Mapúa Institute of Technology at Laguna
Malayan Colleges Laguna

ECE101-1L – FUNDAMENTALS OF ELECTRONIC CIRCUITS (LAB)

Activity #6b: Common Base, Common Emitter, Common Collector Circuit

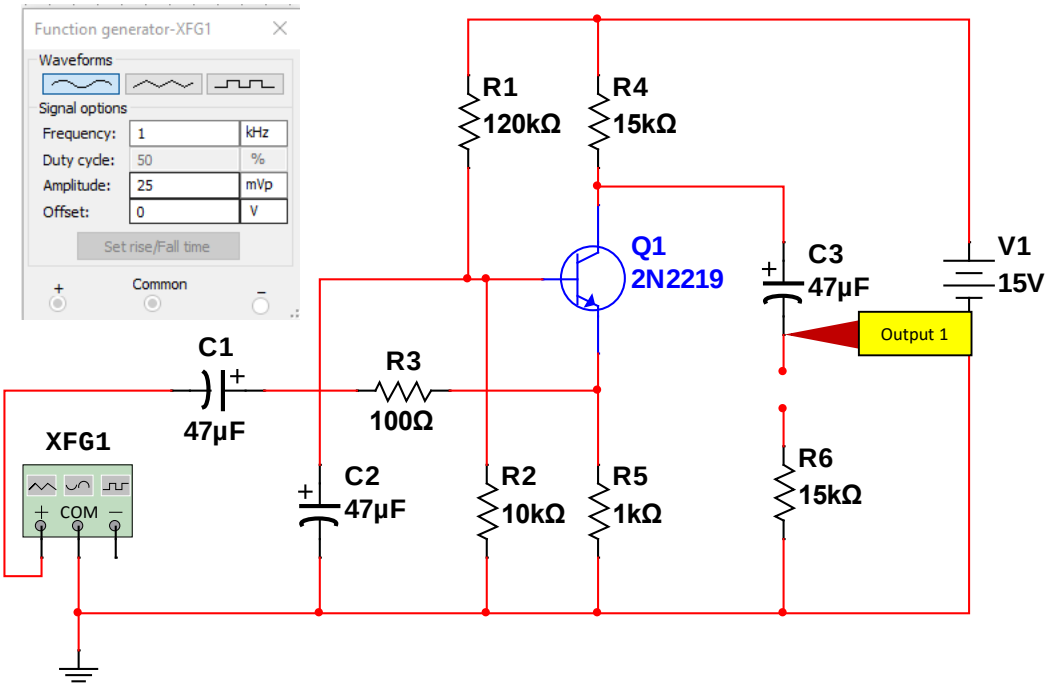
Objectives:

- Determine the AC operating characteristics of Common Base, Common Emitter, Common Collector transistor circuit

Procedures:

Part A. Common Base

1. Using Multisim create the schematic shown below, and change the function generator settings as shown below.



2. Measure and Record the DC Voltages

VC	
VB	
VE	

3. Is the transistor properly biased for AC Operation?

_____

_____

4. Place an Oscilloscope and Probe Channel 1 to the Input Signal and Channel 2 to the Output of the Transistor, change the color of each waveform, change the vertical placement of each waveform and screenshot the Input and Output waveform

_____
_____

5. What is the peak-to-peak voltage of output signal?

_____
_____

6. Is there any distortion?

_____
_____

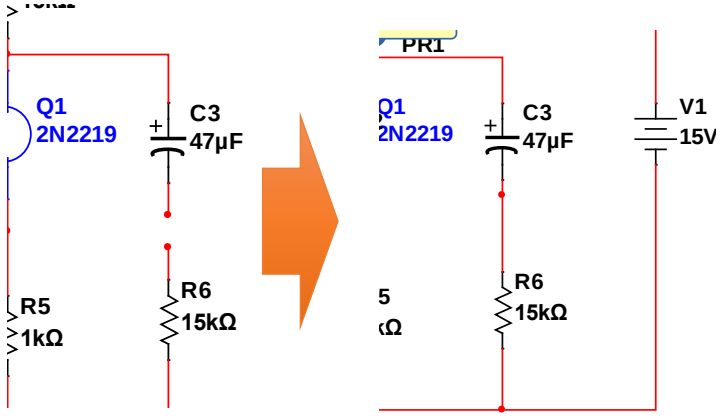
7. What is the phase relationship between the output and Input signals?

_____
_____

8. Calculate and record the voltage gain (Av = Vo/Vi)
(Note: Use peak-to-peak voltage measurements instead of rms values)

_____
_____

9. Connect resistor R6 to C3 at the collector terminal. The collector terminal output impedance is now the parallel resistance of R6 and the original collector output impedance. What is the new peak-to-peak Voltage (Vo) of the output signal?
(Note: When the output voltage is decreased by 50% the original output impedance equals the resistance of R6, which was connected in parallel with R4.)



