Laboratory Exercise 2: BJT Operation

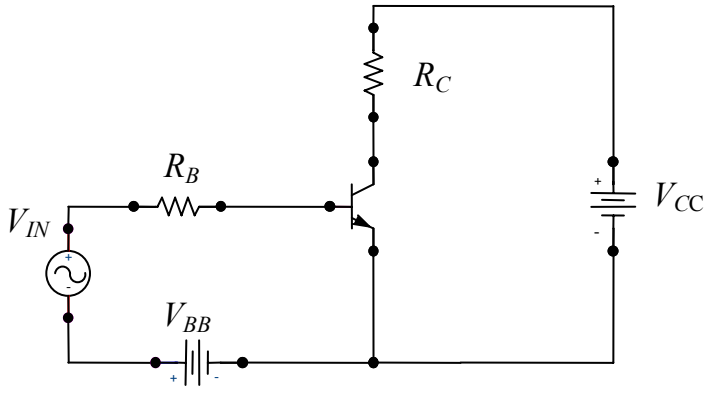
See accompanying Data Sheet for the MPS2222 BJT. Review this exercise and complete steps 1, 2, and 3 before coming to class.

1. Read the Data Sheet to determine the layout of the transistor and the DC current gains, β (the data sheet refers to the DC current gain as h_{fe}).

2. Using the kit of parts design, an amplifier circuit which operates in the active region and has an approximate Q-point of VCE = 4.5v and I_C = 6ma.

3. Write down the values of R_B and R_C for this design.

R_B _____
R_C _____



4. Build this circuit and using the oscilloscope (or VOM in your kit) measure and record I_B, V_{BE}, V_{CE}, I_C and β assuming $V_{IN} = 0$.

I_{BQ} _____
V_{BEQ} _____
I_{CQ} _____
V_{CEQ} _____
β _____

5. Using the function generator, choose a value of V_{IN} such that the BJT operates entirely in the active region. Using the oscilloscope, view V_{CE} and I_C and then calculate the voltage gain and current gain of this amplifier. Show the results (waveforms and levels) and your calculations.

ΔV_{IN} _____
ΔI_B _____
ΔI_C _____
ΔV_{CE} _____
A_V _____
A_I _____

6. Slowly increase V_{IN} (until it reaches both cutoff and saturation) and note how the BJT performs. Does it reach cutoff before saturation? Why? Show the waveforms as you increase V_{IN}. What are the values of V_{IN} when cutoff and saturation is reached? Calculate the voltage and current gain for the various scenarios observed

ΔV_{IN} _____
ΔI_B _____
ΔI_C _____
ΔV_{CE} _____
A_V _____
A_I _____

ΔV_{IN} _____
ΔI_B _____
ΔI_C _____
ΔV_{CE} _____
A_V _____
A_I _____

ΔV_{IN} _____
ΔI_B _____
ΔI_C _____
ΔV_{CE} _____
A_V _____
A_I _____