Name: _____SOLUTION_____ (please print)

Signature: _____

ECE 2201 – Quiz #3
March 25, 2019

Keep this quiz closed and face up until you are told to begin.

1. This quiz is closed book, closed notes. You may use one 8.5" x 11" crib sheet, or its equivalent.
2. Show all work on these pages. Show all work necessary to complete the problem. A solution without the appropriate work shown will receive no credit. A solution which is not given in a reasonable order will lose credit.
3. It is assumed that your work will begin on the same page as the problem statement. If you choose to begin your work on another page, you must indicate this on the page with the problem statement, with a clear indication of where the work can be found. **If your work continues on to another page, indicate clearly where your work can be found. Failure to indicate this clearly will result in a loss of credit.**
4. Show all units in solutions, intermediate results, and figures. Units in the quiz will be included between square brackets.
5. Do not use red ink. Do not use red pencil.
6. You will have 30 minutes to work on this quiz.

_____/20

4pm class

Room for extra work

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{ 20 Points} Device 1 can be modeled as an ideal *voltage source in series with a resistance*. Device 2 can be also modeled as an ideal *current source in parallel with a resistance*. The Devices and their current-voltage characteristics are shown in Figure 1. Device 1 and Device 2 are connected in a circuit shown in Figure 2.

a. Find the power delivered by the dependent voltage source in Figure 2.
b. Find the power delivered by the independent voltage source 8V in Figure 2.
c. Find the model for Device 1, showing its terminals A and B.
d. Find the model for Device 2, showing its terminals C and D.
e. Redraw the circuit schematic showing devices models.

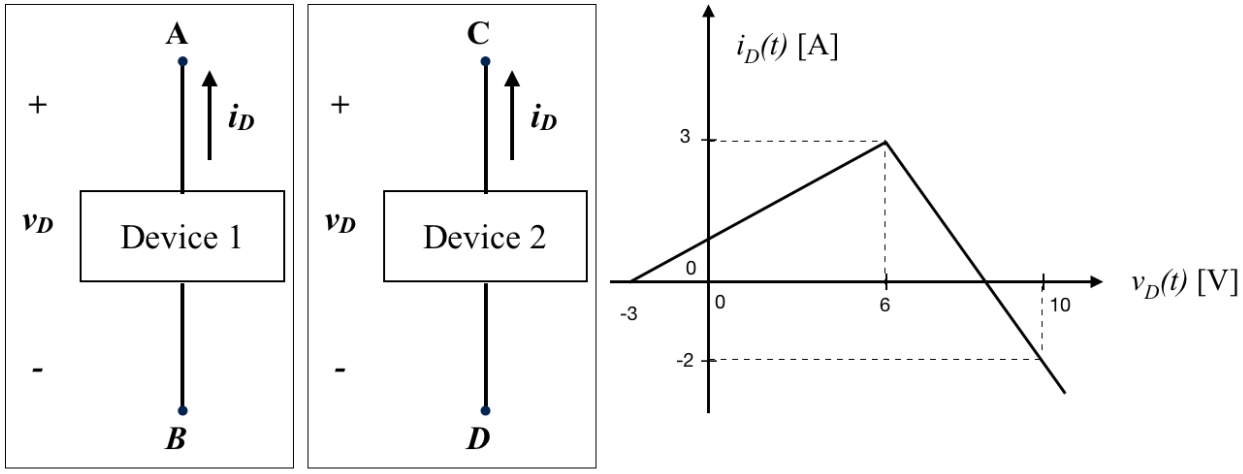


Figure 1.

