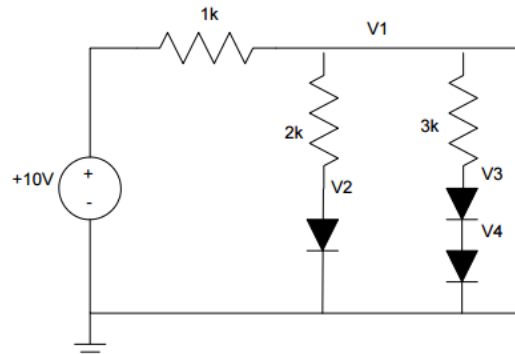# ECE 320 - Solution to Homework #3

Ideal Diode, Light Emitting Diodes. Due monday, September 14th

1) For the following circuit, determine the voltages at each node. Assume ideal silicon diodes.
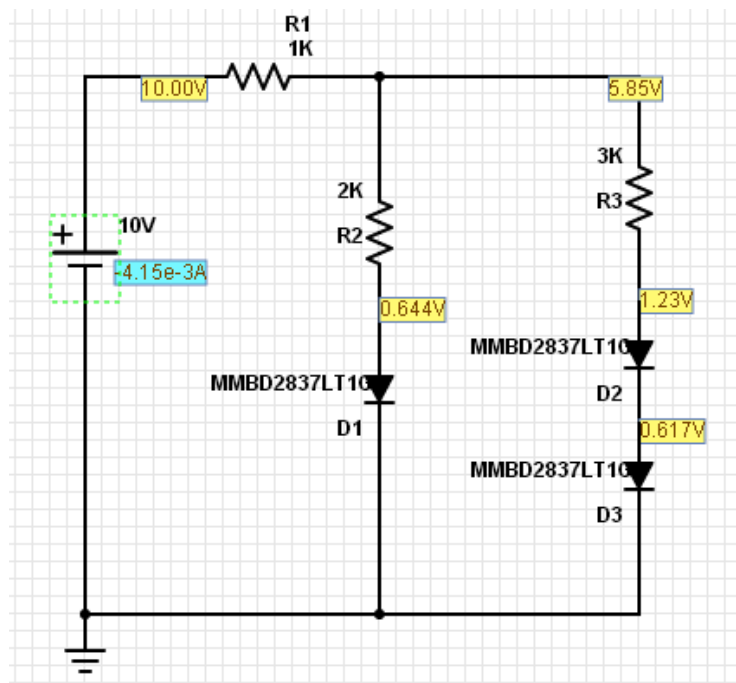

Assume all diodes on

V2 = 0.7V

V4 = 0.7V

V3 = 1.4V

Use voltage nodes to solve for V1

$$\left(\frac{V_1-10}{1k}\right) + \left(\frac{V_1-0.7}{2k}\right) + \left(\frac{V_1-1.4}{3k}\right) = 0$$
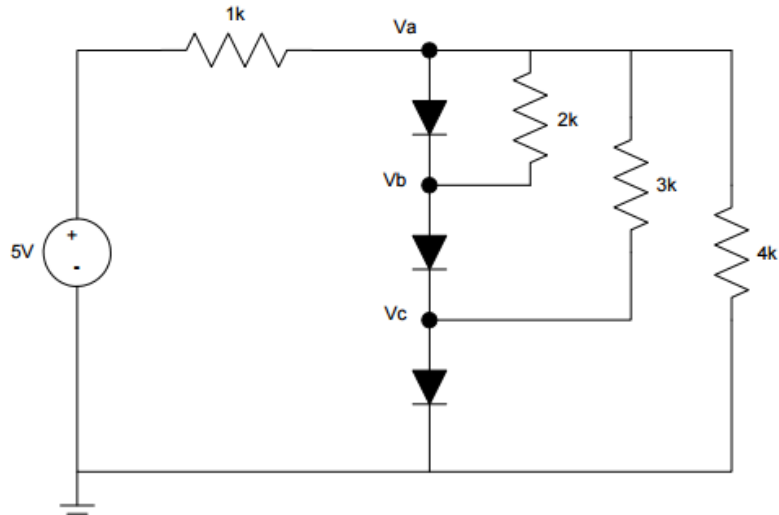
V1 = 5.90 V

2) Determine the voltages using PartSim (or similar circuit simulator).

3) (Lab) Build this circuit and check your answers.

Problem 1-3)

4) For the following circuit, determine the voltages at each node. Assume ideal silicon diodes.

