PHYS 102: General Physics 2 KOÇ UNIVERSITY Fall Semester 2015

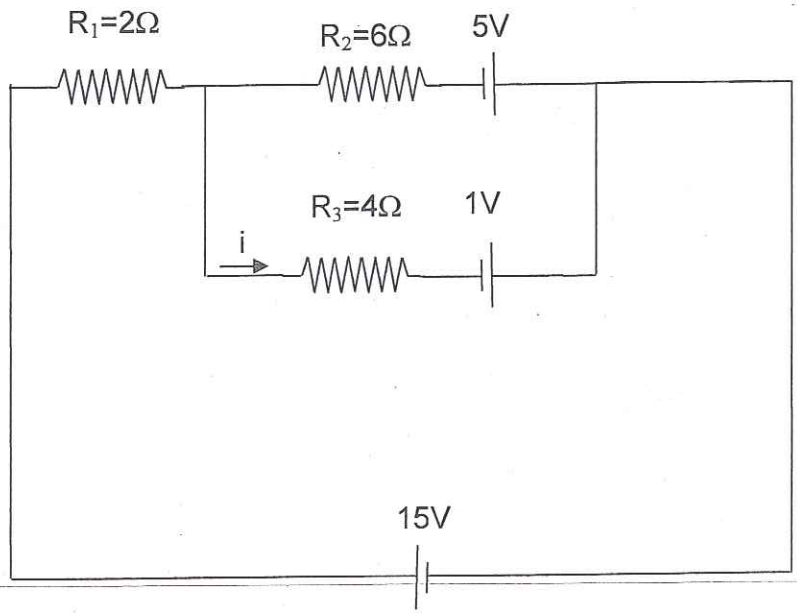
College of Arts and Sciences

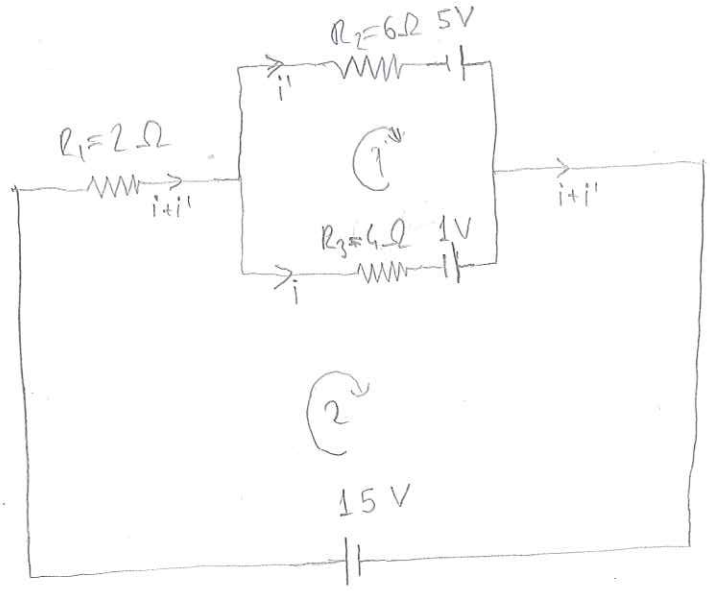
Section 1 Quiz 6 November 6, 2015

Closed book. No calculators are to be used for this quiz.
Quiz duration: 10 minutes

Name: **Student ID:** **Signature:**

In the circuit shown below, find the current i using Kirchoff's Rules.





Loop 1:

$$-(6\,\Omega)\,i' + 5\,V - 1\,V + i(4\,\Omega) = 0$$

$$4i - 6i' = -4\,A \qquad (1)$$

Loop 2:

$$15\,V - (i+i')\,2\,\Omega - i(4\,\Omega) + 1\,V = 0$$

$$6i + 2i' = 16\,A \qquad (2)$$

Using (1) and (2)

$$4i - 6i' = -4\,A$$
$$18i + 6i' = 48\,A \quad +$$

$$22i + 0 = 44\,A$$

$$i = 2\,A$$

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Section 2 **Quiz** 6 **November 6, 2015**

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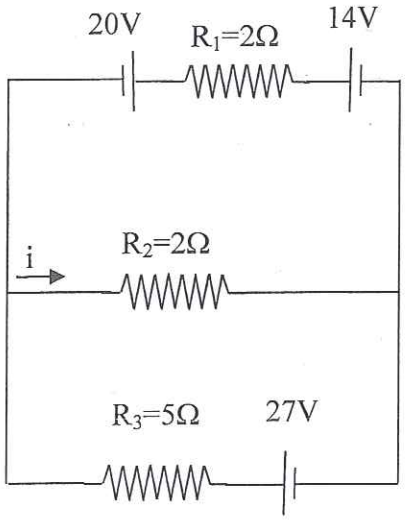
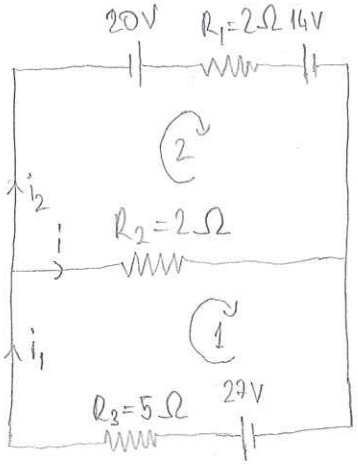
Quiz duration: 10 minutes

Name: **Student ID:** **Signature:**

In the circuit shown below, find the current i using Kirchoff's Rules.





