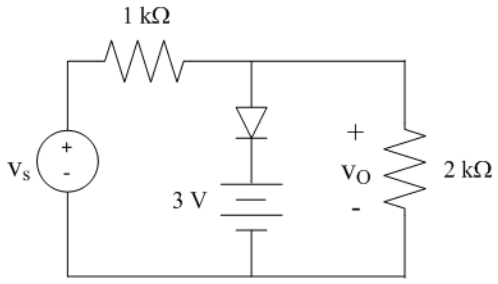
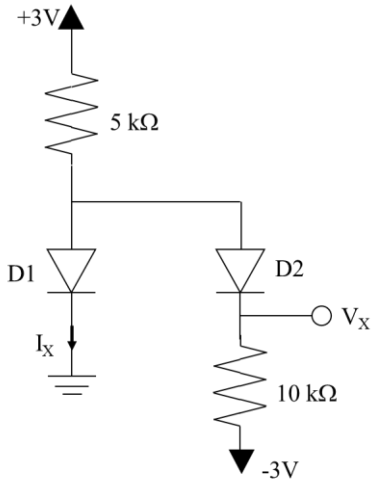
EE 315 – Module 3 Practice Problems

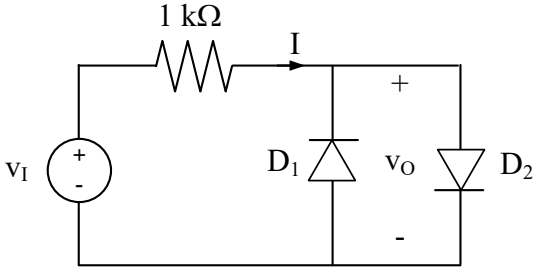
1. For the following circuit assume that the source voltage is a square wave with a peak voltage of 6 volts and has a zero average value. For the following circuit, sketch the voltage, $v_O(t)$ and find the average value. Assume ideal diode.



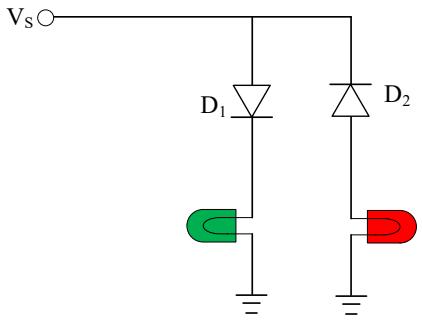
2. For the following circuit, find the voltage, V_x and the current, I_x. Assume ideal diodes



3. For the following circuit, $v_I = 10\cos(t)$ volts. Assume ideal diodes.
   a. For what values of v_I is diode 1 on?
   b. For what values of v_I is diode 2 on?
   c. What is the peak current value, I (magnitude only required).
   d. Plot the voltages, v_I and v_O.

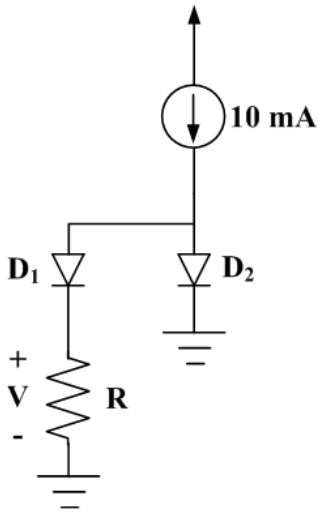


4. Consider the following circuit. The voltage, V_S, can be either +3V, 0V, or -3V. The LED lights require +3 volts dropped across them in order to light up. Assume ideal diodes.

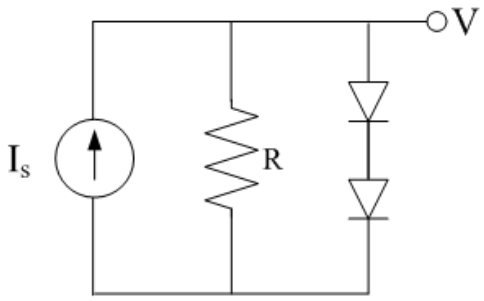


   a. What does V_S need to be for the green light (only) to be on?
   b. What does V_S need to be for the red light (only) to be on?
   c. Can both lights be on simultaneously?

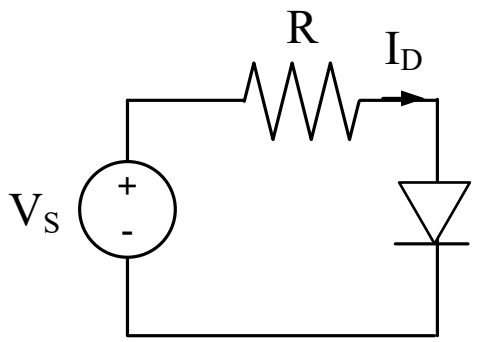
5. Consider the following circuit. The diodes are identical and operate in the forward bias region at room temperature. Find the value of the resistor, R, such that the voltage drop, V is 80mV.



6. Consider the following circuit. The diodes are identical and have a current of 1mA for a voltage of 0.7V. The source current is 100mA. Design the resistor, R, such that the voltage, V is 1.6V.

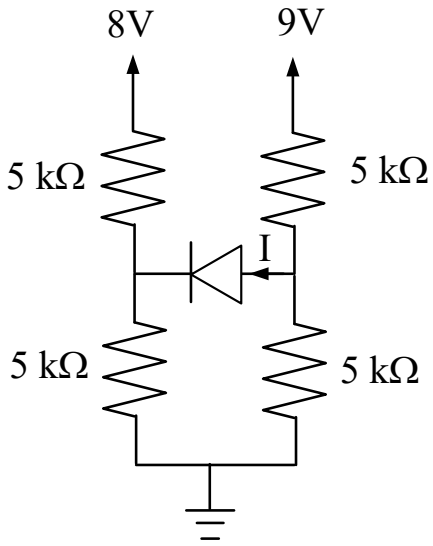


7. Consider the following circuit where the voltage source is 1V and the resistor is 200 ohms. The diode is known to have 1mA at 0.7V.

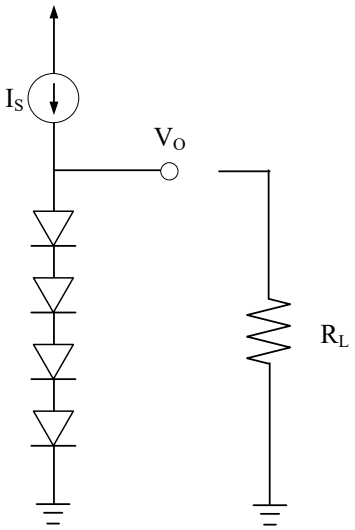


   a. What is the current, I_D assuming an ideal diode?
   b. What is the current, I_D assuming a 0.75 constant drop model?
   c. What is the current, I_D using the iterative process using the exponential model?

8. Consider the following circuit. Find the current I using (a) the ideal model and (b) using a 0.7V constant drop model of the diode. Hint! Use Thevenin equivalent circuits to simplify the circuit.



9. Consider the following circuit. The diodes are identical with a saturation current of $1X10^{-16}$ A. What should the current I_S be to obtain an output voltage of 2.8V? Suppose a load resistor is connected at the output and draws 0.1mA of current from the diodes. What is the change in the output voltage?



10. Consider the following circuit, which contains a 9.1 V zener diode. It is know that when the zener voltage is 9.1V, the zener current is 3mA. The incremental zener resistance is 25Ω. Find the resistor R, if the zener current is 5mA.