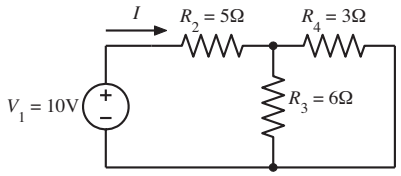
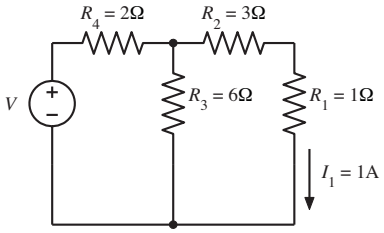
Solution of ECE 300 Test 2 F08

1. Find the numerical value of I in the circuit below.



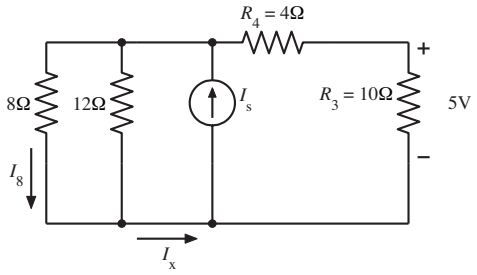
$$I = \frac{V_1}{R_2 + R_3 \parallel R_4} = \frac{10\text{V}}{5\Omega + 6\Omega \parallel 3\Omega} = \frac{10\text{V}}{5\Omega + 2\Omega} = \frac{10\text{V}}{7\Omega} = 1.429\text{A}$$

2. Find the numerical value of V in the circuit below.



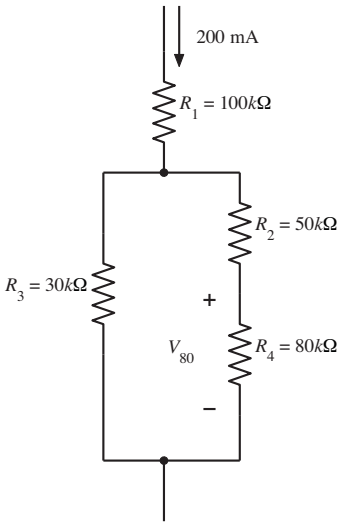
Voltage across the 1Ω resistor (positive on top) is 1V. Voltage across 3Ω resistor (positive on the left) is 3V. Therefore the voltage across the 6Ω resistor (positive on top) is 4V and the current through the 6Ω resistor is 2/3 A. So the current through the 2Ω resistor (flowing to the right) is 5/3 A and the voltage across it (positive on the left) is 10/3V. Then the voltage V must be 4V + 10/3V or 22/3V or 7.333 V.

3. Find the numerical values of the three currents indicated on the circuit diagram below.



Current through the 10Ω resistor is 1/2 A flowing downward. Therefore the current through the 4Ω resistor is 1/2 A flowing to the right and the voltage across the 4Ω resistor is 2V (positive on the left). So the voltage across the current source and the 8Ω and 12Ω resistors is 7V (positive on top). Therefore the current I_8 is 7/8A and the current through the 12Ω resistor is 7/12A flowing downward. Therefore I_s is the sum of 7/8, 7/12 and 1/2 or 1.958A. I_x must be the same as the sum of the currents flowing through the 8Ω and 12Ω resistors or 1.458A.

4. Find the numerical value of V_{80} in the circuit below.

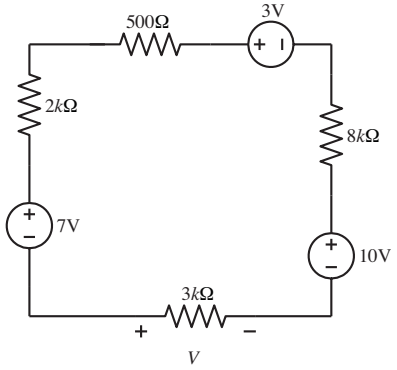


The 200 mA current splits between the two paths. The current through the right-hand path is (using current splitting)

$$200\text{mA} \times \frac{30k\Omega}{30k\Omega + 50k\Omega + 80k\Omega} = 37.5\text{mA}$$

Therefore the voltage across the $80k\Omega$ resistor is $37.5\ \text{mA} \times 80\ k\Omega = 3000\ \text{V}$

5. Find the numerical value of *V* in the circuit below.



The three voltage sources in series can be replaced by a single voltage source in the position, and with the polarity of the 7V source, of –6V. The voltage *V* is then (using voltage division)

$$V = -\left[-6\text{V} \times \frac{3000}{3000 + 2000 + 500 + 8000}\right] = 4/3\text{V} = 1.333\text{V}$$

