

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

Room for extra work

1pm class

{ 20 Points } Device 1 can be modeled as an ideal voltage source in series with a resistance. Device 1 and its current-voltage characteristics are shown in Figure 1. Device 2 can be also modeled as an ideal voltage source in series with a resistance. Device 2 and its current-voltage characteristics are shown in Figure 2. One Device 1 and two Devices 2 are connected in a circuit shown in Figure 3.

- Find the power delivered by the dependent current source shown in Figure 3.
- Find a model for Device 1, showing its terminals A and B.
- Find models for both Devices 2 that are valid in the circuit in Figure 3.
- Draw the circuit schematic showing models of all devices.

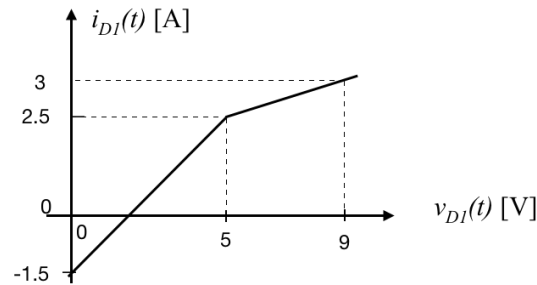
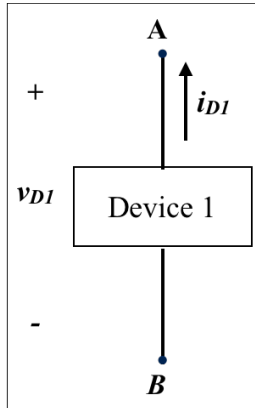


Figure 1.

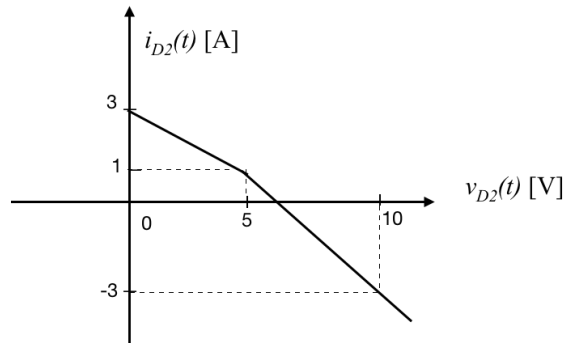
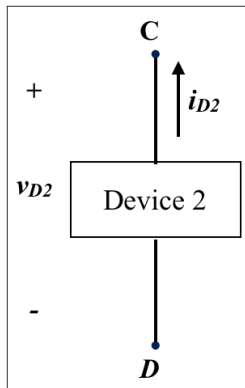


Figure 2.

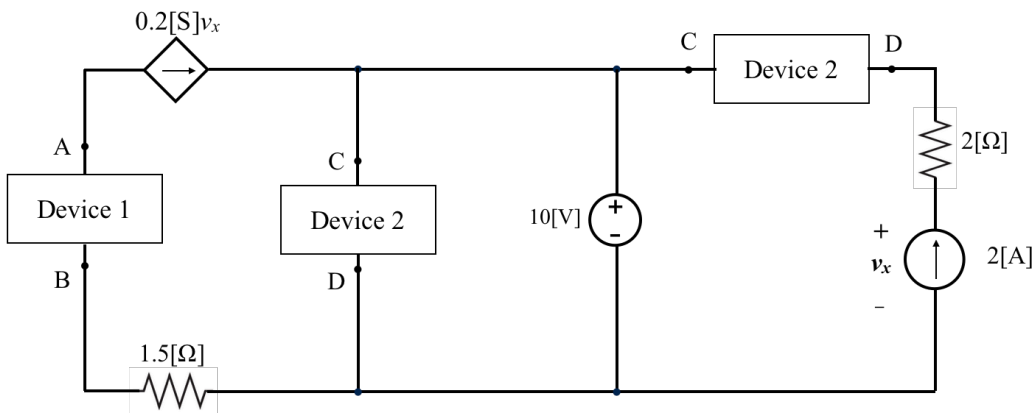


Figure 3.

