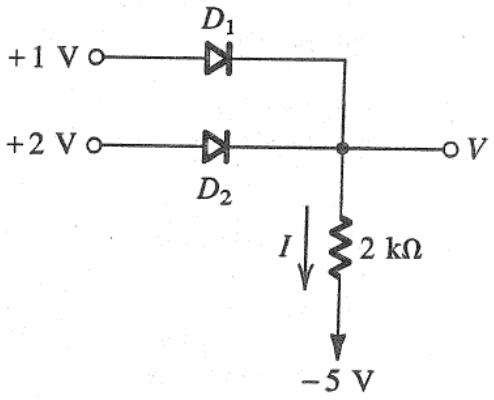
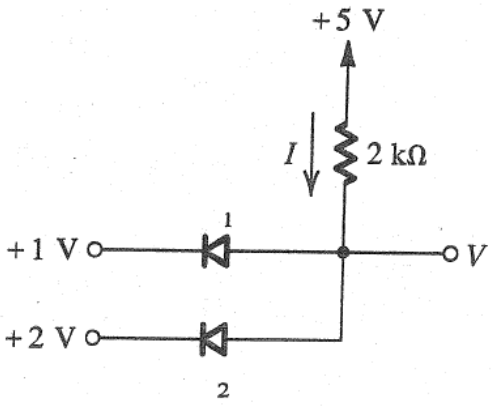
EE2303 CH3 Diodes Homework Problems

3.2 For the circuits shown in Fig. P3.2 using ideal diodes, find the values of the labeled voltages and currents



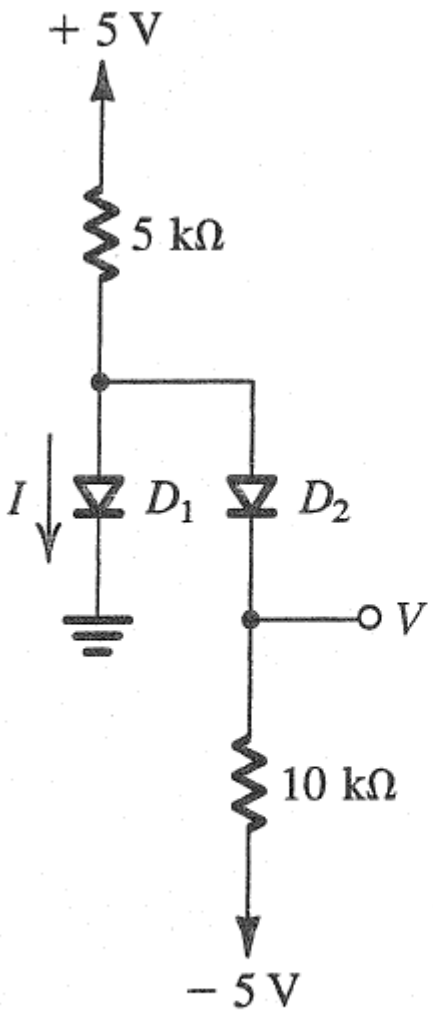
(a)



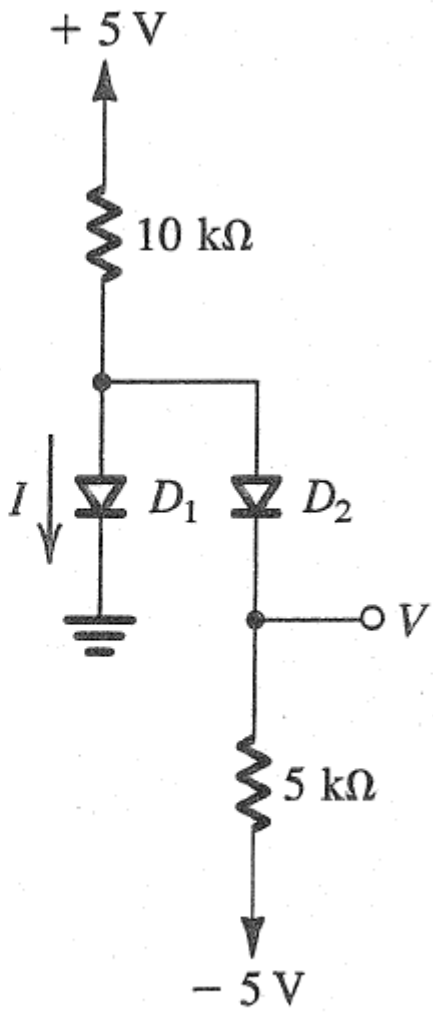
(b)

Figure P3.2

3.7 Assuming that the diodes in the circuits of Fig. P3.7 are ideal, find the values of the labeled voltages and currents.