Assume the top diode is off, the other two are on

    $Vc = 0.7V$

    $Vb = 1.4V$

Solve for Va

$$\left(\frac{V_a-5}{1k}\right) + \left(\frac{V_a-1.4}{2k}\right) + \left(\frac{V_a-0.7}{3k}\right) + \left(\frac{V_a}{4k}\right) = 0$$

    $Va = 2.848V$

Diode 1 is on, so my assumption was off. Try again with all diodes on
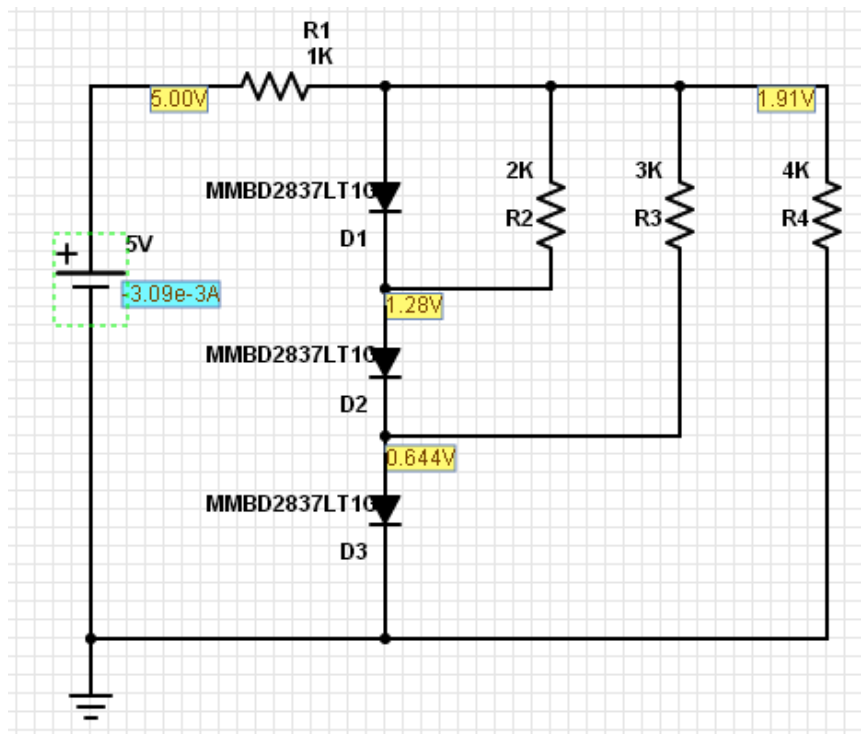
    Va = 2.1V

    Vb = 1.4V

    Vc = 0.7V

Check: the current from Va to the diode is positive

$$\left(\frac{5-2.1}{1k}\right) = I_d + \left(\frac{2.1-1.4}{2k}\right) + \left(\frac{2.1-0.7}{3k}\right) + \left(\frac{2.1}{4k}\right)$$

$Id = 1.558mA > 0mA$

5) Determine the voltages using PartSim (or similar circuit simulator).

6) (Lab) Build this circuit and check your answers.

The Piranah RGB LEDs in lab have the followign specifications:

7) Design a circuit to produce yellow light with a 5V source
- Red = 255
- Green = 236
- Blue = 67

	Red	Green	Blue
Vf @ 20mA	2.1	3.6	3.6
mcd @ 20mA	8,000	8,000	8,000
Desired mcd	255	236	67
Desired Current (mA)	0.64	0.59	0.17
R	4,549.02	2,372.88	8,358.21
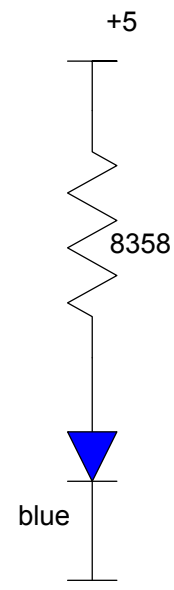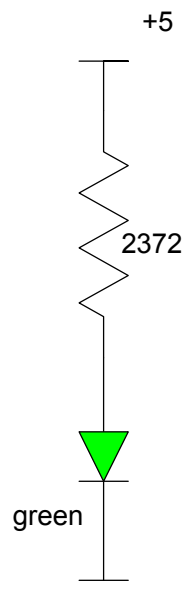
8) Design a circuit to produce NDSU green with a 5V source
- Red = 16
- Green = 64
- Blue = 0

	Red	Green	BlueVf
Vf @ 20mA	2.1	3.6	3.6
mcd @ 20mA	8,000	8,000	8,000
Desired mcd	16	64	0.1
Desired Current (mA)	0.04	0.16	0
R	72,500	8,750	5,600,000

+5	+5	+5
72.5k	8.75k	n/c
red	green	blue