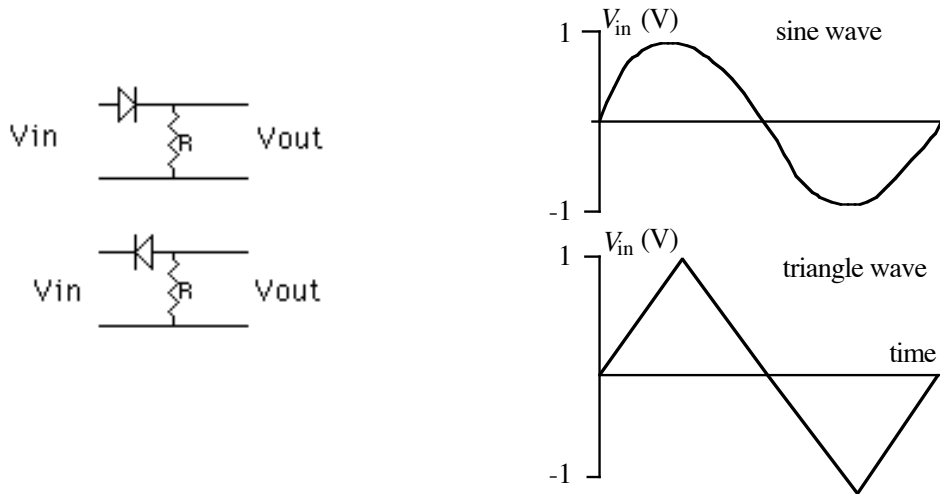


Physics 4700 Homework IV

Due: March 1

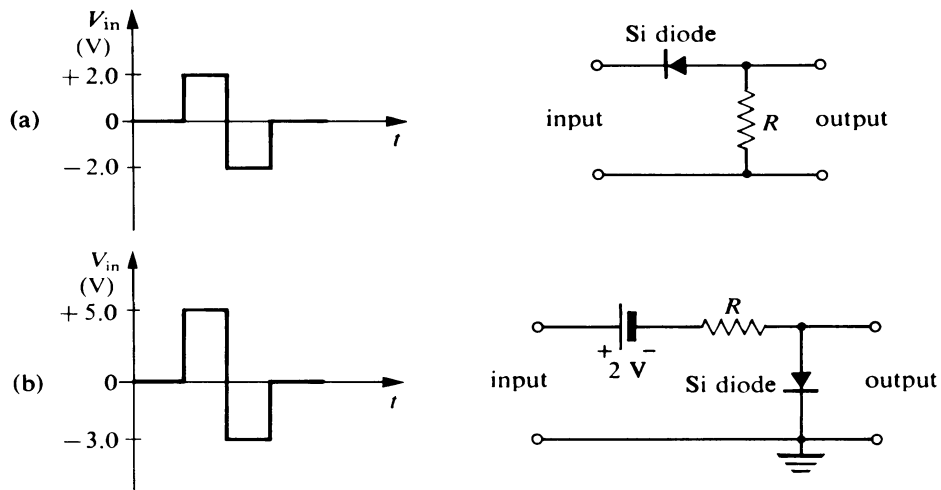
Note: The output is measured across the resistor after the input voltage has passed through the forward biased diode.

- Given the following circuits and input waveforms sketch the output waveforms (4 waveforms in all). Assume the diodes are silicon.



Note: The output is measured across the resistor after the input voltage has passed through the forward biased diode. In (b), how does the battery power affect the input signal?

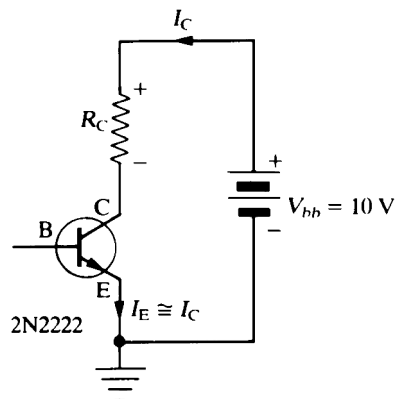
- Sketch the output waveform to scale for the following.



- The simple model for a bi-polar transistor has two parameters α and β .
 - How are I_C , I_B , and I_E related?
 - How are I_C and I_B related in terms of α ? In terms of β ?
 - How are I_C and I_E related in terms of α ? In terms of β ?
 - How are I_B and I_E related in terms of α ? In terms of β ?

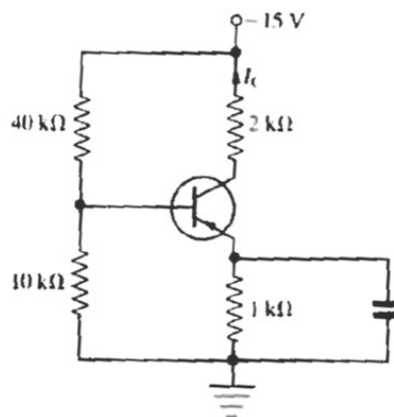
Note: Calculate the max I_C for max power and then compare the I_C due to the resistors.

- In this problem assume that the emitter is grounded and the collector resistor is connected between the collector and power supply. Consider a transistor with a maximum power dissipation of 200 mW and a 20 V power supply. On the graph of I_C vs. V_{CE} sketch the maximum power curve and shade in the forbidden region of operation. Also draw the dc load line for a 2 k Ω collector resistor. Is this a safe load line? Repeat for 400 Ω collector resistor. Is this a safe load line?

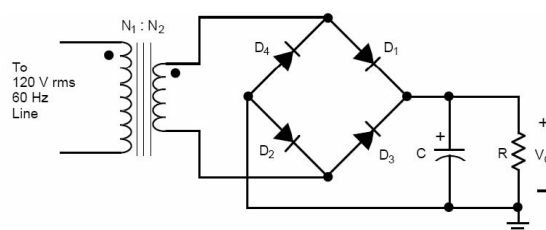


Note: The transistor is an NPN. How is I_C related to I_E ? Use Kirchhoff's law to determine V_{CE} .

- Calculate I_C and V_{CE} . The transistor is silicon and has a β of 100.



- Use the EasyEDA program (download free at www.EasyEDA.com and see the instruction on the web posted under the lab section) to simulate the output of a full-wave rectifier. Pick reasonable values for R and C to smooth out the 60 Hz input voltage. When you analyze the circuit with the program you will want to use the *transient* option.



Note: How does the capacitor affect the signal for a given input frequency?

7. Plot V_{out} vs. V_{in} for the following circuit if $V_{\text{in}} = V_0 \sin \omega t$, with $V_0 = 2 \text{ V}$ and $\omega = 360 \text{ Hz}$. Assume the diode is made of silicon.

