HW5

Due 5/17 at 3:00PM on Gradescope

Please write your answers in the boxes provided for Part 2.

You are not required to submit the solutions to Part 1. (Please still include these pages in the submission so Gradescope knows how many pages to expect.)

Part 1 (Practice Problems):

Q1. Textbook Problem 9.6

Sketch *i* versus *v* to scale for the circuits shown in Figure P9.6. The reverse-breakdown voltages of the Zener diodes are shown. Assume voltages of 0.6V for all diodes including the Zener diodes when current flows in the forward direction.

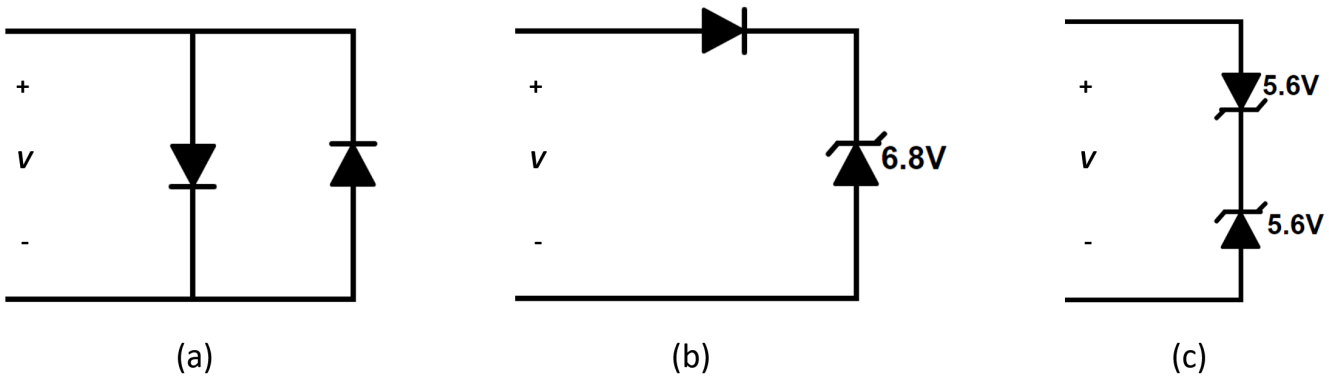

Figure P9.6

Q2. Textbook Problem 9.37

Find the values of *I* and *V* for the circuits of Figure P9.37, assuming that the diodes are ideal.

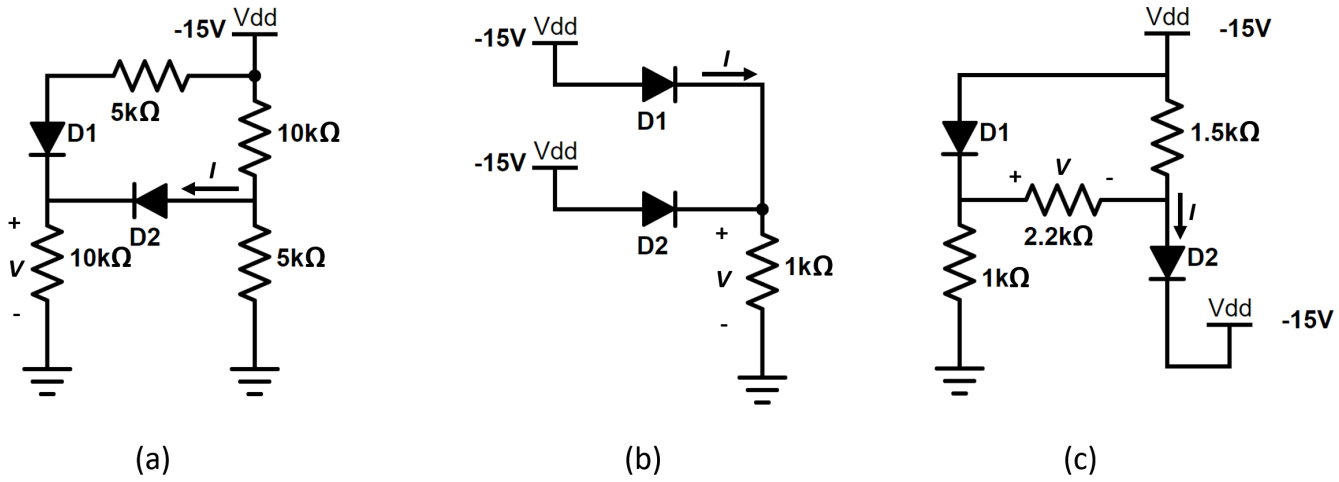

Figure P9.37

Q3. Textbook Problem 9.59

Consider the battery-charging circuit shown in Figure 9.25 on page 476, in which $v_s(t) = 10\sin(200\pi t)$, $R = 80\Omega$, $V_B = 12V$, and the diode is ideal.

a. Sketch the current $i(t)$ to scale versus time.
b. Determine the average charging current for the battery.