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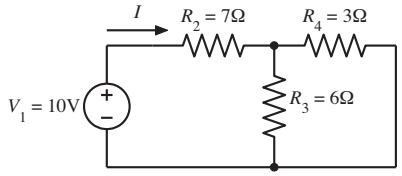
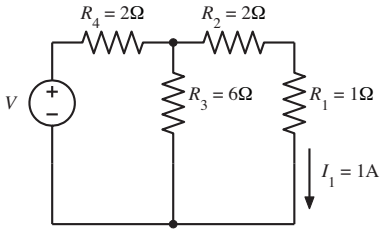
1. Find the numerical value of I in the circuit below.



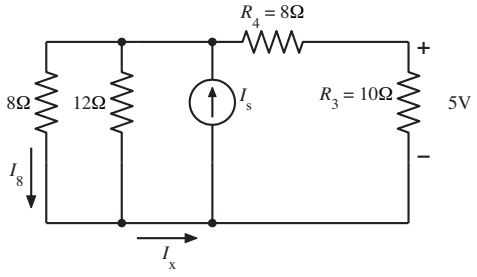
$$I = \frac{V_1}{R_2 + R_3 \parallel R_4} = \frac{10\text{V}}{7\Omega + 6\Omega \parallel 3\Omega} = \frac{10\text{V}}{7\Omega + 2\Omega} = \frac{10\text{V}}{9\Omega} = 1.111\text{A}$$

2. Find the numerical value of V in the circuit below.



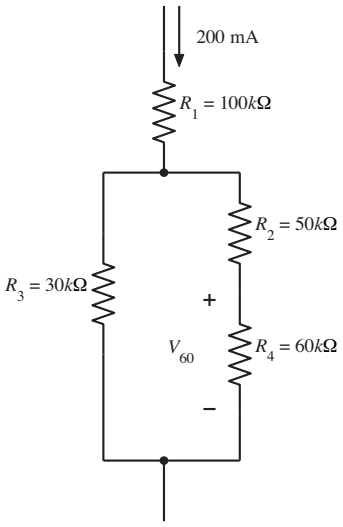
Voltage across the 1Ω resistor (positive on top) is 1V. Voltage across 2Ω resistor (positive on the left) is 2V. Therefore the voltage across the 6Ω resistor (positive on top) is 3V and the current through the 6Ω resistor is 1/2 A. So the current through the 2Ω resistor (flowing to the right) is 3/2 A and the voltage across it (positive on the left) is 3V. Then the voltage V must be 3V + 3V or 6 V.

3. Find the numerical values of the three currents indicated on the circuit diagram below.



Current through the 10Ω resistor is 1/2 A flowing downward. Therefore the current through the 8Ω resistor is 1/2 A flowing to the right and the voltage across the 8Ω resistor is 4V (positive on the left). So the voltage across the current source and the 8Ω and 12Ω resistors is 9V (positive on top). Therefore the current I_8 is 9/8A and the current through the 12Ω resistor is 3/4A flowing downward. Therefore I_s is the sum of 9/8, 3/4 and 1/2 or 2.375A. I_x must be the same as the sum of the currents flowing through the 8Ω and 12Ω resistors or 1.875A.

4. Find the numerical value of V_{60} in the circuit below.

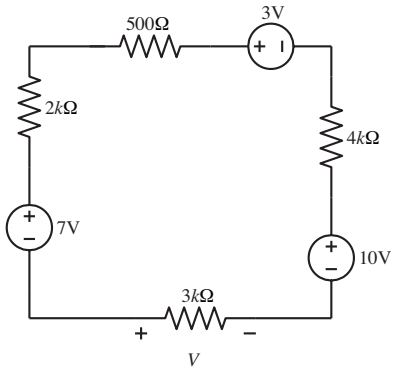


The 200 mA current splits between the two paths. The current through the right-hand path is (using current splitting)

$$200\text{mA} \times \frac{30k\Omega}{30k\Omega + 50k\Omega + 60k\Omega} = 42.86\text{mA}$$

Therefore the voltage across the $60k\Omega$ resistor is $42.86\ \text{mA} \times 60\ k\Omega = 2571.6\ \text{V}$

5. Find the numerical value of *V* in the circuit below.



The three voltage sources in series can be replaced by a single voltage source in the position, and with the polarity of the 7V source, of –6V. The voltage *V* is then (using voltage division)

$$V = -\left[-6\text{V} \times \frac{3000}{3000 + 2000 + 500 + 4000}\right] = 1.895\text{V}$$