_____
_____

10. Based on the decrease in the output voltage, what was the original output impedance?

_____
_____

11. Change the R1 Value to 10Kohms. Did the output signal decrease or increase? Screenshot the output waveform.

_____
_____

12. Measure and record the new DC Voltages of transistor.

VC	
VB	
VE	

13. Base from the values measured above, does the transistor operate in Active region?

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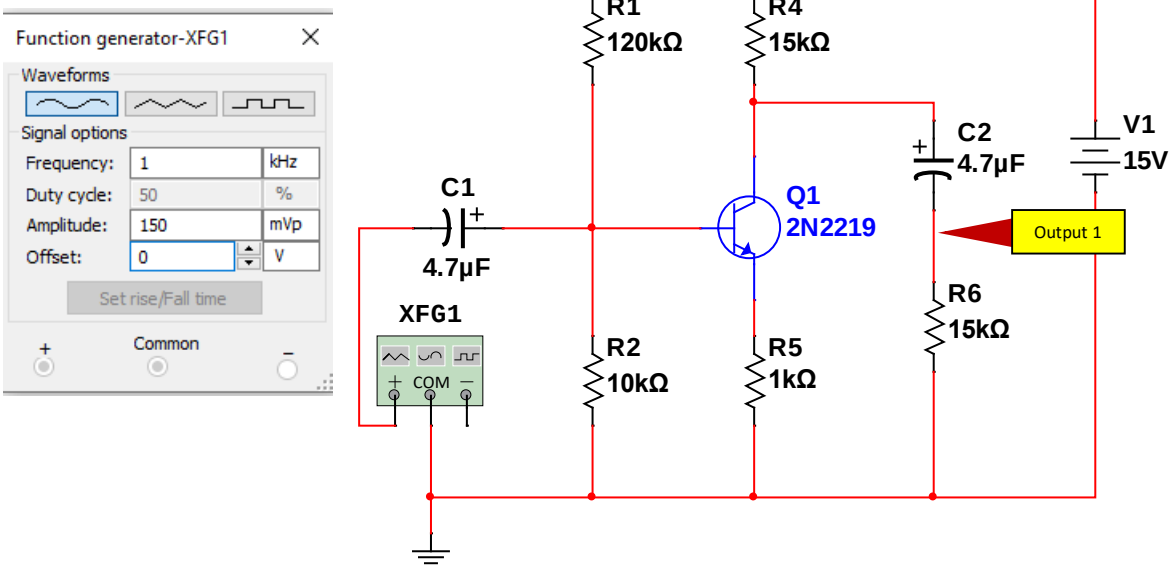
_____

Part B. Common Emitter

1. Using Multisim create the schematic shown below, and change the function generator settings as shown below.



2. Measure and record the new DC Voltages of transistor.

VC	
VB	
VE	

3. Is the NPN transistor Q1 properly biased for ac operation? Why?

_____
_____

4. Place an Oscilloscope and probe CH1 to the output of function generator and probe CH2 to the output of the Transistor Circuit. Adjust the Colors and Position of each waveform.
   a. Screenshot the output of oscilloscope showing 2 waveforms.

      _____
   b. What is the peak-to-peak voltage of the Output signal?

      _____
      _____
   c. Is there any distortion or clipping of the sinewave between input and output?

      _____
      _____
   d. What is the phase relationship between output and input signals?

      _____
      _____

5. Calculate and Record the Voltage Gain (Av = -Vo/Vi)
   (Note: Use the peak-to-peak values instead of rms)

_____
_____

6. Calculate and Record the Voltage gain using (Av = -ri/R5)
   (Note: ri is the parallel resistance of R4 and R6)

_____
_____

7. Is the Result in #5 and #6 same or almost same?

_____
_____

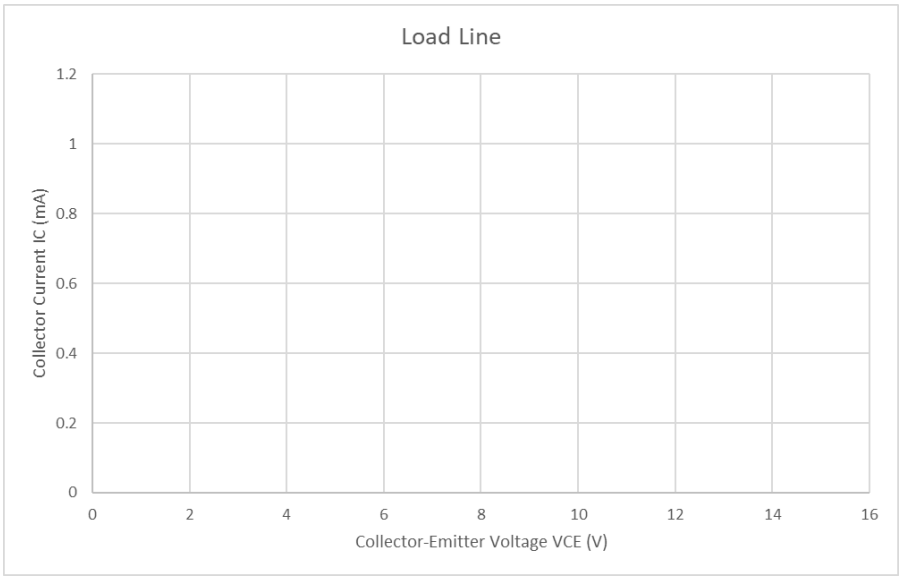
8. The Q-point on the load line is at intersection of IC and VCE. Using the voltage measurements in Part B. #2, Calculate the following
   a. Collector Current Ic = (V1-VC)/R4

