

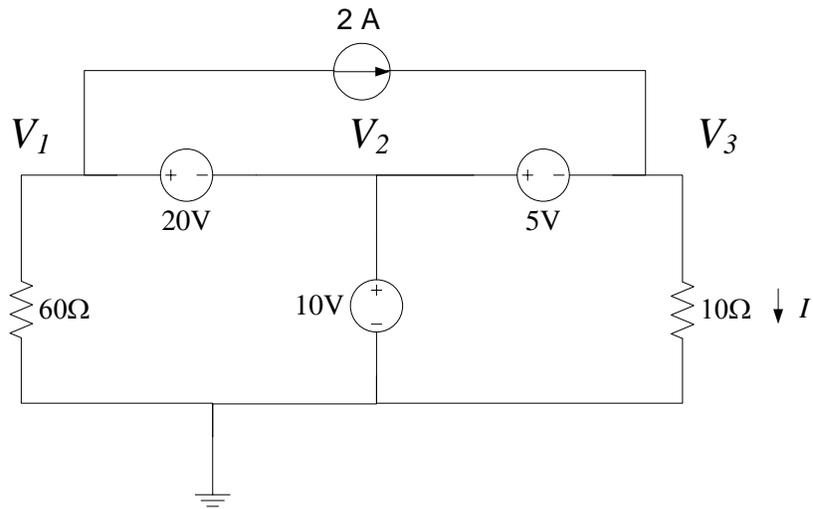
**EE331****Electrical Engineering I****EXAM 1****Monday September 26<sup>th</sup>, 2011**

This is a 50 minute exam. Please work quickly and quietly. Place your name below before beginning. There are 6 pages including this cover sheet. Please ensure that you have all 6 pages. Show as much work as practical to maximize partial credit. Eyes should remain on your own work. There is no sharing of calculators. **Do not discuss this exam until it is returned to you.** Please commence when advised.

<b>Page</b>	<b>Points</b>	<b>Score</b>
1		
2	<b>20</b>	
3	<b>18</b>	
4	<b>20</b>	
5	<b>18</b>	
6	<b>18</b>	
Total	<b>94</b>	

**NAME:** \_\_\_\_\_

**Problem 1: (12 pts) Warm up!** Find the voltages  $V_1$ ,  $V_2$ , and  $V_3$  and the current  $I$ .  
(Don't think too hard)



