Electronics Homework Set #5

Chapter 3 : #4, 5, 7, 8, 10, 15

Problem 3.4

Recall that the forward voltages of small-signal silicon diodes decrease about 2 mV/K. Such a diode has a voltage of 0.600 V, with a current of 1.00 mA at a temperature of 25°C. Find the diode voltage at 1.00 mA and a temperature of 175°C.

Problem 3.5

Sketch i against v to scale for the circuits shown in the figure below. The diodes are typical small-signal silicon devices at 300K. The reverse breakdown voltages of the Zener diodes are shown. Assume 0.6V for all diodes (including Zeners) in the forward-bias region.
Problem 3.7

A certain diode is at a temperature of 25°C. Suddenly, a forward current of 100 mA is applied, and the diode voltage becomes 0.65V. After several minutes, the diode warms due to its power dissipation, and the voltage is 0.45V. Estimate the diode temperature.

Problem 3.8

Sometimes we may want to obtain a reference voltage by combining ordinary diodes in series, rather than using a Zener diode. How many diodes must be placed in series to obtain a 3-V reference voltage? Assume that each diode has a forward voltage drop of 0.6V. By what percentage does this voltage change when the temperature increases by 10°C?

Problem 3.10

Consider the circuit below. Draw the load line for the circuit for a 1.0 V source and R = 500 Ω. Repeat for a 0.5 V source and R = 500 Ω.

Does the slope of the load line change when the source voltage changes?
-- No

Find and expression for slope of the load line in terms of the circuit resistance R.
Slope = -1 / R

Problem 3.15

Assuming the diodes are ideal, find the values of I and V for each of the following circuits.