      _____
   b. Collector-Emitter Voltage VCE = VC-VE

      _____
   c. Saturation Current ICsat = Ic + [VCE/(ri+R5)]

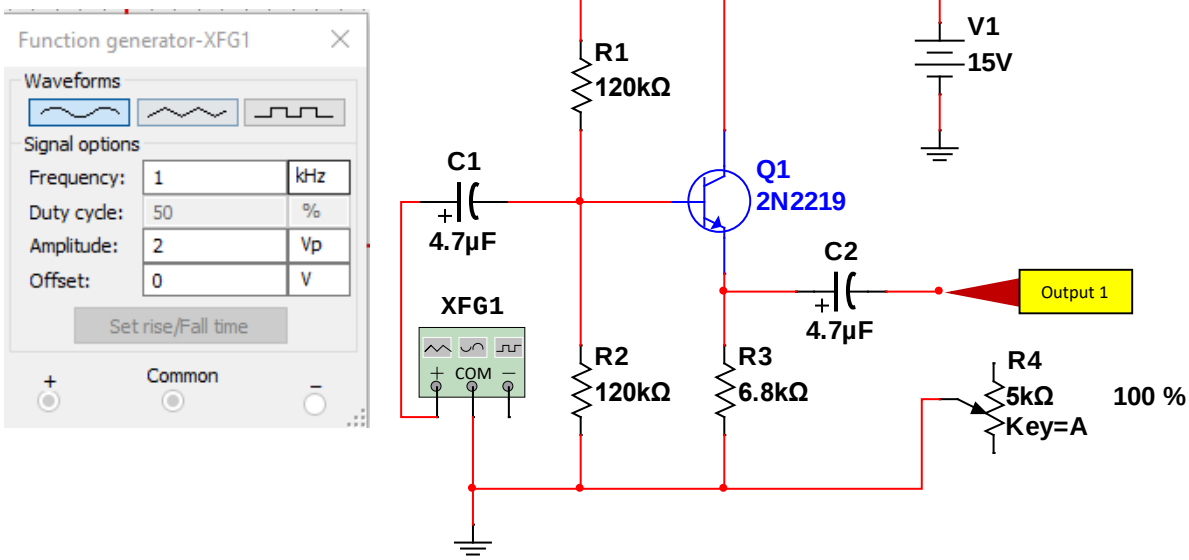
      _____

9. You can use any spreadsheet software (ex. Excel). Plot the following:
    a. Qpoint (Intersection of IC and VCE)
    b. ICsat
    c. VCE (Cutoff)



Part C. Common Collector

1. Using Multisim create the schematic shown below, and change the function generator settings as shown below.



2. Measure and record the new DC Voltages of transistor.

VC	
VB	
VE	

3. Is the NPN transistor Q1 properly biased for ac operation? Why?

_____

_____

4. Place an Oscilloscope and probe CH1 to the output of function generator and probe CH2 to the output of the Transistor Circuit. Adjust the Colors and Position of each waveform.
   a. Screenshot the Output of the oscilloscope showing the 2 waveforms

      _____

      _____

   b. What is the peak-to-peak voltage of the Output signal?

      _____

      _____

   c. Is there any distortion or clipping of the sinewave between input and output?

      _____

      _____

5. Calculate and record the voltage gain (Av = Vo/Vi).

_____

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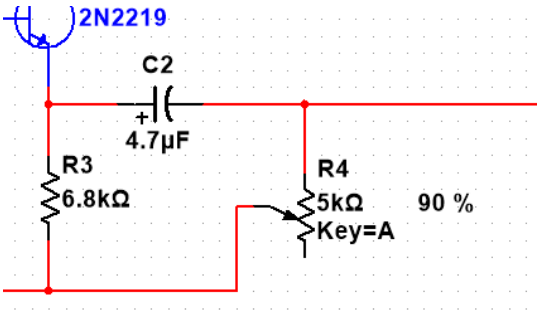
6. Connect the terminal of capacitor and the potentiometer R4 and set the R4 to 90%



7. Screenshot the output of Oscilloscope shown 2 waveforms (Input and Output).

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_____

8. Is there any distortion on the Output Signal?

_____

_____

Discussions:

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