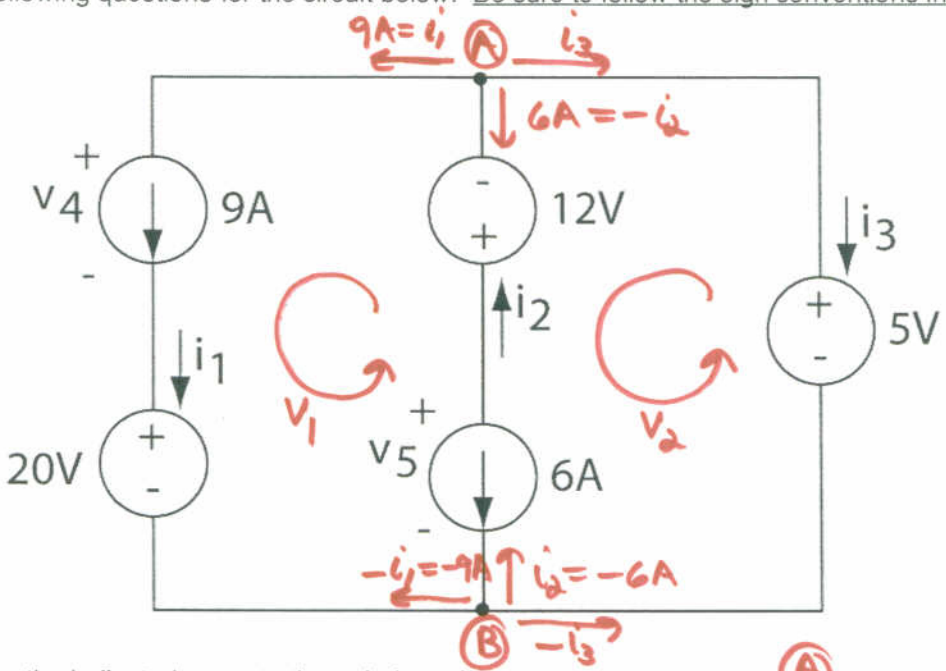
Name : Solution Section:_____ CWRU e-mail:_____

CASE WESTERN RESERVE UNIVERSITY
Case School of Engineering
Department of Electrical Engineering and Computer Science
ENGR 210. Introduction to Circuits and Instruments (4)

Quiz No. X2 1/28/05

PUT ANSWERS IN THE SPACE PROVIDED AND SHOW YOUR WORK IF APPROPRIATE

Problem 1 (10 points) – CONNECTION CONSTRAINTS
Answer the following questions for the circuit below. Be sure to follow the sign conventions indicated.



(a) Determine the indicated currents through the voltage sources.

I1= 9 amperes ② ≤1 for good work ≤1 for answer

I2= −6 amperes ② – same as I1

(A) $i_1 = 9A$, $-i_2 = 6A$, $i_3 = ?$

(B) not needed. Use to check!

(b) What is the current through the 5 volt voltage source.

I3= −15 amperes ② – same as I1

$i_1 - i_2 + i_3 = 0$

$9A + 6A = -i_3$

$i_3 = -15A$

(c) What is the voltage across each current source?

V4= −15 volts ② – same as I1

V5= 17 volts ② – same as I1

V_1: $V_4 + 20V - V_5 + 12V = 0$

V_2: $-12V + V_5 - 5V = 0$

$V_5 = 17V$

$V_4 = -15V$

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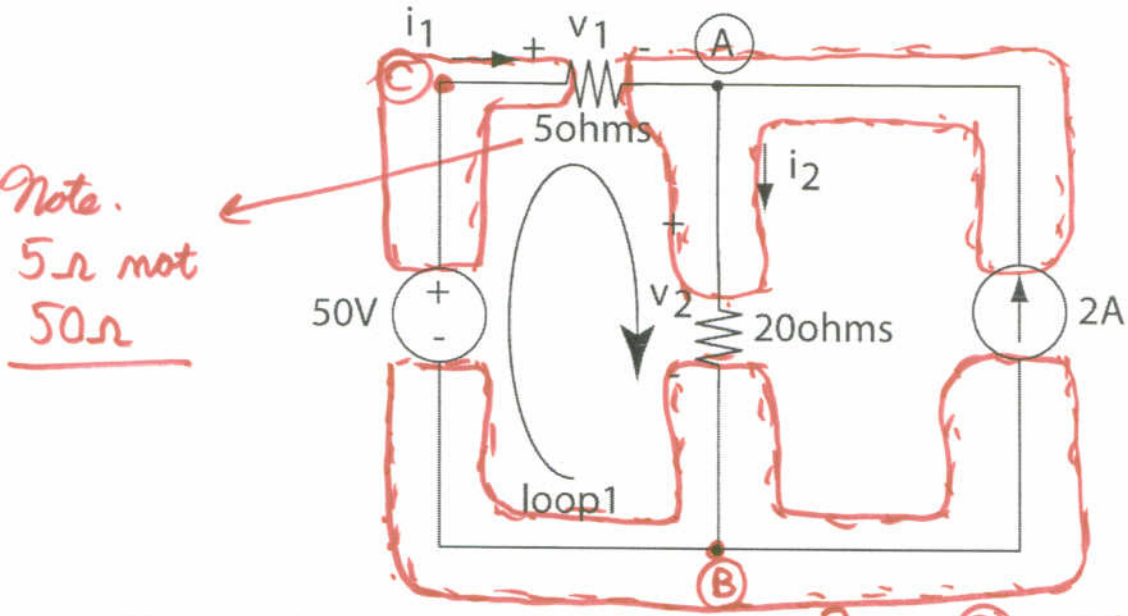
Problem 2 (10 points) COMBINED CONSTRAINTS



Note. 5Ω not 50Ω

(a) How many nodes are in the above circuit? # nodes = 3 ② — 2 for answer

(b) Write the Kirchoff's Current Law equation for all the currents at node A. Your answer should be in terms of given circuit parameters, i.e., i1, i2, etc.

$i_1 - i_2 + 2A = 0$ ② — 2 for equation

(c) Write the Kirchoff's Voltage Law equation for loop 1. Your answer should be in terms of given circuit parameters, i.e., i1, i2, etc.

$V_1 + V_2 - 50V = 0$ ② — 2 for equation

(d) What are the values of i1 and i2? / 1 for answer

I1= 0.4 amperes ②

I2= 2.4 amperes ② — 2 for good work

$i_2 = 0.4A + 2A = 2.4A$ same as I1

$i_2 = 2.4A$

$V_1 = (5\Omega)(i_1)$

$V_2 = (20\Omega)(i_2) = (20\Omega)(i_1 + 2A)$

$= 20\Omega \cdot i_1 + 40V$

$50V = V_1 + V_2$

$= 5\Omega \cdot i_1 + 20\Omega \cdot i_1 + 40V$

$10V = 25\Omega \cdot i_1$

$i_1 = 0.4A$