

Name: \_\_\_\_\_ (please print)

Signature: \_\_\_\_\_

ECE 3355  
Quiz 4 (on-line)  
April 8, 2021

Quiz duration: 30 minutes

1. This quiz is open book, open notes. You may not, however, consult another person, verbally or online, for help. You may not submit your quiz to any site online in an effort to get help on the quiz.
2. Show all work necessary to complete the problem on these pages. A solution without the work shown will receive no credit.
3. Show units in intermediate and final results, and in figures.
4. If your work is sloppy or difficult to follow, points will be subtracted.

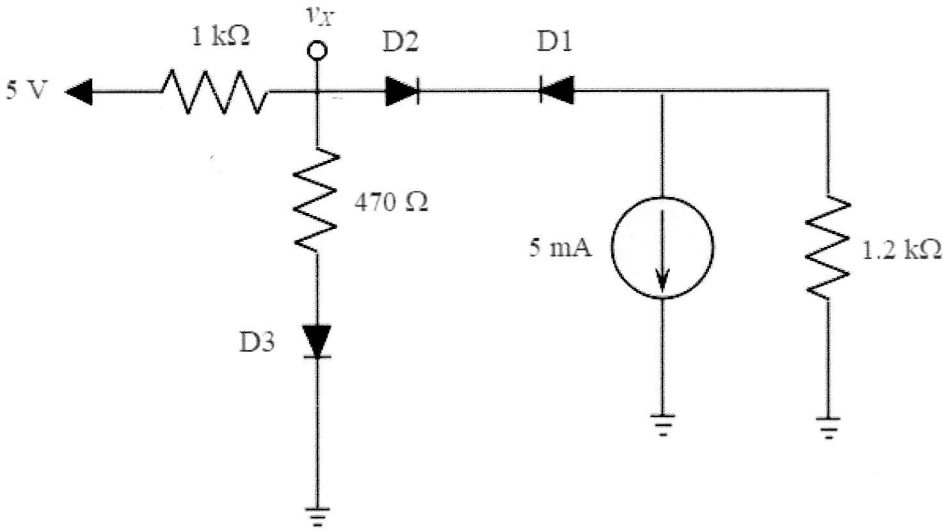
Instructions for an on-line quiz

- You will have 30 minutes to take the quiz, and 15 minutes to scan and upload it. Blackboard will stop accepting your work at 11:20 am.
- Please turn on your video, but do not focus it on the work you are doing.
- When you upload, make it a single .pdf document, and be sure it is legible and complete before uploading!
- I will be available for questions. If you need to ask a question, please use the “raise your hand” option on Zoom.

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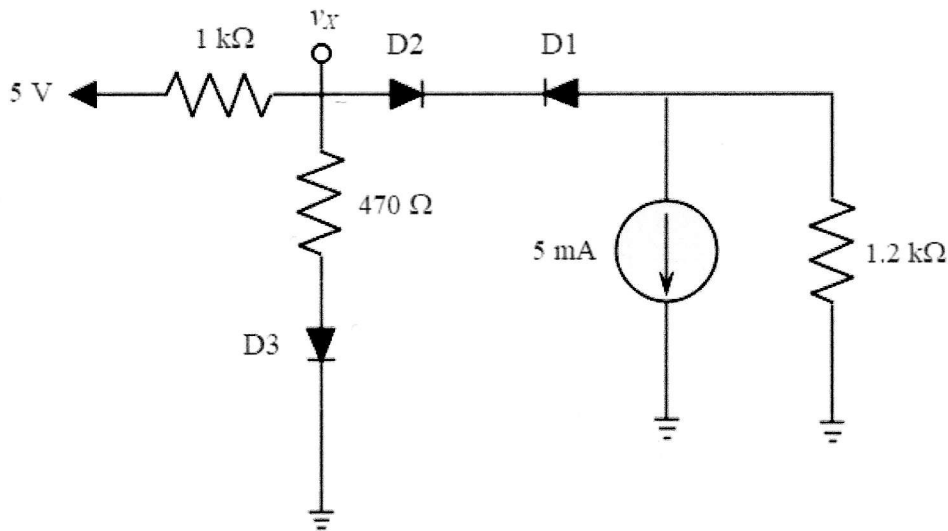
Room for Extra Work

In the circuit below, the diodes are modeled by a piece-wise linear model with  $I_S = 3 \text{ mA}$ ,  $V_f = 1.2 \text{ V}$ , and  $r_d = 0$ . Find  $v_x$ .



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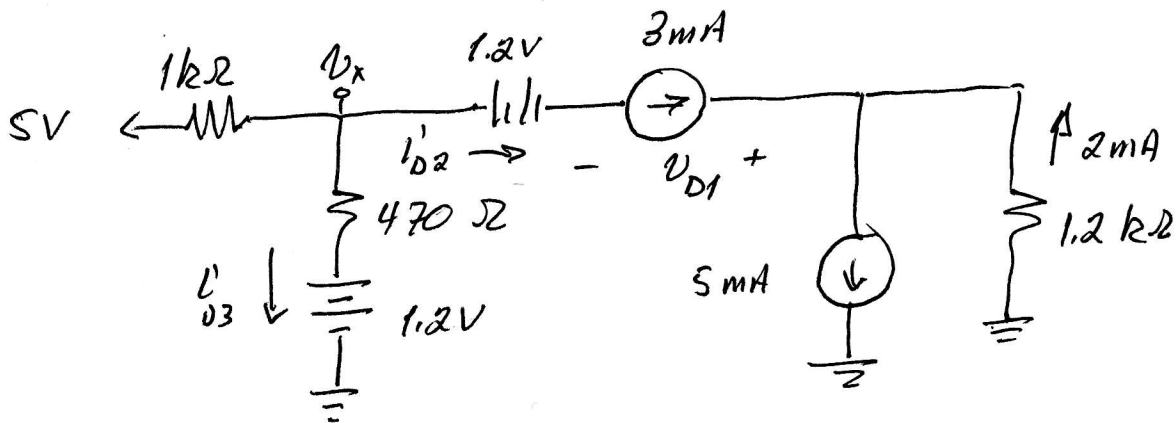
First, let's sketch the diode  $i_D - v_D$  characteristics:

we have numbered the regions and indicated voltage and current polarities as we have done in class.

As for guesses... It is clear that D1 and D2 cannot both be on since they point in opposite directions. In fact, they cannot both be in region 4, 3, or 1 since this would require currents in series to be in opposite directions.

A good guess is that D2 is on and D1 is off. We will choose D2 in (1) and D1 in (4). D3 is less obvious, but the 5V source suggests it could also be on, so we will choose region (1) for D3 as well.

Room for Extra Work



$$\frac{V_x - 5}{1000} + 0.003 + \frac{V_x - 1.2}{470} = 0 \Rightarrow V_x = 1.456 \text{ V}$$

Prove:  $I_{D3} > 0$        $\frac{V_x - 1.2}{470} = 3.1 \text{ mA} \checkmark$

$I_{D2} > 0$        $I_D = 3 \text{ mA} \checkmark$

$V_{D1} < 0$        $-V_x + 1.2 - V_{D1} - 0.002(1200) = 0$

$V_{D1} = -V_x + 1.2 - 2.4 = -2.656 \text{ V} \checkmark$

So our guesses are correct!