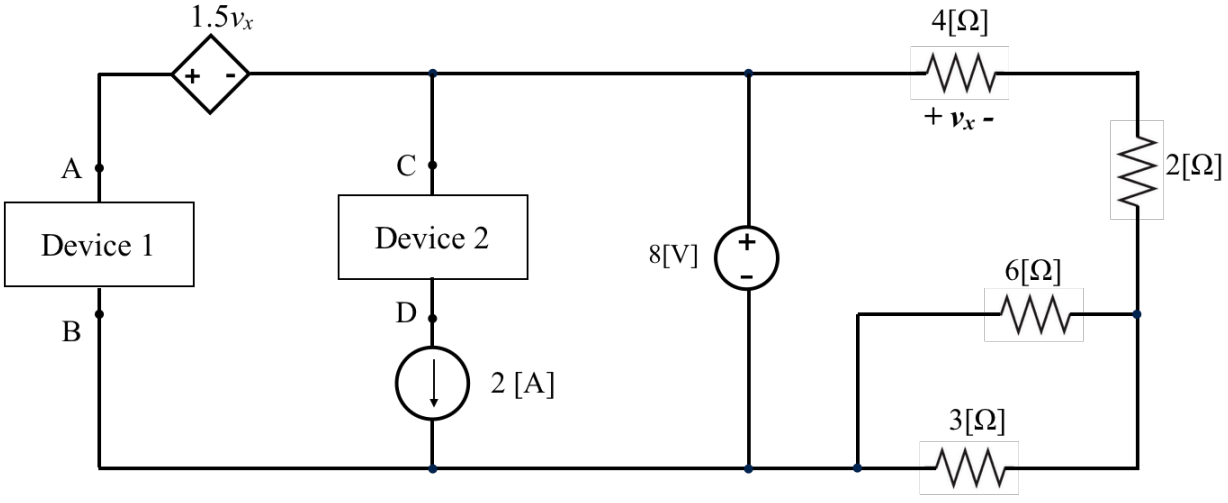
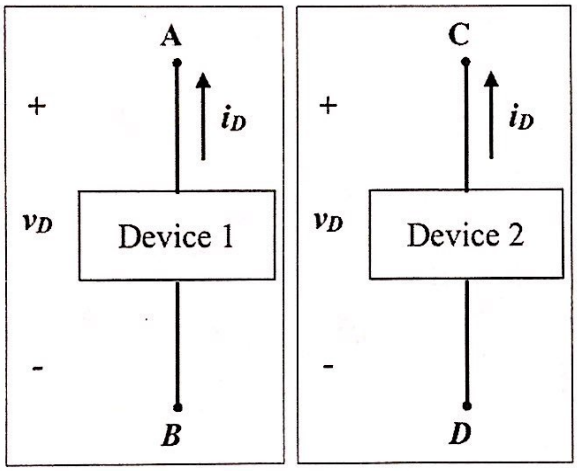


Figure 2.

Room for extra work



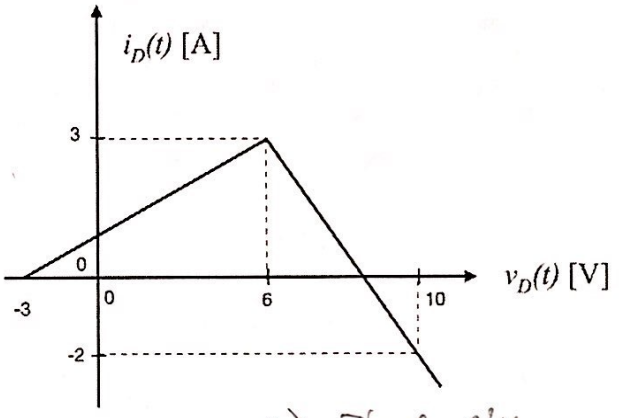


Figure 1.

a) Find v_x

$$v_x = \frac{8}{3\|6+2+4} \cdot 4[\Omega] = 4[V]$$

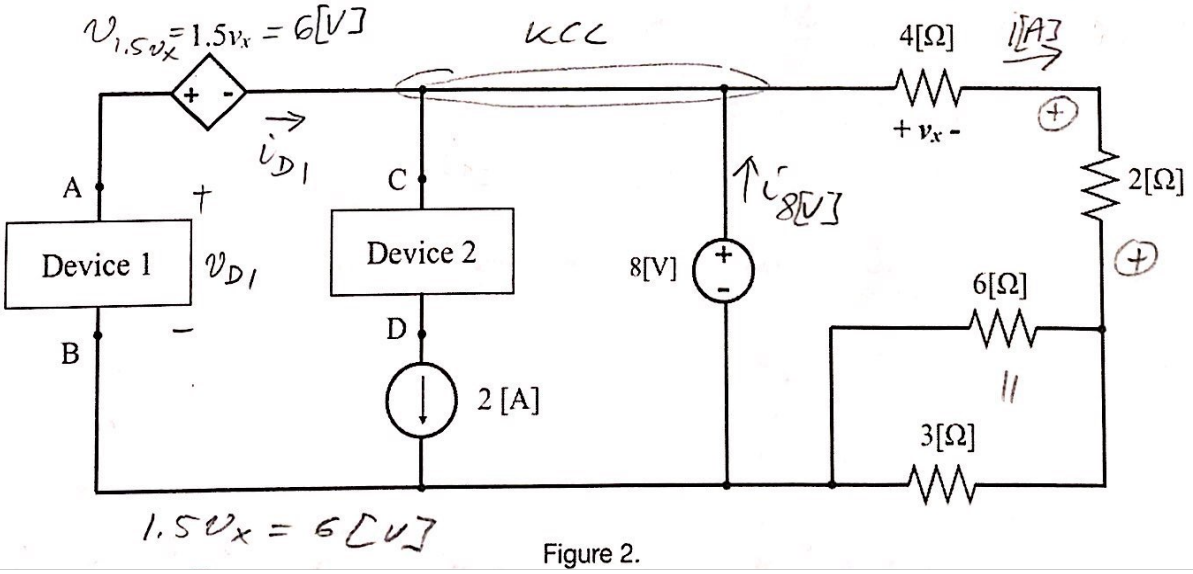


Figure 2.

