Name: _____ (please print)

Signature: _____

ECE 3455
# Quiz #3
October 25, 2007

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.

SOLUTIONS

_____ /20

In the figure below, the diodes are characterized by the piecewise linear model with the following parameters: $I_S = 0.001$ A; $r_d = 50$ Ω; $V_{th} = 0.5$ V. Find V_x.
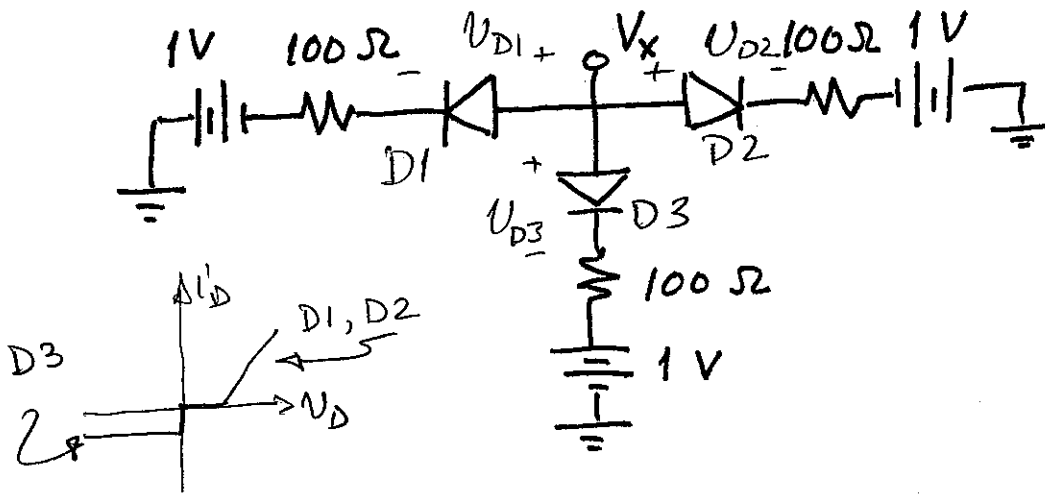
Based on the polarities of the 1 V batteries relative to the polarity of v_D (labeled above), we will guess that D1 and D2 are conducting (forward bias) and D3 is in reverse bias.

includes 50Ω for r_d
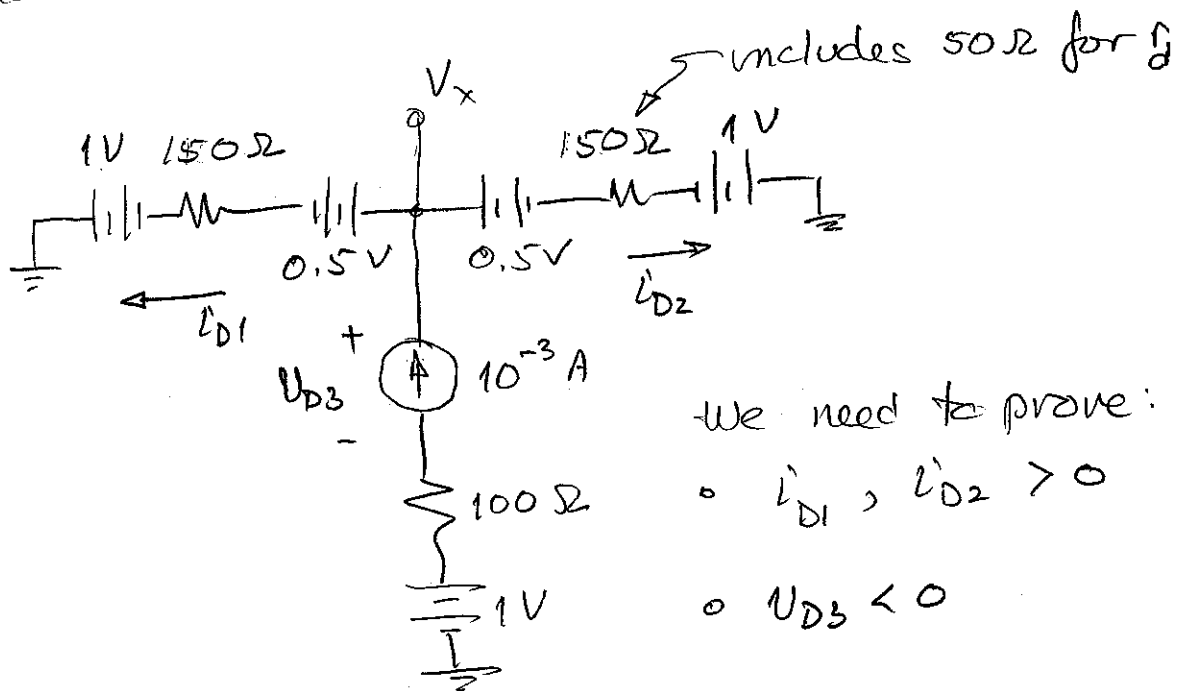
We need to prove:
- i'_{D1}, $i'_{D2} > 0$
- $v_{D3} < 0$

2. $\dfrac{V_x + 1 - 0.5}{150} = 0.001$

$2V_x + 1 = 0.150 \implies V_x = -0.425$

Then $\quad L'_{D_1} = L'_{D_2} = \dfrac{V_x + 1 - 0.5}{150} = 0.5 \text{ mA} \quad \checkmark$

$V_{D3} = V_x - 1 + 10^{-3} \cdot 100 = -1.325 \text{ V} \quad \checkmark$

So our guess was correct, and $\underline{\underline{V_x = -0.425 \text{ V}}}$