(a)



(b)

Figure P3.7

3.8 Assuming that the diodes in the circuits of Fig. P3.8 are ideal, utilize Thévenin's theorem to simplify the circuits and thus find the values of the labeled currents and voltages.

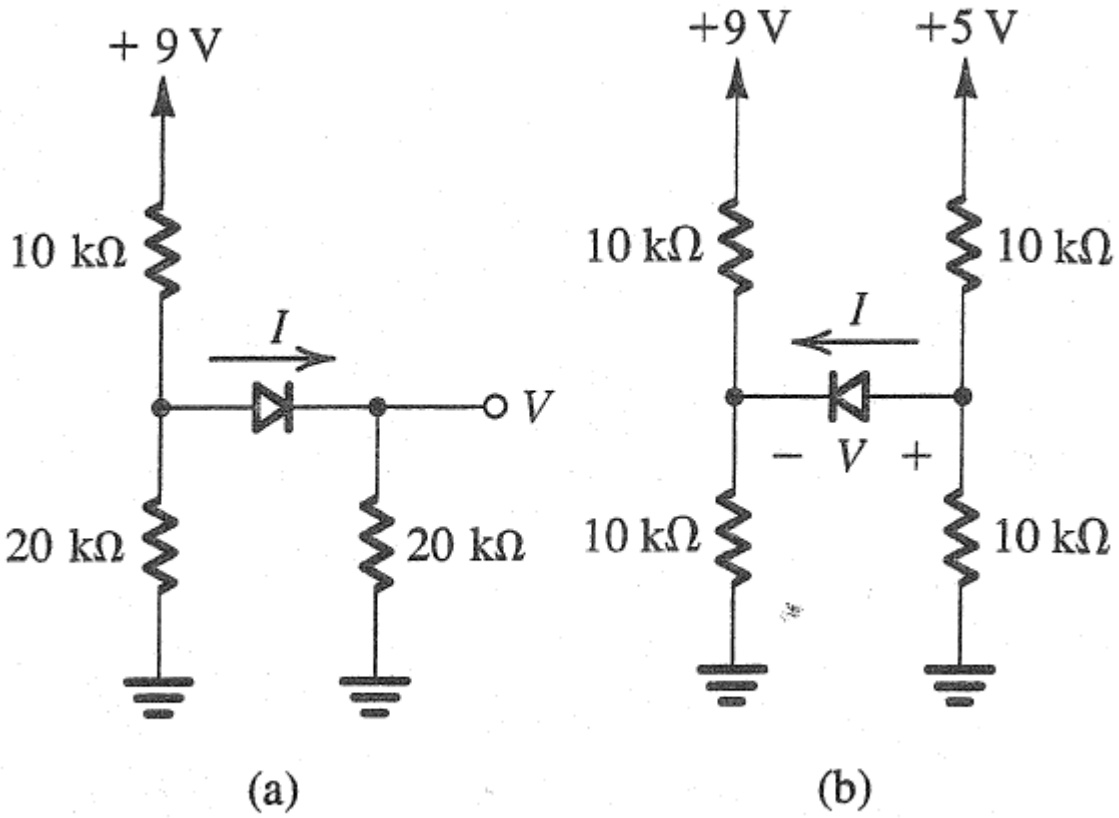


Figure P3.8

3.33 For the circuits in Fig. P3.7, using the constant-voltage-drop ($V_D = 0.7$ V) diode model, find the values of the labeled currents and voltages.

