ECE 320 - Homework #3

Diodes, Ideal Diodes, LEDs. Due Monday, September 16th

1) Assume the VI characteristics for a diode are

$$V_d = 0.052 \ln\left(\frac{I_{dss}}{10^{-8}} + 1\right) \qquad I_{ds} = 10^{-8} \left(\exp\left(\frac{V_{ds}}{0.052}\right) - 1\right)$$

For the circuit below on the left

- Write the votlage node equations
- Solve for V1 (probably using *fminsearch* in Matlab)
- 2) Check your results in CircuitLab (or similar program)
- 3) Assume an ideal silicon diode (Vf = 0.7V). Determine the voltages and currents
- 4) For the circuit below on the right
 - Write the votlage node equations assuming non-ideal diodes (exponential VI relationship)
 - Solve for V1, V2, and V3 (probably using *fminsearch* in Matlab)
- 5) Check your results using Circuit Lab (or similar program)
- 6) Assume an ideal silicons diode (Vf = 0.7V). Determine the voltages and currents

7) Lab: Build both of these circuits in lab and measure the voltages. Do they match your computation and simulation results?



LEDs

The specifications for a Piranah RGB LED are

Color	Vf @ 20mA	mcd @ 20mA
red	2.0V	10,000
green	3.2V	10,000
blue	3.2V	10,000

8) Design a circuit to drive these LEDs with a 10V source to produce hot pink:

- Red = $9450 \mod (241/255)$
- Green = 549 mcd (14/255)
- Blue = 7960 mcd (203/255)

9) Design a circuit to drive these LEDs with a 10V source producing leaf green:

- $\text{Red} = 7529 \mod (192/255)$
- Green = $9450 \mod (241/255)$
- Blue = $705 \mod (18/255)$

Other colors can be obtained from

https://www.rapidtables.com/web/color/color-wheel.html