Room for extra work

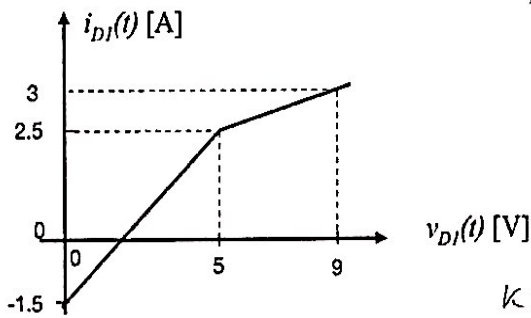
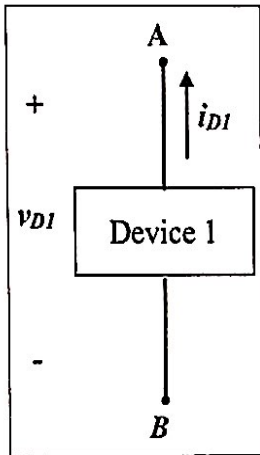


Figure 1.

a) ① Find  $v_x$   
Device 2 @ 2A range ①

$$v_{D2} = -\frac{2}{5} \cdot v_{D2} + 3 \text{ [A]}$$

$$v_{D2} |_{2A} = 2.5 \text{ [V]}$$

$$\text{KVL } \textcircled{1} -10 \text{ [V]} + 2.5 \text{ [V]} - 4 \text{ [V]} + v_x = 0$$

$$v_x = 11.5 \text{ [V]} \rightarrow 0.2 v_x = 2.3 \text{ [A]}$$

Device 1 @ 2.3 [A]

$$i_{D1} = \frac{4}{5} v_{D1} - 1.5 \text{ [A]}$$

$$v_{D1} |_{2.3 \text{ [A]}} = \frac{3.8 \cdot 5}{4} = 4.75 \text{ [V]}$$

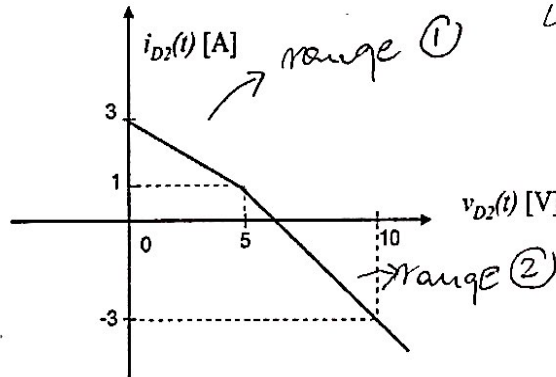
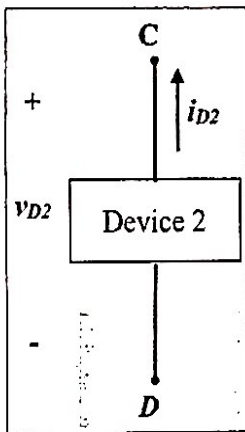


Figure 2.

$v_{DCS}$  from KVL ②

$$10 \text{ [V]} + 1.5 \text{ [\Omega]} \cdot 2.3 \text{ [A]} - 4.75 \text{ [V]} - v_{DCS} = 0$$

