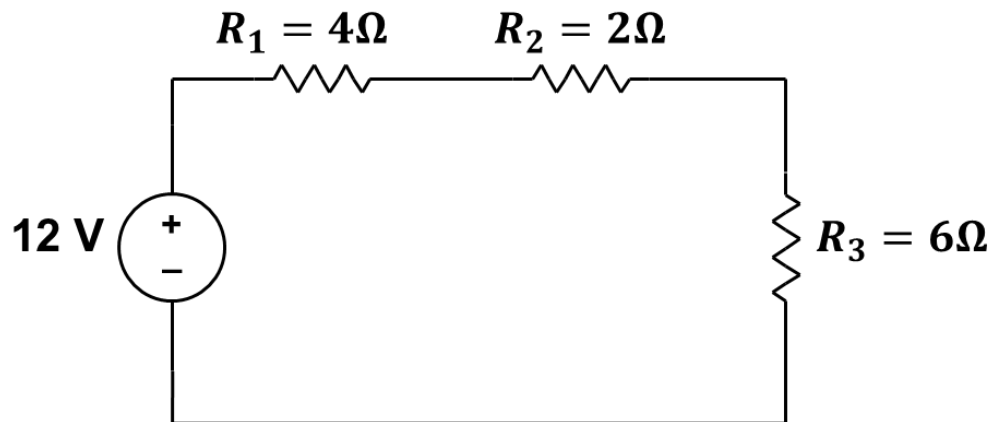
Write your answer here:

Total charge delivered = \_\_\_\_\_

Problem 1 score: [    ]/10



2. (10 points). Find the **power absorbed by each element** in the circuit below. Is power conserved in this circuit? Additional work space on next page.



Write your answer here:

Power absorbed by 12V source = \_\_\_\_\_

Power absorbed by  $R_1$  = \_\_\_\_\_

Power absorbed by  $R_2$  = \_\_\_\_\_

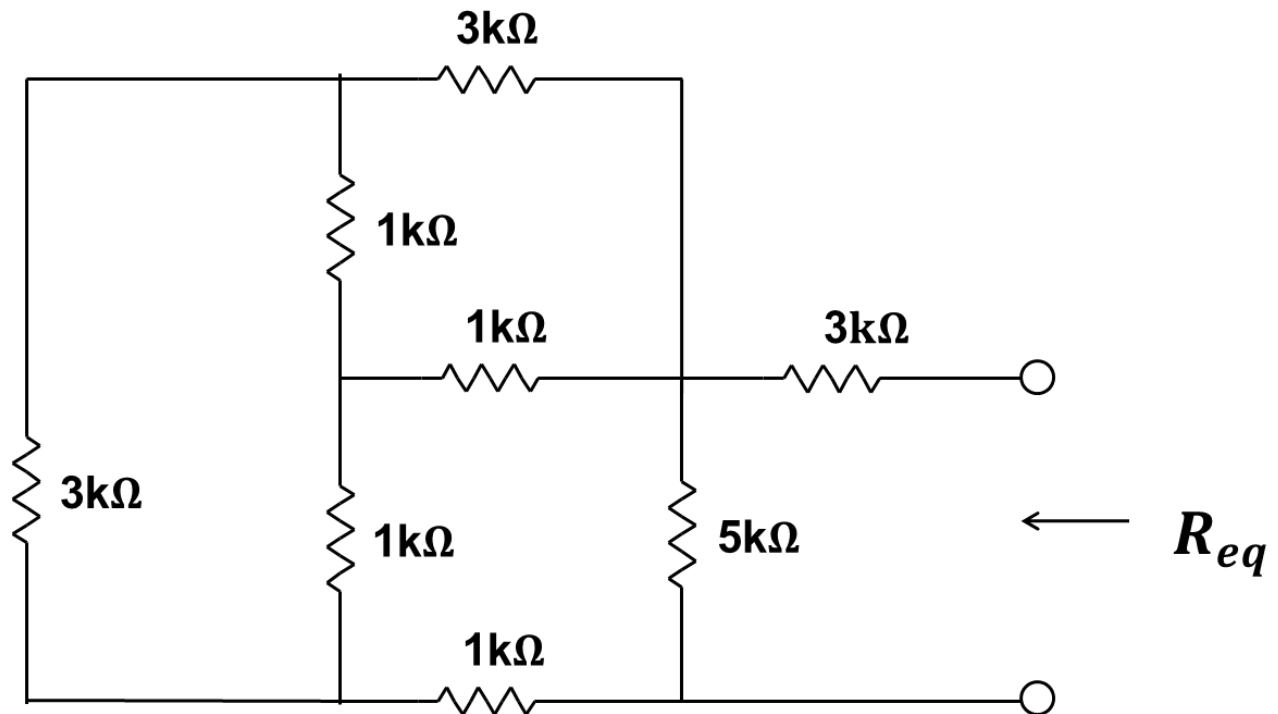
Power absorbed by  $R_3$  = \_\_\_\_\_

Is power conserved? \_\_\_\_\_

Problem 2 score: [    ]/10



3. (10 points). Find the **equivalent resistance**  $R_{eq}$ . Additional work space on next page.



Write your answer here:

$R_{eq} =$  \_\_\_\_\_

Problem 3 score: [    ]/10



4. (10 points). Use Cramer's rule to **solve the following system of equations** (show all work for finding  $\Delta$ ,  $\Delta_1$ , and  $\Delta_2$ ; you will lose 5 points if you use a different approach). Check your solution by plugging your values for  $x$  and  $y$  into the original equations. Additional work space on next page.

$$2x + 3y = 5 \quad \text{and} \quad x - 2y = 4$$

Write your answer here:

$x =$  \_\_\_\_\_

$y =$  \_\_\_\_\_

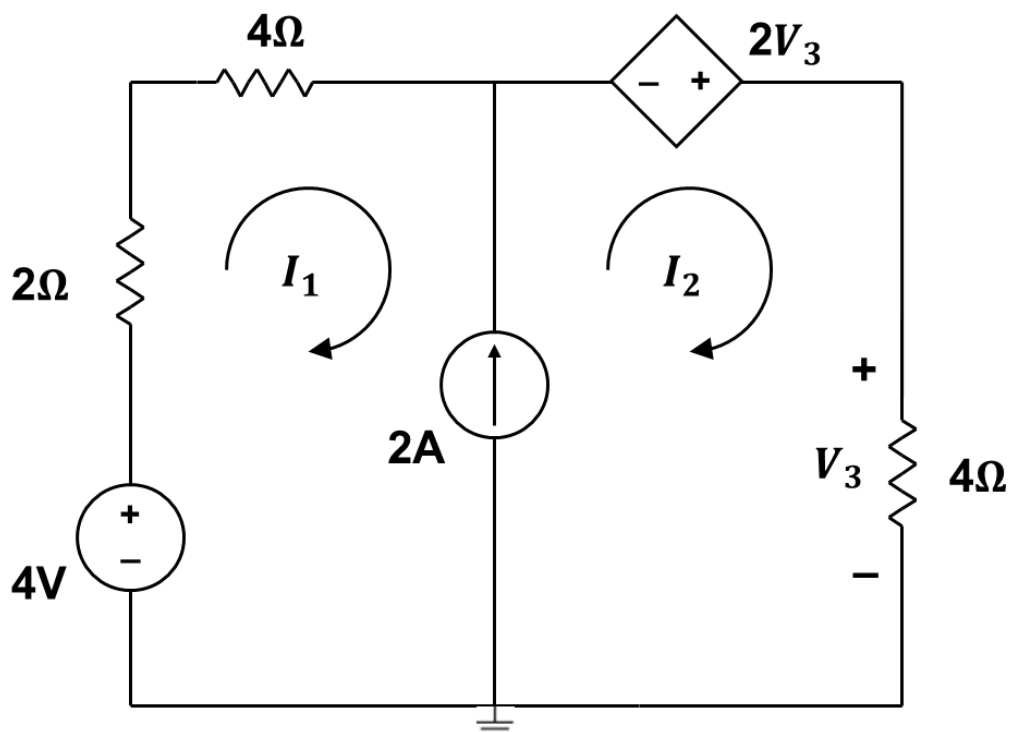
Does your solution work in the original set of equations? \_\_\_\_\_

Problem 4 score: [    ]/10





5. (15 points). Use **mesh analysis** to find  $V_3$ , using mesh currents defined in the circuit below (you will lose 5 points if you use a different approach). Additional work space on next page.



