

ECSE-200 Electric Circuits 1
Quiz #2 (Jan. 25, 2019)

LAST NAME SOLUTIONS MCGILL ID# _____

FIRST NAME _____ SIGNATURE _____

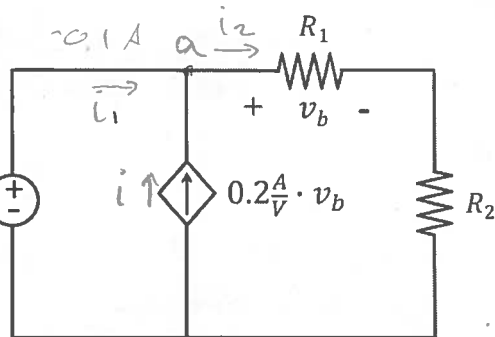
- Show all your work
- Clearly indicate your final answer
- Only a standard calculator is accepted

- Provide symbol for both the SI multiplier and SI unit in your final answer
- You have 45 minutes to complete this quiz
- Plagiarism will have important consequences

Indicate your calculator model: _____

Question 1. Consider the circuit shown. Answer the following two questions.

- What is the value of the current supplied by the dependent current source if $R_1 = R_2$? [2 pt]
- How much power does the independent voltage source deliver if $R_2 = 4R_1$? [2 pt]



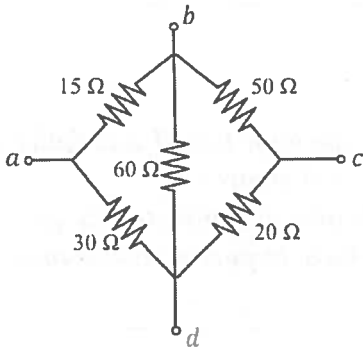
$R_1 = 10\Omega$ ← added on board

a) $i = 0.2 \frac{A}{V} \cdot v_b$ (voltage division)
 $v_b = 5V \cdot \frac{R_1}{R_1 + R_2} = 5V \cdot \frac{R_1}{R_1 + R_2} = 2.5V [+1]$
 $i = 0.2 \frac{A}{V} \cdot 2.5V = 0.5A [+1]$ $i = 0.5A$

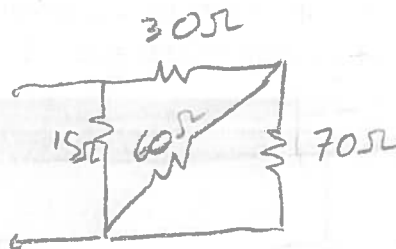
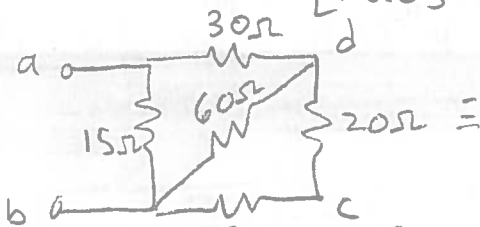
b) KCL @ node a with labeled currents $\sum_{m=1}^3 i_m = 0: -i_1 + i_2 - i = 0$
 $-i_1 + \frac{v_b}{10\Omega} - 0.2 \frac{A}{V} \cdot v_b = 0 [+0.5]$
 $v_b = 5V \cdot \frac{R_1}{R_1 + 4R_1} = 1V$
 $-i_1 + \frac{1V}{10\Omega} - 0.2A = 0$
 $-i_1 + 0.1A - 0.2A = 0$
 $i_1 = -0.1A [+1]$
 Power = $5V \cdot (-0.1A) = -0.5W$
Power delivered: $-0.5W$ [+0.5]

Question 2. Consider the circuit shown below with four terminals (a , b , c , and d). Answer the two questions below.

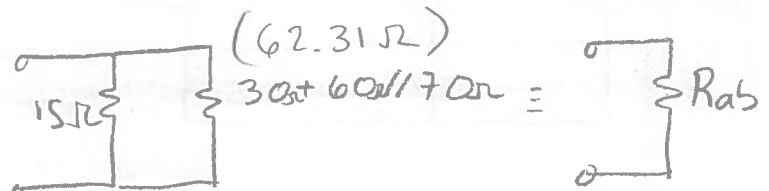
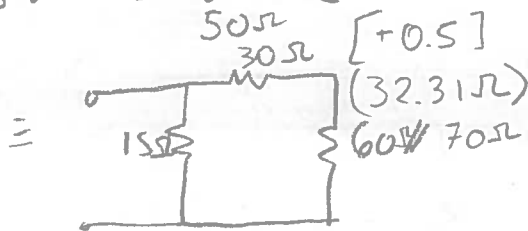
- a) What is the equivalent resistance between terminal pair ab ? [2 pt]
 b) What is the equivalent resistance between terminal pair cd ? [2 pt]