[Hint: The average current is the charge that flows through the battery in one cycle divided by the period.]

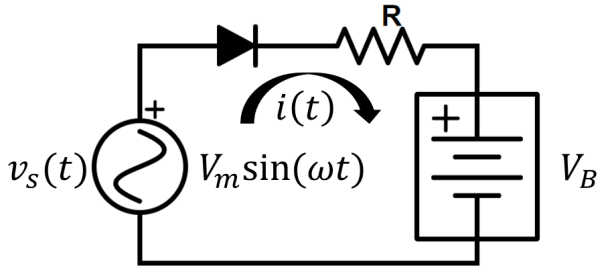

Figure 9.25

Q4. Textbook Problem 9.63

Sketch to scale the output waveform for the circuit shown in Figure P9.63. Assume that the diodes are ideal.

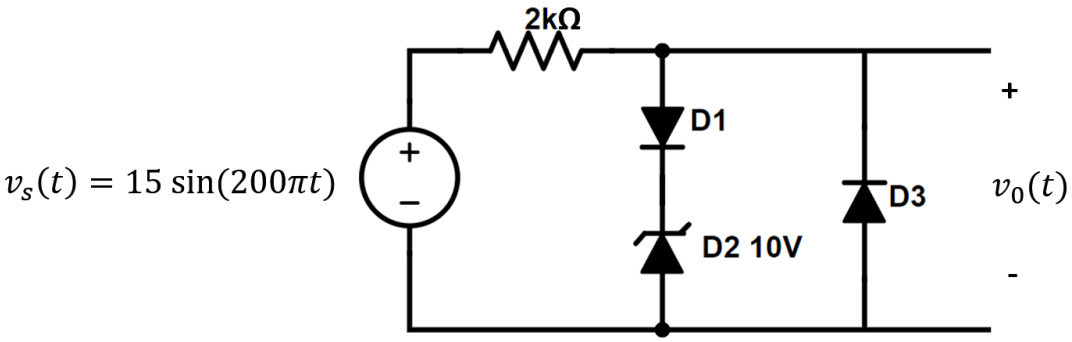

Figure P9.63

Q5. Textbook Problem 9.28

Consider the voltage regulator shown in Figure P9.28. The source voltage V_s varies from 10 to 14V, and the load current i_L varies from 50 to 100mA. Assume that the Zener diode is ideal. Determine the largest value allowed for the resistance R_s so that the load voltage v_L remains constant with variations in load current and source voltage. Determine the maximum power dissipation in R_s.

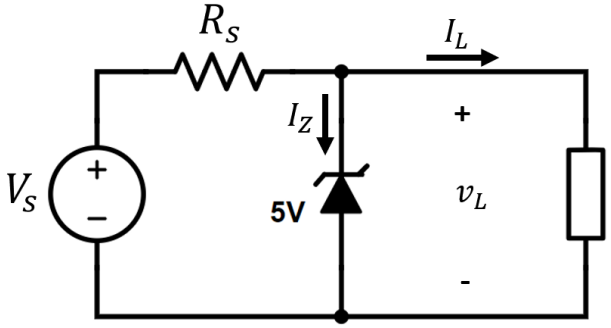

Figure 9.28

Part 2 (Graded)

Q1. Textbook Problem 9.40

The circuit shown in Figure P9.40(a) is a type of logic gate. Assume that the diodes are ideal. The voltages V_A and V_B independently have values of either 0V (for logic 0, or low) or 5V (for logic 1, or high). For which of the four combinations of input voltages is the output high (i.e., $V_0 = 5V$)? What type of logic gate is this? Repeat for the circuit of Figure P9.40(b).