$$v_{DCS} = 8.7 \text{ [V]}$$

$$P_{del, 0.2 v_x} = 2.3 \cdot 8.7$$

$$= 20 \text{ [W]}$$

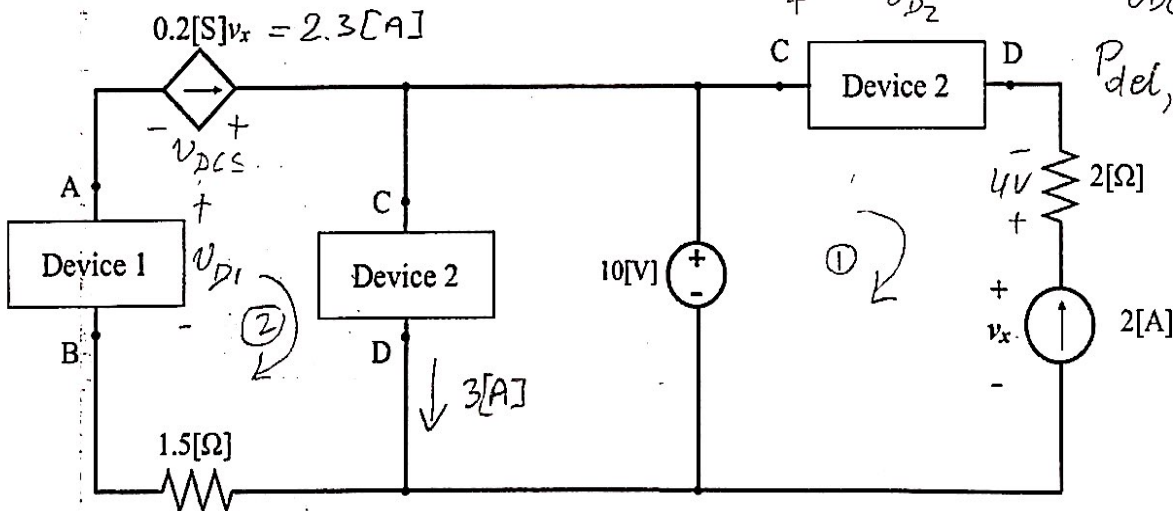
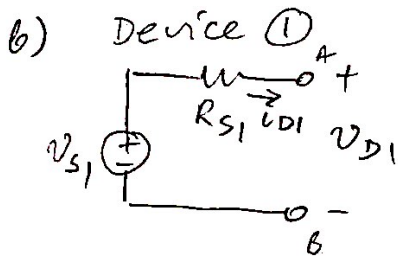


Figure 3.

Room for extra work



$$v_{D1} - v_s + i_{D1} \cdot R_s = 0$$

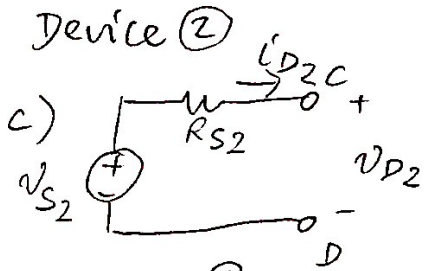
$$\begin{cases} 0 - v_s + (-1.5[A]) \cdot R_s = 0 & | \times -1 \\ 5 - v_s + 2.5[A] \cdot R_s = 0 \end{cases}$$


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$$5 + 4 R_s = 0$$

$$R_s = -\frac{5}{4} [\Omega] = -1.25 [\Omega]$$

$$v_s = 1.875 [V]$$



range ①

$$v_{D2} - v_{s2} + i_{D2} \cdot R_{s2} = 0$$

$$\begin{cases} 0 - v_{s2} + 3 R_{s2} = 0 & | \times \textcircled{1} \\ 5 - v_{s2} + 1 \cdot R_{s2} = 0 \end{cases}$$

$$R_{s2} = 2.5 [\Omega]$$

$$v_{s2} = 7.5 [V]$$

range ②

$$v_{D2}' - v_{s2}' + i_{D2}' \cdot R_{s2}' = 0$$

$$\begin{cases} 5 - v_{s2}' + 1[A] \cdot R_{s2}' = 0 \\ 10 - v_{s2}' - 3[A] \cdot R_{s2}' = 0 \end{cases} \rightarrow 5 - 4 R_{s2}' = 0$$

$$R_{s2}' = \frac{5}{4} = 1.25 [\Omega]$$

$$v_{s2}' = 5 + 1[A] \cdot 1.25 [\Omega] = 6.25$$

