2.7 The full-wave rectifier circuit shown in Figure P2.7 has an input signal whose frequency is 60 Hz. The rms value of $v_S = 8.5$ V. Assume each diode cut-in voltage is $V_\gamma = 0.7$ V. (a) What is the maximum value of V_O? (b) If $R = 10\ \Omega$, determine the value of C such that the ripple voltage is no larger than 0.25 V. (c) What must be the PIV rating of each diode?

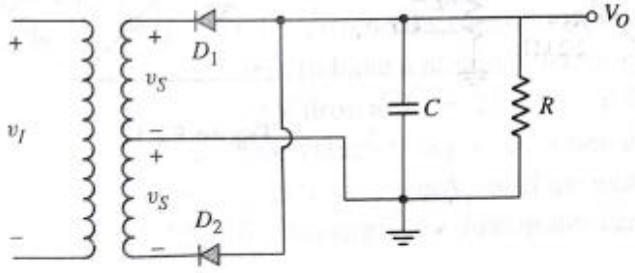


Figure P2.7

2.9 The circuit in Figure P2.9 is a complementary output rectifier. If $v_s = 26 \sin [2\pi(60)t]$ V, sketch the output waveforms v_o^+ and v_o^- versus time, assuming $V_\gamma = 0.6$ V for each diode.

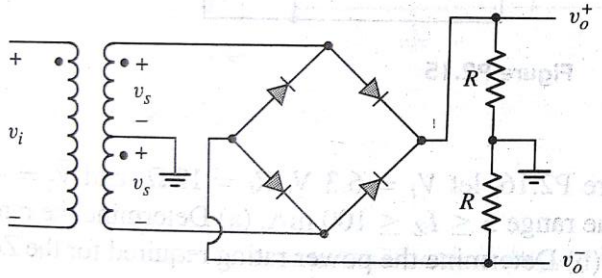


Figure P2.9

*2.13 (a) Sketch v_o versus time for the circuit in Figure P2.13. The input is a sine wave given by $v_i = 10 \sin \omega t$ V. Assume $V_\gamma = 0$. (b) Determine the rms value of the output voltage.

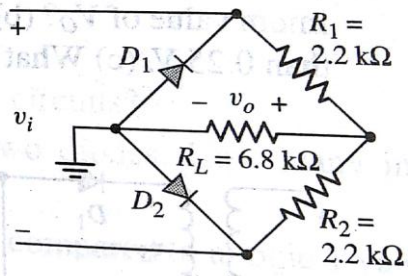


Figure P2.13

*2.21 A voltage regulator is to have a nominal output voltage of 10 V. The specified Zener diode has a rating of 1 W, has a 10 V drop at $I_Z = 25$ mA, and has a Zener resistance of $r_z = 5\,\Omega$. The input power supply has a nominal value of $V_{PS} = 20$ V and can vary by ±25 percent. The output load current is to vary between $I_L = 0$ and 20 mA. (a) If the minimum Zener current is to be $I_Z = 5$ mA, determine the required R_i. (b) Determine the maximum variation in output voltage. (c) Determine the percent regulation.

2.22 Consider the circuit in Figure P2.22. Let $V_\gamma = 0$. The secondary voltage is given by $v_s = V_s \sin \omega t$, where $V_s = 24$ V. The Zener diode has parameters $V_Z = 16$ V at $I_Z = 40$ mA and $r_z = 2\,\Omega$. Determine R_i such that the load current can vary over the range $40 \le I_L \le 400$ mA with $I_Z(\text{min}) = 40$ mA and find C such that the ripple voltage is no larger than 1 V.

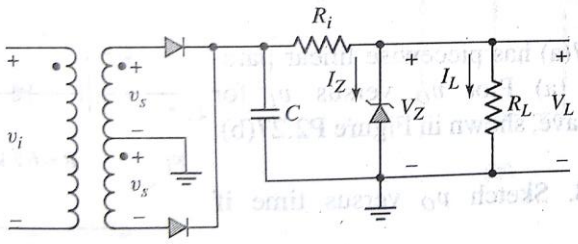
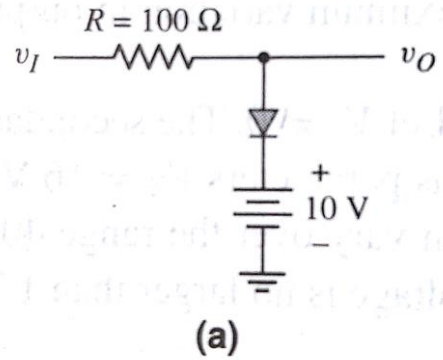


Figure P2.22

2.27 The diode in the circuit of Figure P2.27(a) has piecewise linear parameters $V_\gamma = 0.7$ V and $r_f = 10\,\Omega$. (a) Plot v_O versus v_I for $-30 \le v_I \le 30$ V. (b) If the triangular wave, shown in Figure P2.27(b), is applied, plot the output versus time.



(a)

Figure P2.27

2.39 The diodes in the circuit in Figure P2.39 have the same piecewise linear parameters as described in Problem 2.37. Determine the output voltage V_O and the currents I_{D1}, I_{D2}, I_{D3}, and I for the following input conditions: (a) $V_1 = V_2 = 0$; (b) $V_1 = V_2 = 5$ V; (c) $V_1 = 5$ V, $V_2 = 0$; and (d) $V_1 = 5$ V, $V_2 = 2$ V.

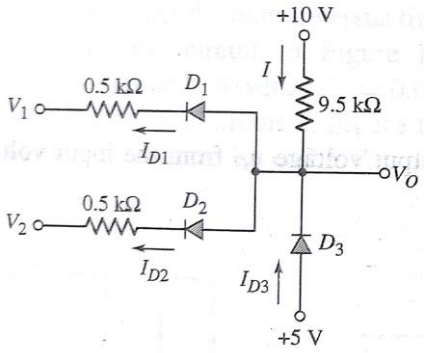


Figure P2.39

2.41 (a) For the circuit in Figure P2.41, each diode has $V_\gamma = 0.6$ V. Plot v_O versus v_I over the range $0 \leq v_I \leq 10$ V. (b) Compare the results of part (a) with a computer simulation analysis.

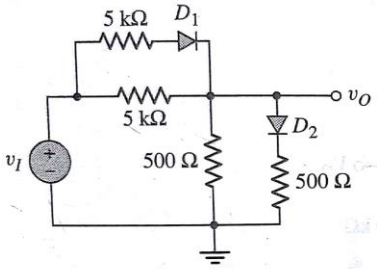


Figure P2.41

*2.42 Assume $V_\gamma = 0.7$ V for each diode in the circuit in Figure P2.42. Plot v_O versus v_I for $-10 \leq v_I \leq +10$ V.

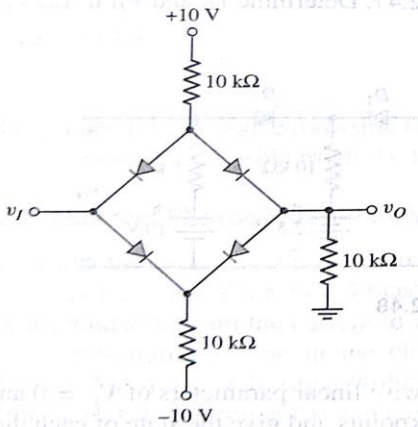


Figure P2.42