$v_{D1} = 8[V] + 6[V] = 14[V]$

Device ① @ $14[V] \rightarrow i_{D1} = -\frac{5}{4} \cdot v_{D1} + 10.5[A] \rightarrow i_{D1} = -7[A]$

$P_{del, 1.5v_x} = -6[V] \cdot (-7[A]) = \boxed{42[W]}$ Power is delivered

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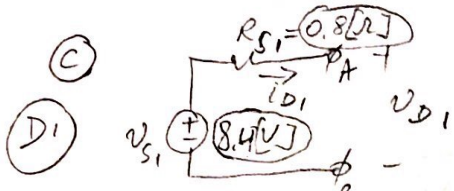
(b) KCL $-i_{D1} + 2A - i_{8[V]} + 1[A] = 0$

$i_{8[V]} = 10[A]$

$P_{del,\,8[V]} = 8[V] \cdot 10[A] = \boxed{80[W]}$

(c) (D1)



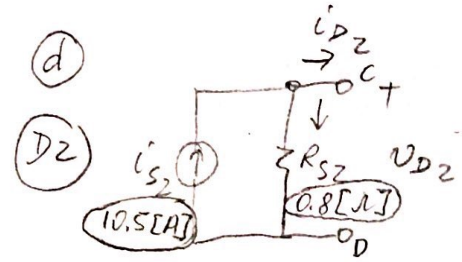
KCL $\rightarrow \boxed{v_{D1} - v_{S1} + i_{D1} \cdot R_{S1} = 0}$

$$\begin{cases} 6[V] - v_{S1} + 3[A] \cdot R_{S1} = 0 \\ 10[V] - v_{S1} + (-2[A]) \cdot R_{S1} = 0 \end{cases} \quad \Big| \times -1$$

$4[V] = 5[A] \cdot R_{S1} \rightarrow R_{S1} = 0.8[\Omega]$

$v_{S1} = 6 + 2.4 = 8.4[V]$

(d) (D2)



D2 operates @ $i_{D2} = -2[A]$

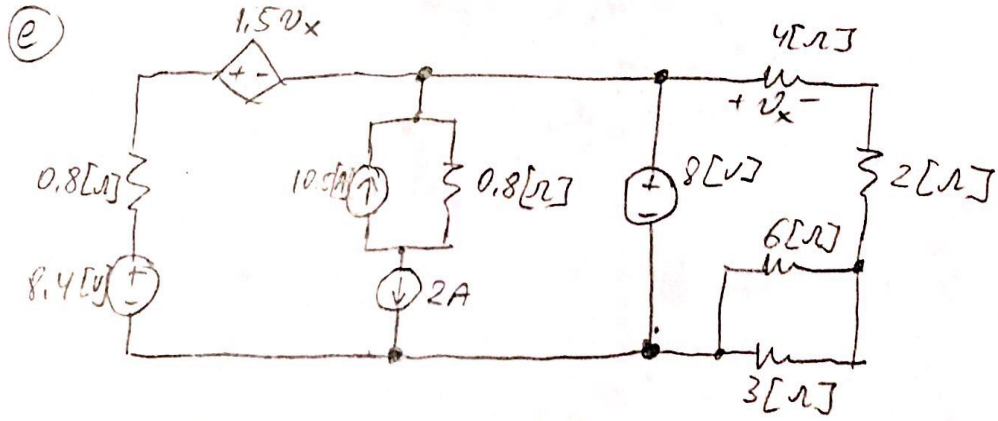
KCL $\rightarrow \boxed{i_{D2} - i_{S2} + \frac{v_D}{R_{S2}} = 0}$

$$\begin{cases} 3 - i_{S2} + \frac{6}{R_{S2}} = 0 \\ -2 - i_{S2} + \frac{10}{R_{S2}} = 0 \end{cases} \quad \Big| \times -1$$

$-5 + \frac{4}{R_{S2}} = 0 \rightarrow R_{S2} = 0.8[\Omega]$

$i_{S2} = 10.5[A]$

(e)



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