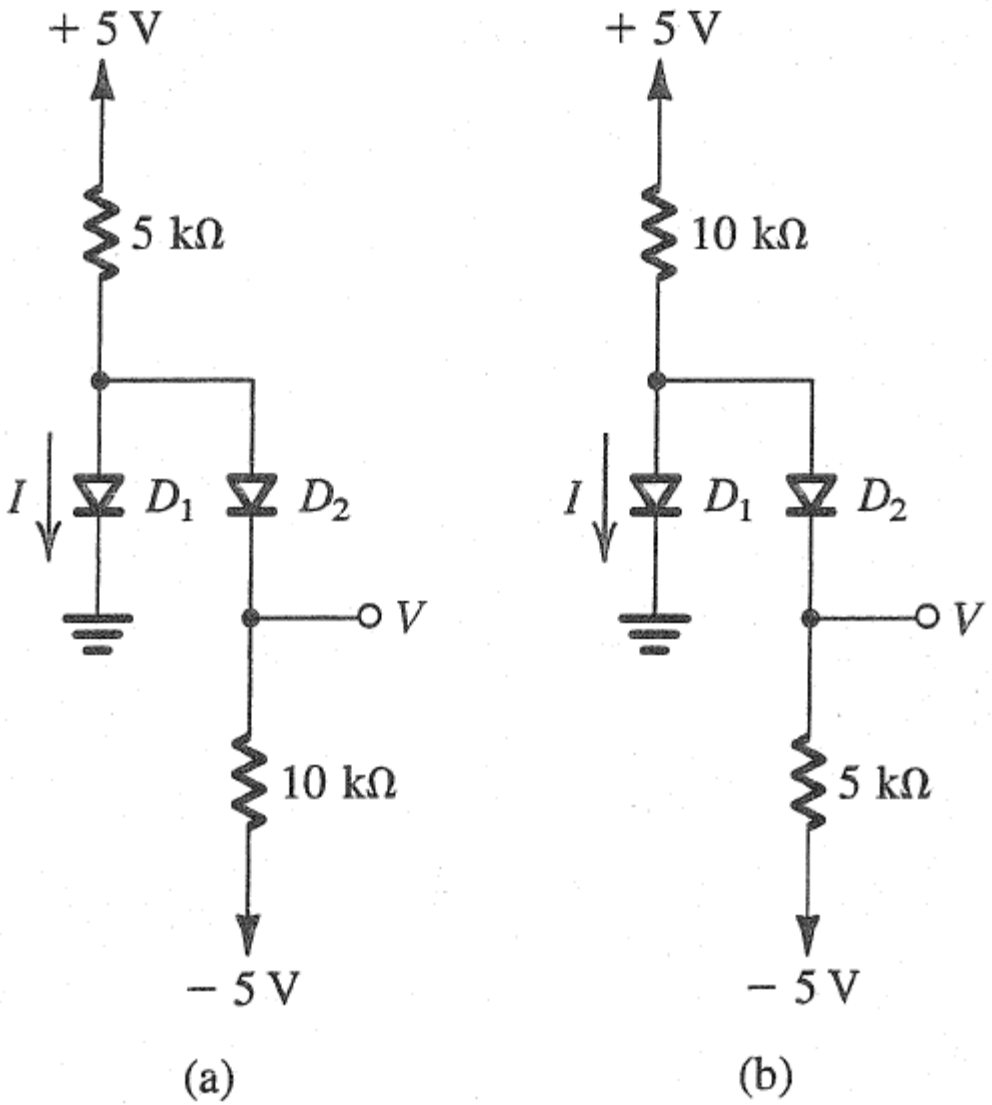


Figure P3.7

D 3.52 Design a 7.5-V zener regulator circuit using a 7.5-V zener specified at 12 mA. The zener has an incremental resistance $r_z = 30\ \Omega$ and a knee current of 0.5 mA. The regulator operates from a 10-V supply and has a 1.2-kΩ load. What is the value of R you have chosen? What is the regulator output voltage when the supply is 10% high? Is 10% low? What is the output voltage when both the supply is 10% high and the load is removed? What is the smallest possible load resistor that can be used while the zener operates at a current no lower than the knee current while the supply is 10% low?

3.58 A full-wave bridge rectifier circuit with a 1-kΩ load operates from a 120-V (rms) 60-Hz household supply through a 10-to-1 step-down transformer having a single secondary winding. It uses four diodes, each of which can be modeled to have a 0.7-V drop for any current. What is the peak value of the rectified voltage across the load? For what fraction of a cycle does each diode conduct? What is the average voltage across the load? What is the average current through the load?