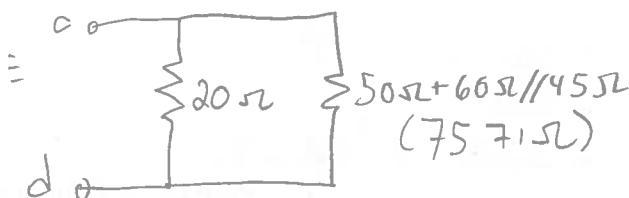
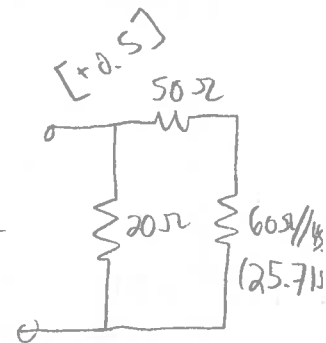
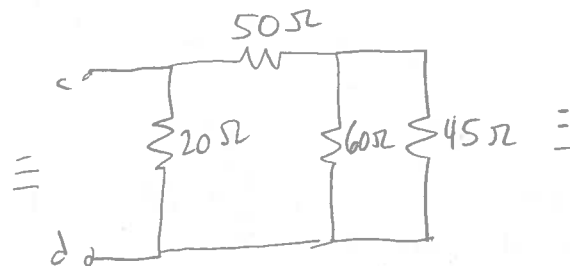
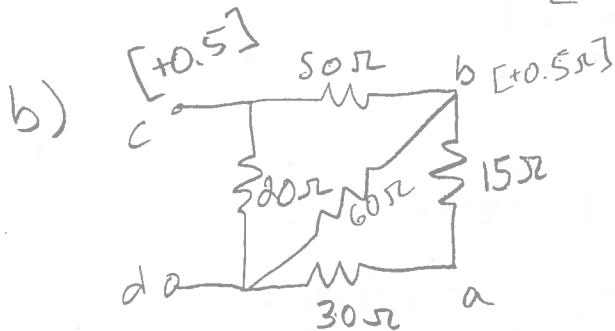
a) Redrawing the circuit + [+0.5]



$$R_{ab} = 12.09 \Omega$$

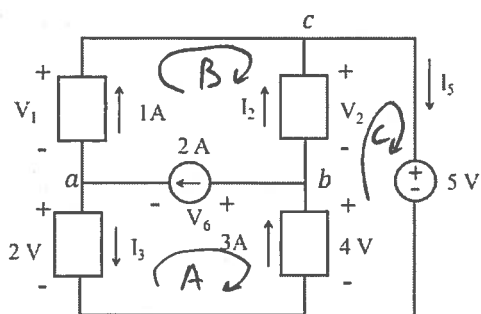


$$R_{ab} = 15 \parallel (30 + 60 \parallel 70) = 12.09 \Omega$$



$$R_{cd} = 20 \parallel (50 + 60 \parallel 45) = 15.82 \Omega$$

Question 3. Consider the circuit shown below. Answer all questions.



- Write down the KCL equation at node labeled a and solve to find I_3 . [1 pt]
- Write down the KCL equation at node labeled b , and solve to find I_2 . [1 pt]
- Write down the KCL equation at node labeled c , and solve to find I_5 . [1 pt]
- Find V_6 by solving the appropriate KVL equation. [1 pt]
- Find V_2 by solving the appropriate KVL equation. [1 pt]
- Find V_1 by solving the appropriate KVL equation. [1 pt]

[0.5]

a) KCL @ node a $+1A - 2A + I_3 = 0$

[0.5]
 $I_3 = 1A$

b) KCL @ node b $+2A + I_2 - 3A = 0$

$I_2 = 1A$

c) KCL @ node c $-1A - \underset{(+1A)}{I_2} + I_5 = 0$

$I_5 = 2A$

d) KVL loop A $-2V - V_6 + 4V = 0$

$V_6 = 2V$

e) KVL loop C $-V_2 + 5V - 4V = 0$

$V_2 = 1V$

f) KVL loop B $-V_1 + V_2 + V_6 = 0$
 $(+1V) \quad (2V)$

$V_1 = 3V$