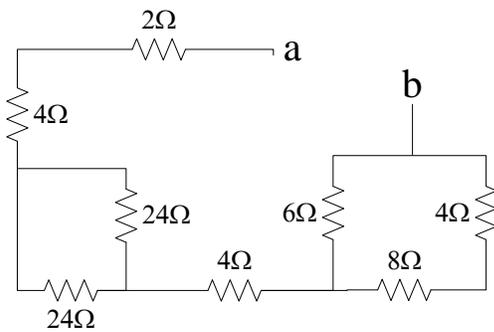
$$V_1 = \underline{\hspace{2cm}}$$

$$V_2 = \underline{\hspace{2cm}}$$

$$V_3 = \underline{\hspace{2cm}}$$

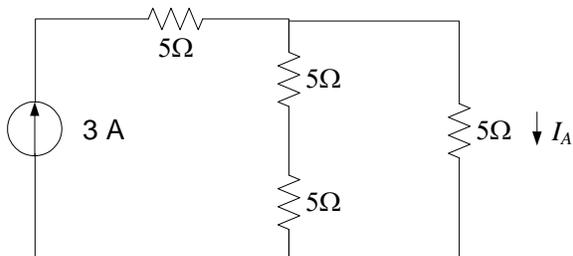
$$I = \underline{\hspace{2cm}}$$

**Problem 2: (4 pts)** Find  $R_{eq}$  between points **a** and **b**.



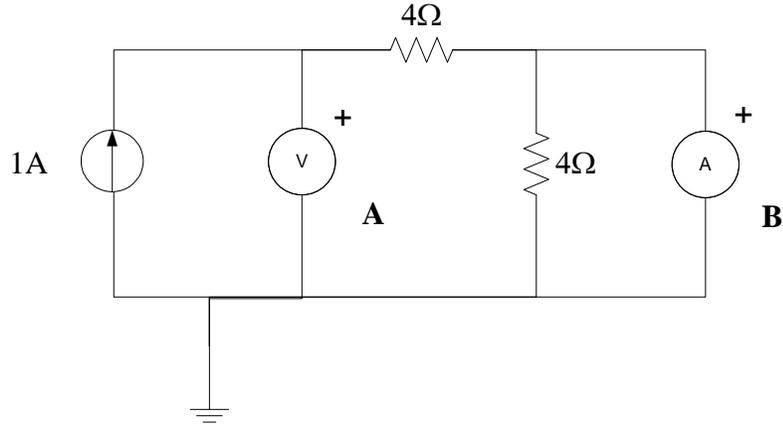
$$R_{eq} = \underline{\hspace{2cm}}$$

**Problem 3: (4 pts)** Find  $I_A$  using the current divider rule.



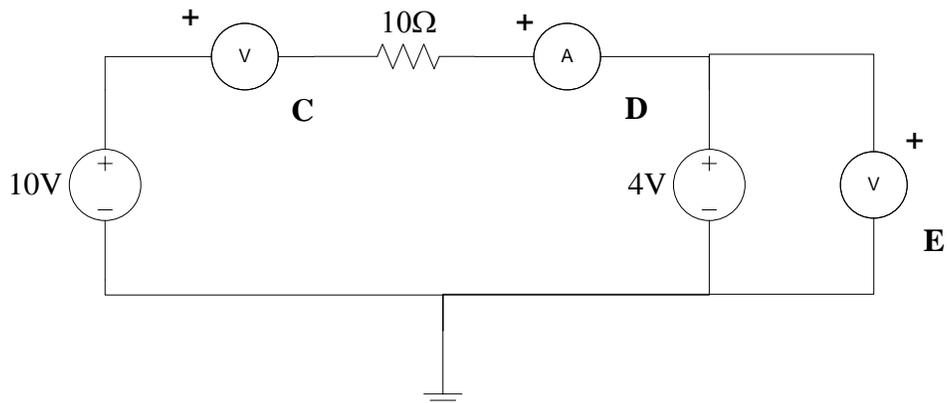
$$I_A = \underline{\hspace{2cm}}$$

**Problem 4: (15 pts)** Ideal ammeters and voltmeters are placed in and across branches in the two circuits below. Solve for the requested readings of the meters.



**Ideal Voltmeter (A) = \_\_\_\_\_**

**Ideal Ammeter (B) = \_\_\_\_\_**



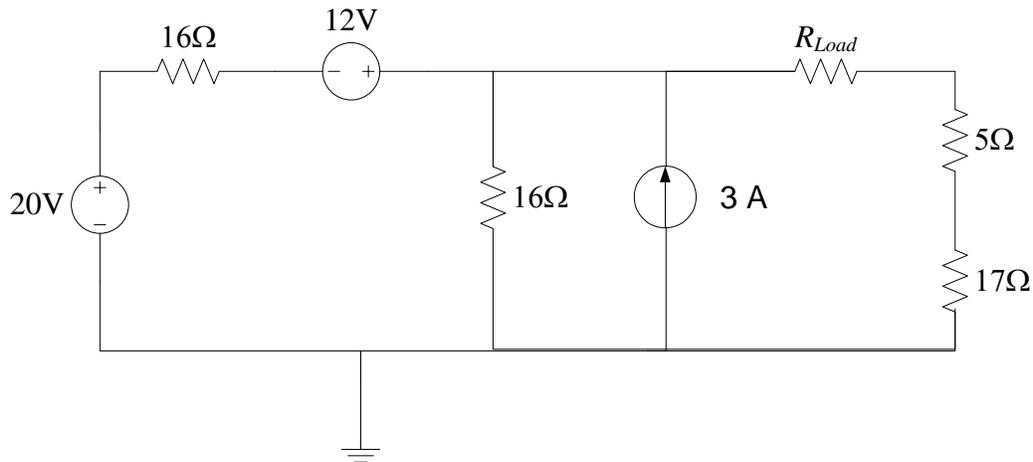
**Ideal Voltmeter (C) = \_\_\_\_\_**

**Ideal Ammeter (D) = \_\_\_\_\_**

**Ideal Voltmeter, (E) = \_\_\_\_\_**

**Question: (3 pts)** If the ideal Ammeter (B) in the first circuit above is replaced with a real ammeter with an internal resistance of  $4\ \Omega$  what would the real Ammeter (B) read?

**Problem 5: (14 pts)** Find and **draw** the Thevenin equivalent circuit. (Show your work!)



**Thevenin Circuit**

$$R_{th} = \underline{\hspace{2cm}}$$

$$V_{th} = \underline{\hspace{2cm}}$$

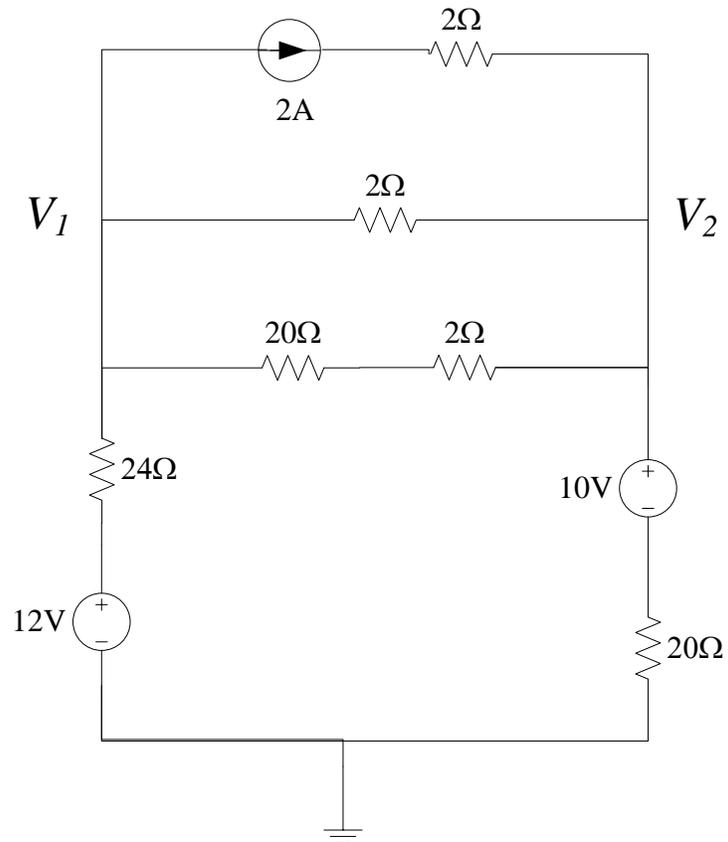
**Question: (6 pts):** If  $R_{load} = 20\Omega$ , compute the power absorbed by the load. Is this the maximum power that could be delivered to  $R_{load}$ ?

$$P_{load} = \underline{\hspace{2cm}}$$

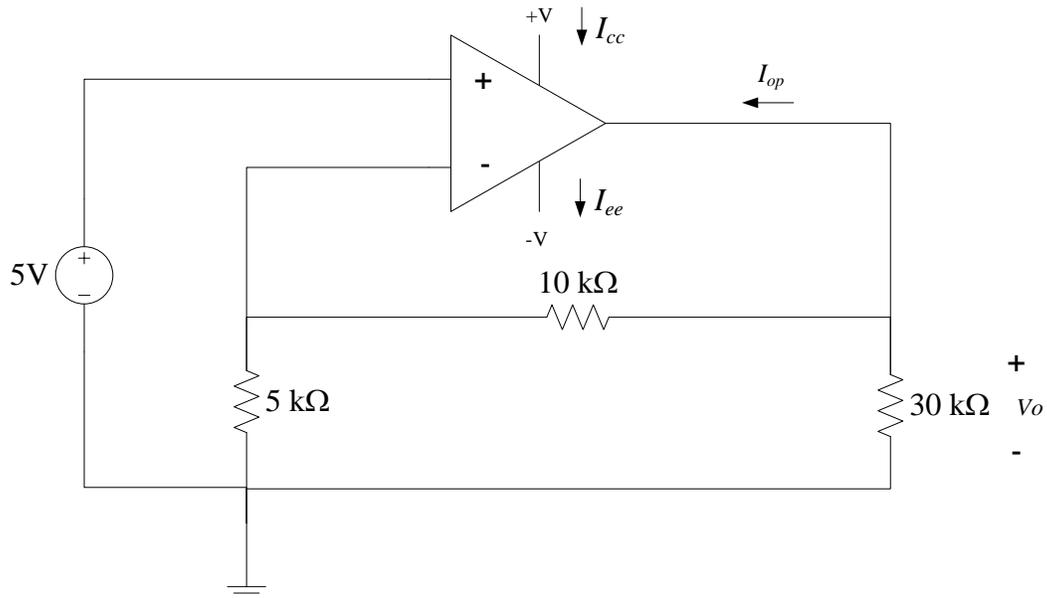
**Maximum power is delivered to load: Yes / No (circle one)**

**Problem 6: (18 pts)** Establish the nodal equations required to solve for  $V_1$ , and  $V_2$   
**(DO NOT solve the equations)**

*Go slowly and be careful!*



**Problem 7: (18 pts)** Given the following non-inverting amplifier circuit, calculate the following quantities: *Show your work!*



- a. (6 pts) Calculate the load voltage,  $V_o$

$$V_o = \underline{\hspace{2cm}}$$

- b. (6 pts) Find the op amp current,  $I_{op}$

$$I_{op} = \underline{\hspace{2cm}}$$

- c. (6 pts) If  $I_{cc} = 2.5$  mA, find the current leaving the op amp from the negative power supply,  $I_{ee}$ .

$$I_{ee} = \underline{\hspace{2cm}}$$