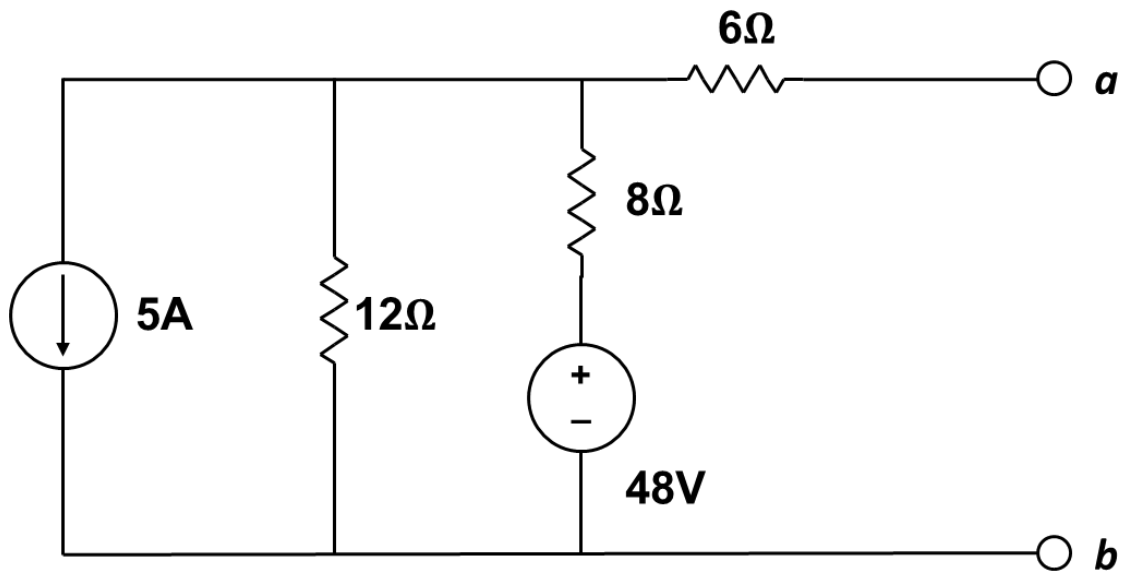
Write your answer here:

$V_3 =$  \_\_\_\_\_

Problem 5 score: [    ]/15



6. (15 points) Find the Thevenin equivalent circuit at terminals  $(a, b)$ . Additional work space on next page.



Write your answer here:

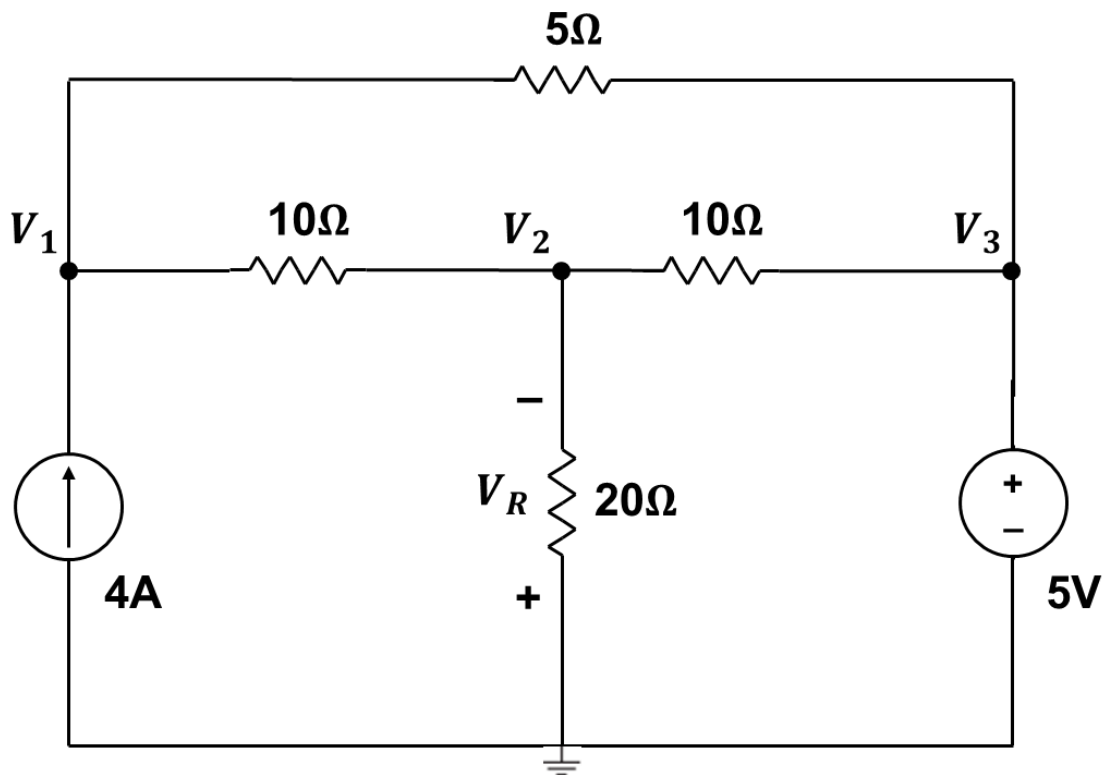
$V_{TH} =$  \_\_\_\_\_

$R_{TH} =$  \_\_\_\_\_

Problem 6 score: [    ]/15



7. (15 points). Using nodal analysis (with the node voltages as defined in the circuit), solve for the voltage  $V_R$  (you will lose 5 points if you use a different approach). Additional work space on next page.



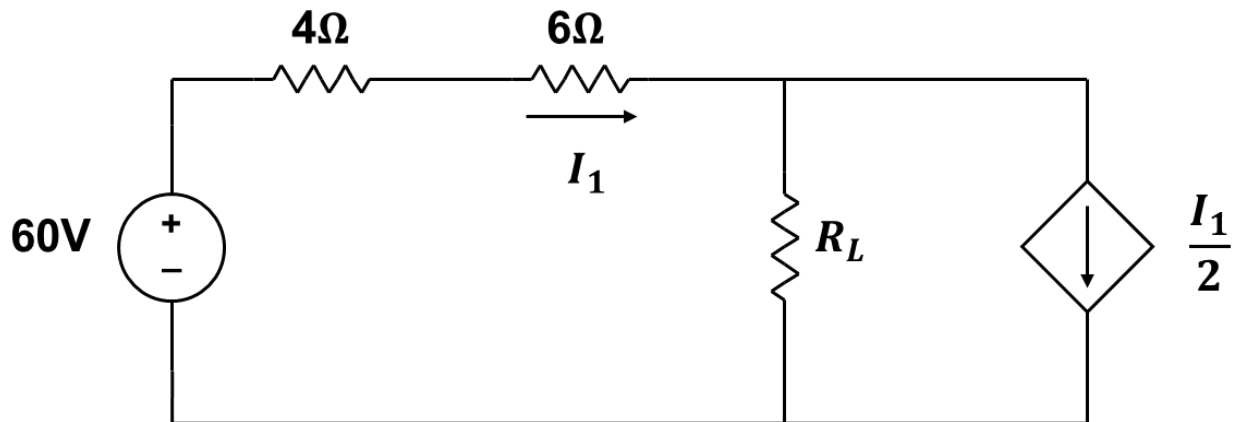
Write your answer here:

$V_R =$  \_\_\_\_\_

Problem 7 score: [    ]/15



8. (15 points) For the circuit below, derive the value for  $R_L$  that will result in maximum power being transferred to  $R_L$ ? Calculate the maximum power that can be delivered to  $R_L$ . Additional work space on next page.



Write your answer here:

$R_L$  for maximum power transfer = \_\_\_\_\_

In that case, power delivered to  $R_L$  = \_\_\_\_\_

Problem 8 score: [    ]/15