3.60 The circuit in Fig. P3.60 implements a complementary-output rectifier. Sketch and clearly label the waveforms of v_O^+ and v_O^-. Assume a 0.7-V drop across each conducting diode. If the magnitude of the average of each output is to be 15 V, find the required amplitude of the sine wave across the entire secondary winding. What is the PIV of each diode?

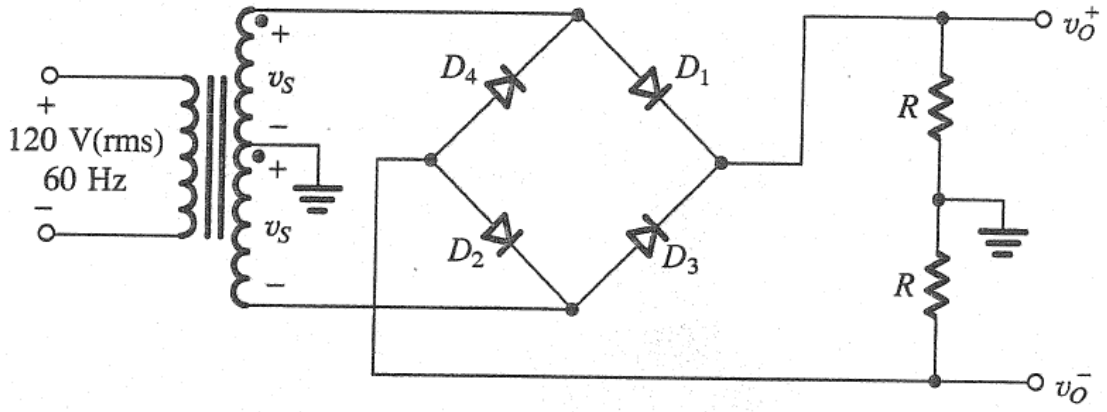


Figure P3.60

Note that VA(t) = VS(t) and VB(t) = - VS(t)

3.69 Sketch and clearly label the transfer characteristic of the circuit in Fig. P3.69 for $-20\text{ V} \leqslant v_I \leqslant +20\text{ V}$. Assume that the diodes can be represented by a piecewise-linear model with $V_{DO} = 0.65\text{ V}$ and $r_D = 20\ \Omega$. Assuming that the specified zener voltage (8.2 V) is measured at a current of 10 mA and that $r_Z = 20\ \Omega$, represent that zener by a piecewise-linear model.

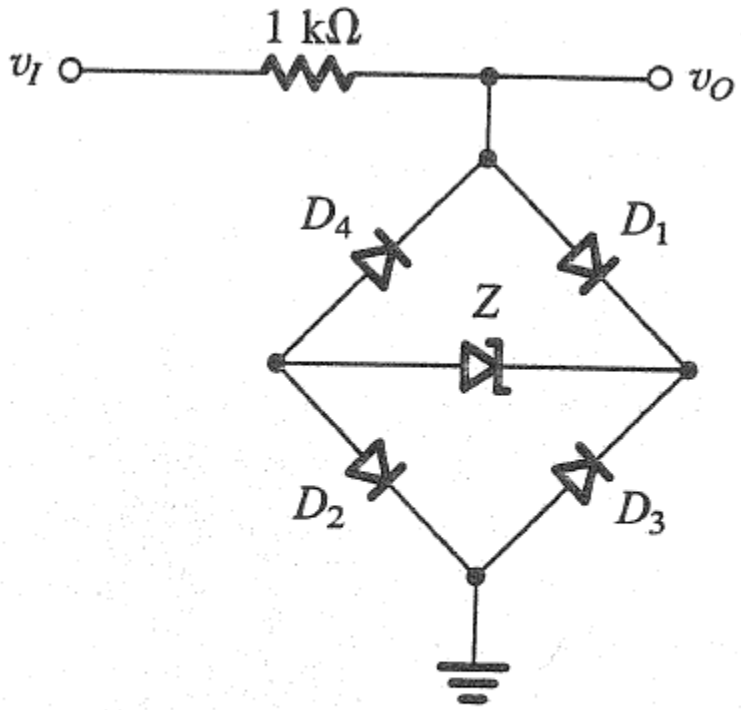


Figure P3.69