$-i + i_1 - i_2 = 0$ (1)

Loop 1:

$27V - i_1(5\,\Omega) - i(2\,\Omega) = 0$

$i_1 = \frac{27}{5}A - \frac{2}{5}i$ (2)

Loop 2:

$20V - i_2(2\,\Omega) - 14V + i(2\,\Omega) = 0$

$i_2 = 3A + i$ (3)

Replacing (2) and (3) in (1):

$-i + \frac{27}{5}A - \frac{2}{5}i - 3A - i = 0$

$\frac{12}{5}i = \frac{27}{5}A - 3A$

$12\,i = 27A - 15A$

$i = 1\,A$

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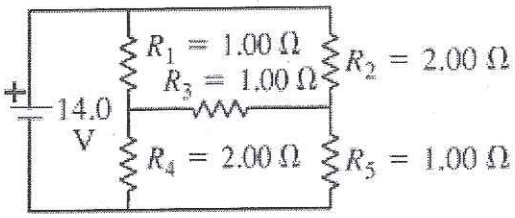
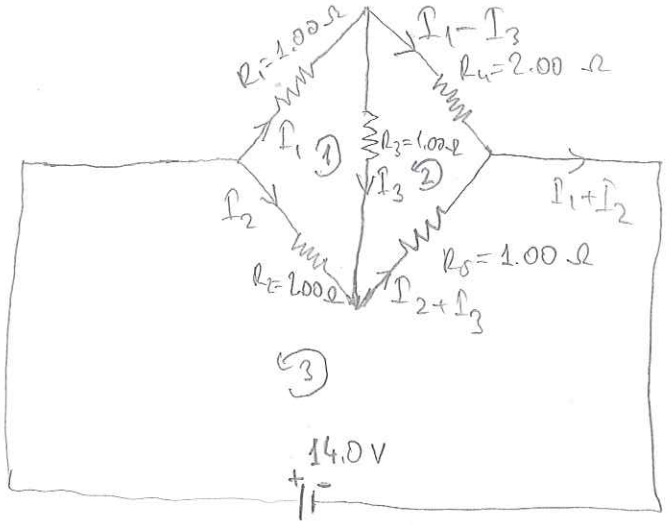
Section 3 **Quiz** 6 **November 6, 2015**

Closed book. No calculators are to be used for this quiz.
Quiz duration: 10 minutes

Name: **Student ID:** **Signature:**

a) Find the current through the battery an each resistor in the circuit shown below.
b) What is the equvalent resistance of the resistor network?





a.) Loop 1:

$$I_1(1.00\,\Omega) - I_2(2.00\,\Omega) + I_3(1.00\,\Omega) = 0$$

$$I_1 - 2I_2 + I_3 = 0 \quad (1)$$

Loop 2:

$$-I_3(1.00\,\Omega) - (I_2 + I_3)(1.00\,\Omega) + (I_1 - I_3)(2.00\,\Omega) = 0$$

$$2I_1 - I_2 - 4I_3 = 0 \quad (2)$$

Loop 3:

$$-14.0\,V + (I_2 + I_3)(1.00\,\Omega) + I_2(2.00\,\Omega) = 0$$

$$3I_2 + I_3 = 14.0\,A$$

$$I_3 = 14.0\,A - 3I_2 \quad (3)$$

Replacing (3) inside (1) and (2) we get:

$$-2 / \; I_1 + 14.0\,A - 5I_2 = 0 \quad (4)$$

$$2I_1 - 56.0\,A + 11I_2 = 0 \quad (5)$$

$$+$$

$$0 \quad -84.0\,A + 21I_2 = 0$$

$$I_2 = 4.0\,A$$

From (3)

$I_3 = 14.0\ A - 3\times(4.0\ A) = 2.0\ A$

From (2)

$2I_1 - 4.0\ A - 4\times(2.0\ A) = 0$

$I_1 = 6.0\ A$

$I_{R1} = I_1 = 6.0\ A$

$I_{R2} = I_2 = 4.0\ A$

$I_{R3} = I_3 = 2.0\ A$

$I_{R4} = I_1 - I_3 = 4.0\ A$

$I_{R5} = I_2 + I_3 = 6.0\ A$

$I_{battery} = I_1 + I_2 = 10.0\ A$

6.) $R_{eq} = \frac{V_{battery}}{I_{battery}} = \frac{14.0\ V}{10.0\ A} = 1.40\ \Omega$