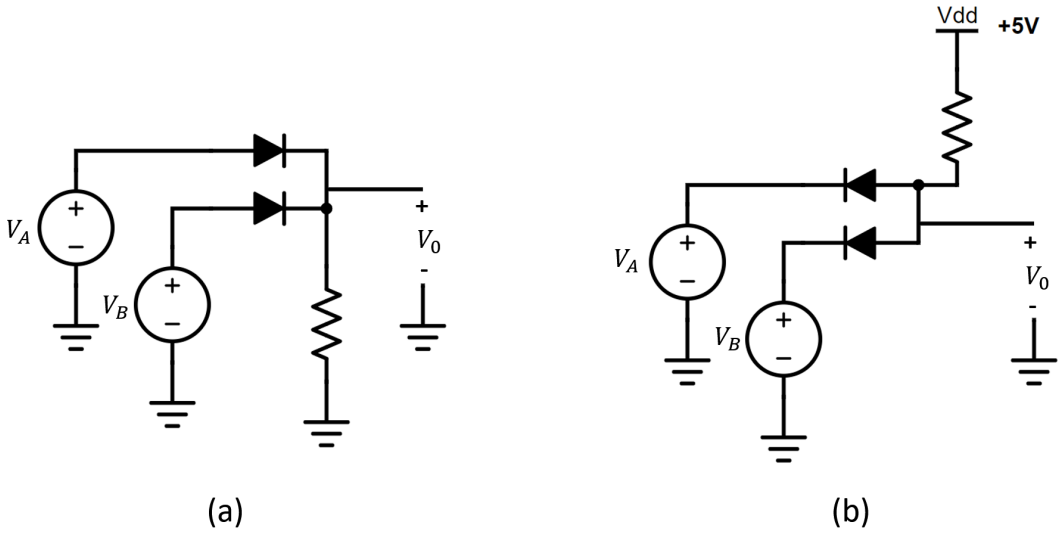

Figure 9.40

V_A	V_B	(a) V_0	(b) V_0
Low	Low		
Low	High		
High	Low		
High	High		

Q2. Textbook Problem 9.66

Sketch the transfer characteristic (v_0 versus v_{in}) to scale for the circuit shown in Figure P9.66. Allow v_{in} to range from -5V to +5V and assume that the diodes are ideal.

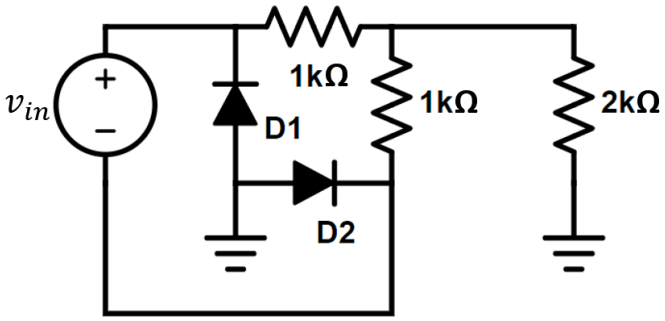

Figure P9.66

Add your sketch here:

Q3. Textbook Problem 9.70

Sketch to scale the steady-state output waveform for the circuit shown in Figure P9.70. Assume that *RC* is much larger than the period of the input voltage and that the diodes are ideal.

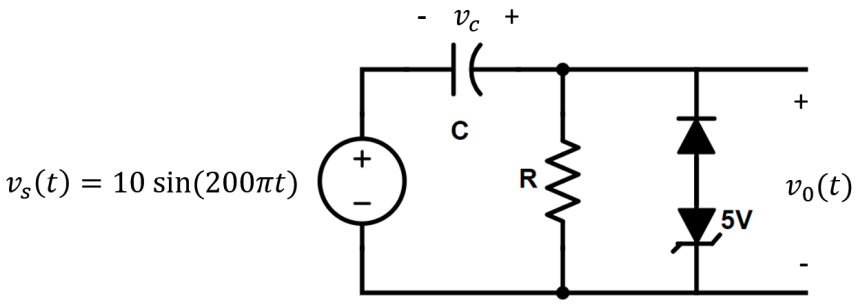

Figure P9.70

Add your sketch here:

Q4. Textbook Problem 9.72

Design a clipper circuit to clip off the portions of an input voltage that fall above 3V or below -5V. Assume that diodes having a constant forward drop of 0.7V are available. Ideal Zener diodes of any breakdown voltage required are available. DC voltage sources of any value are available.

Answer: