Faculty Of Engineering and Technology

Electrical and Computer Engineering Department

CIRCUITS AND ELECTRONICS LABORATORY

ENEE 2103

Experiment #: 7

BJT Transistor As An Amplifier, CE, CC, CB Connection

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1.COMMON EMITTER TRANSISTOR AMPLIFIER

I connected the circuit in figure1.1, and set Vi (t) amplitude to 0, and set the potentiometer value to 10 k and its set value to 0. I set sinusoidal source to 1 kHz and amplitude to zero.

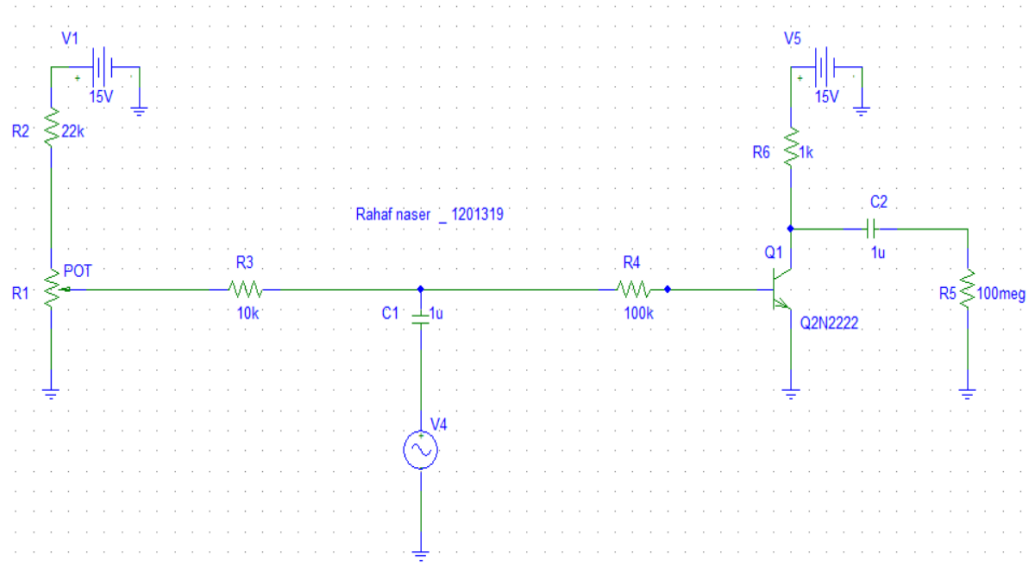

Figure 1.1: Common-Emitter transistor amplifier

Result of simulation

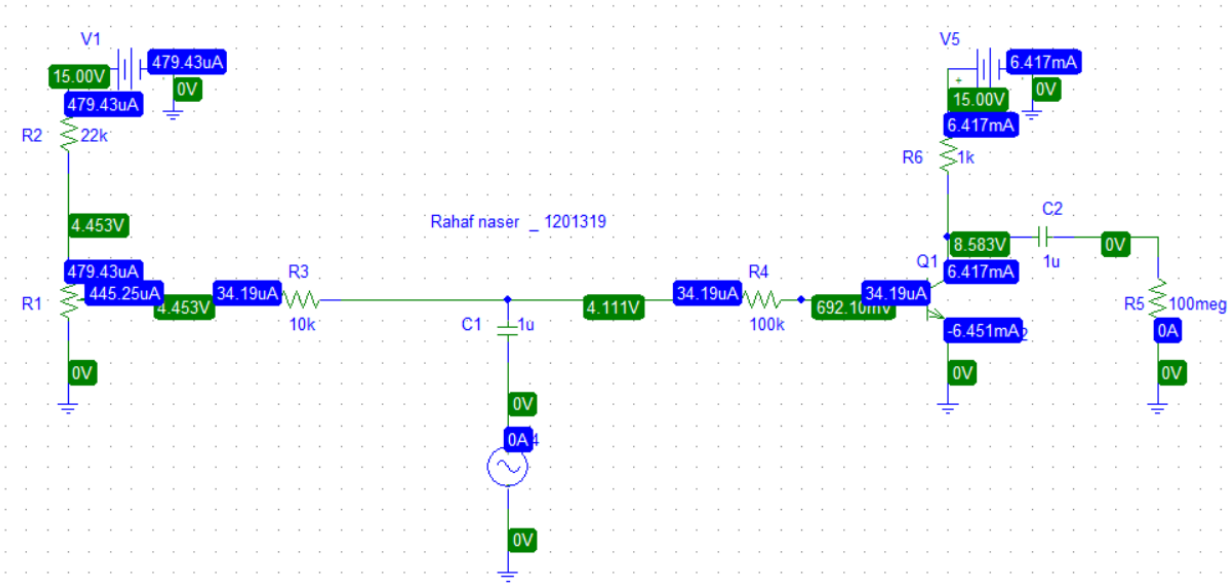

Figure 1.2: Common-Emitter transistor simulation

Measured values from figure 1.2 above:

Vc	8.583v
Vbe	692.1mA
Vce	8.583v
Ic	6.417mA
Ib	34.19uA

Table 1: Voltage and Current values

Then I adjust amplitude of Vi(t) to 1 V and measured Vo(t).

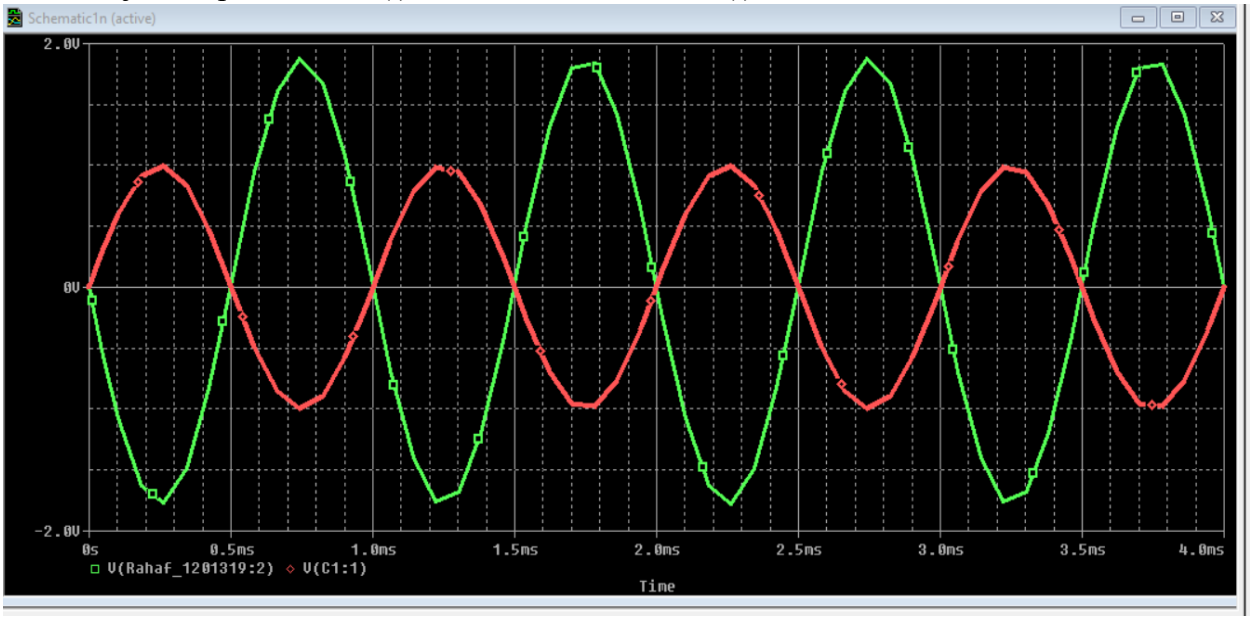

Figure 1.3: Vo when Vi=1v

From figure 1.3 above :

Vo = 1.9v, Av= 1.9/1 = 1.9

After change peak of Vi(t) such that Vo(t) =4V peak and perform Transient analysis

Vin = 4/1.9 = 2.105v

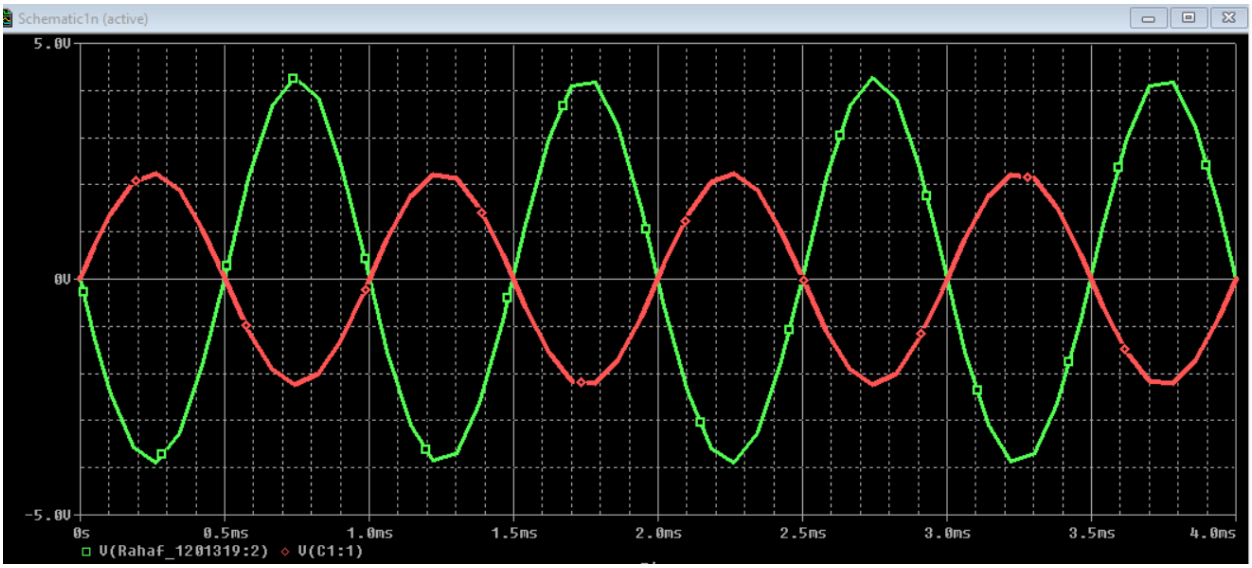

Figure 1.4: Vo=4v

Av = Vo/Vin = 4/2.105=1.9

To calculate Av1= Vb /Vin, I used RMS waves:

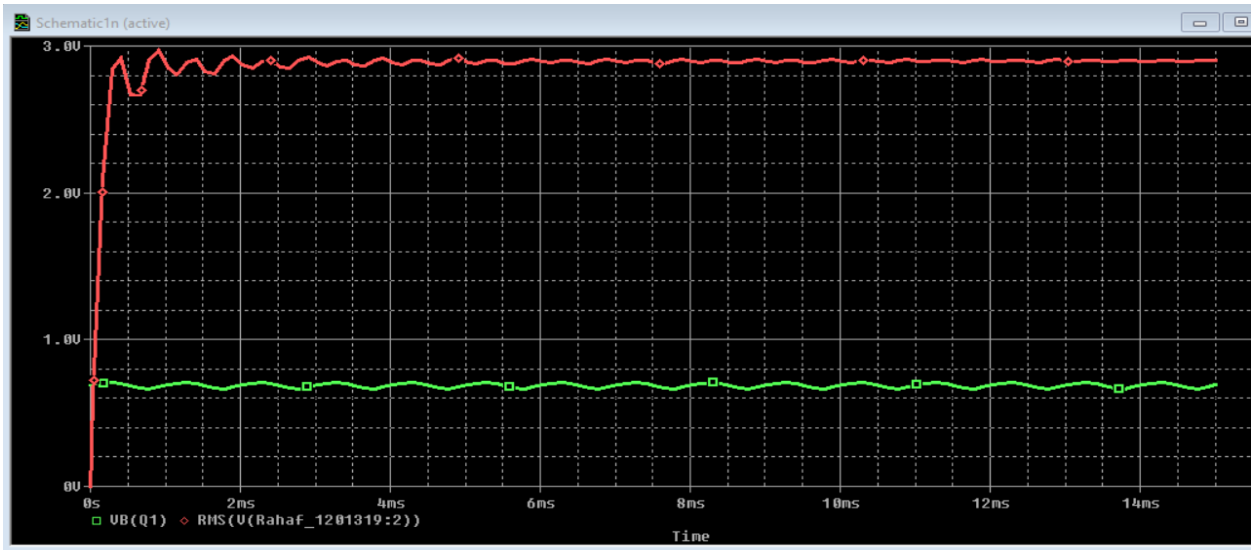

Figure 1.5: VB and Vo RMS

From figure 1.5:

