Name: _____ (please print)

Signature: _____

ECE 3355
Quiz 4 (on-line)
April 2, 2020

Quiz duration: 30 minutes

1. You may have one 8 ½ x 11 in. "crib" sheet, written on both sides, during the quiz. You may have any calculator you choose, but no computers. No other notes or materials will be allowed.
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.

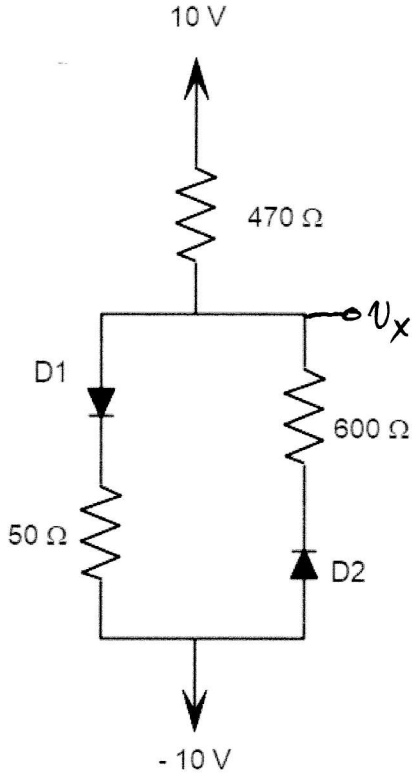
Instructions for an on-line quiz

- You will have 30 minutes to take the quiz, and 10 minutes to upload it. Blackboard will stop accepting your work at 9:50 am.
- Please turn on your video, but do not focus it on the work you are doing.
- When you upload, make it a single document, and be sure it is legible before uploading!
- I will be available for questions. If you need to ask a question, please use the "raise your hand" option on Zoom.

_____/25

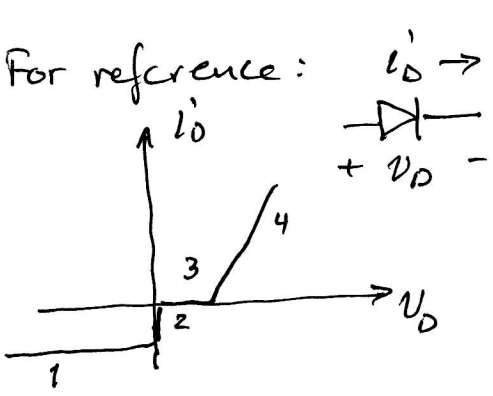
Room for Extra Work

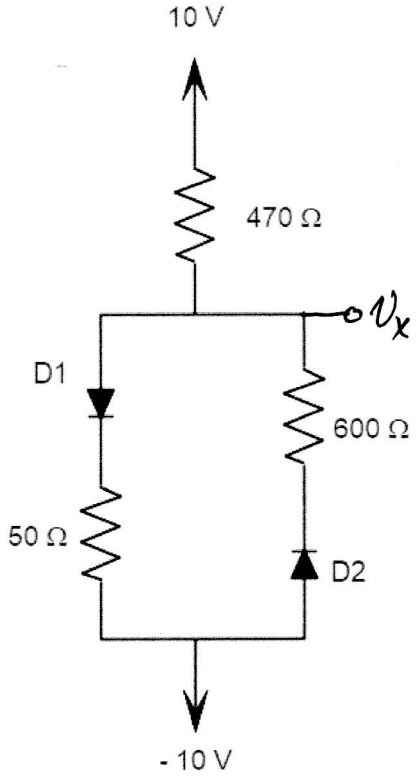
For the circuit below, find v_X. The diodes are modeled using a piecewise-linear model with the following parameters: $V_{th} = 1$ V; $r_D = 100\ \Omega$, $I_S = 10$ mA.



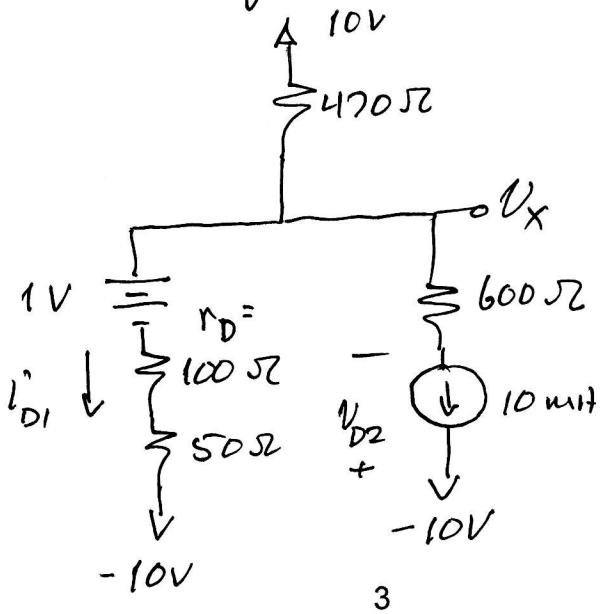
Room for Extra Work

For the circuit below, find v_X. The diodes are modeled using a piecewise-linear model with the following parameters: $V_{th} = 1$ V; $r_D = 100\ \Omega$, $I_S = 10$ mA.





Clearly, D1 and D2 are biased in opposite directions. It also seems clear that D1 is ON. Let's put D1 in region 4 and D2 in region 1.



Prove:

$i_{D1} > 0$

$v_{D2} < 0$

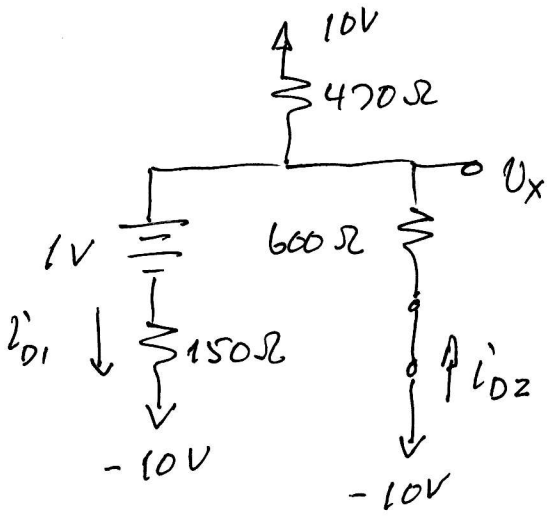
Room for Extra Work

$$\frac{V_x - 10}{470} + \frac{V_x + 10 - 1}{150} + 0.01 = 0 \Rightarrow V_x = -5.540\,V$$

$$i'_{D1} = \frac{V_x + 10 - 1}{150} = 23.06\ mA \checkmark$$

KVL: $10 + V_{D2} + 600(0.01) + V_x = 0 \Rightarrow V_{D2} = 1.54\,V$ X BAD ASS.

Let's try region 2 for D2: we need $0 > i'_{D2} > -10\,mA$



$$\frac{V_x - 10}{470} + \frac{V_x + 10 - 1}{150} + \frac{V_x + 10}{600} = 0$$

$$\Rightarrow V_x = -5.295\,V$$

$$i'_{D1} = \frac{V_x + 10 - 1}{150} = 24.7\ mA \checkmark$$

$$i'_{D2} = -\frac{V_x + 10}{600} = -7.842\ mA \checkmark$$

So this is the correct guess and

$$\boxed{V_x = -5.295\,V}$$