Av1= Vo /VB = 4 /0.7 = 5.7

After remove the 100k resistor to see what happens to voltage gain

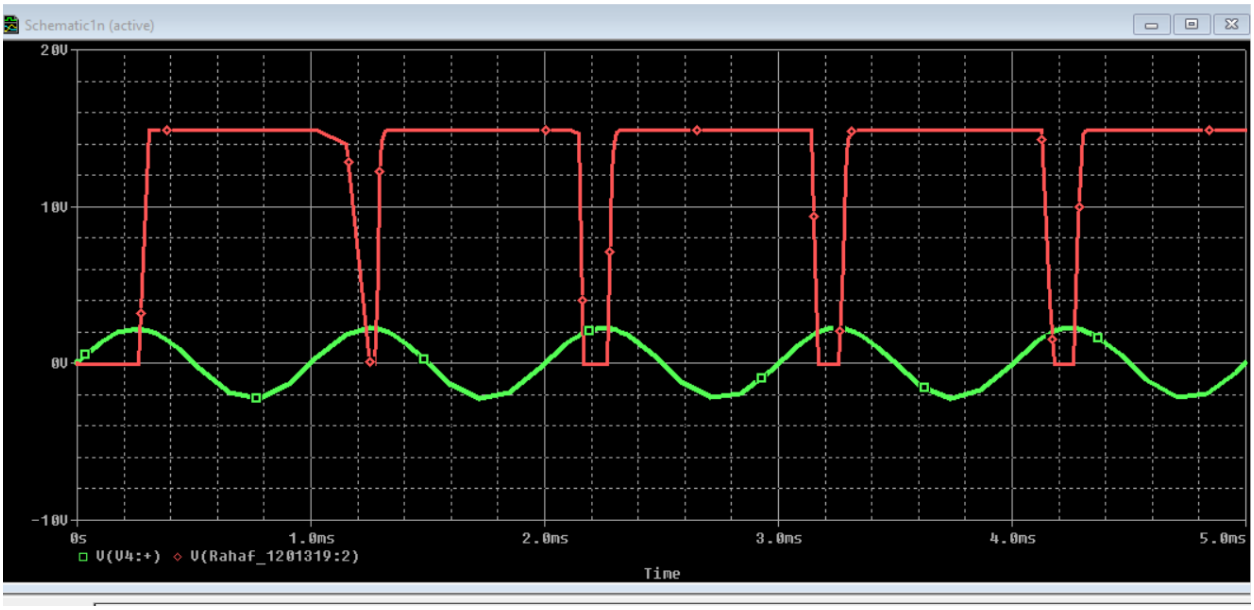

Figure 1.6: after remove the 100k resistor

We can see from the figure that the voltage gain will increase :

Av = 15/2.2 = 6.8

2.COMMON COLLECTOR TRANSISTOR AMPLIFIER

I connected the circuit in figure 2.1. Set the sine wave generator to a frequency of 1 kHz, and its output amplitude to zero.

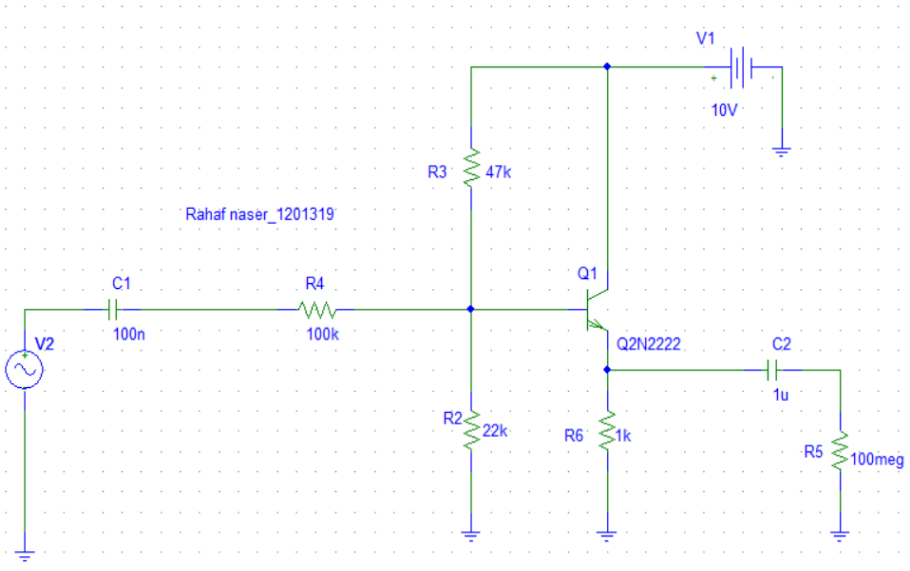

Figure 2.1: Common-Collector transistor amplifier

Simulation result->

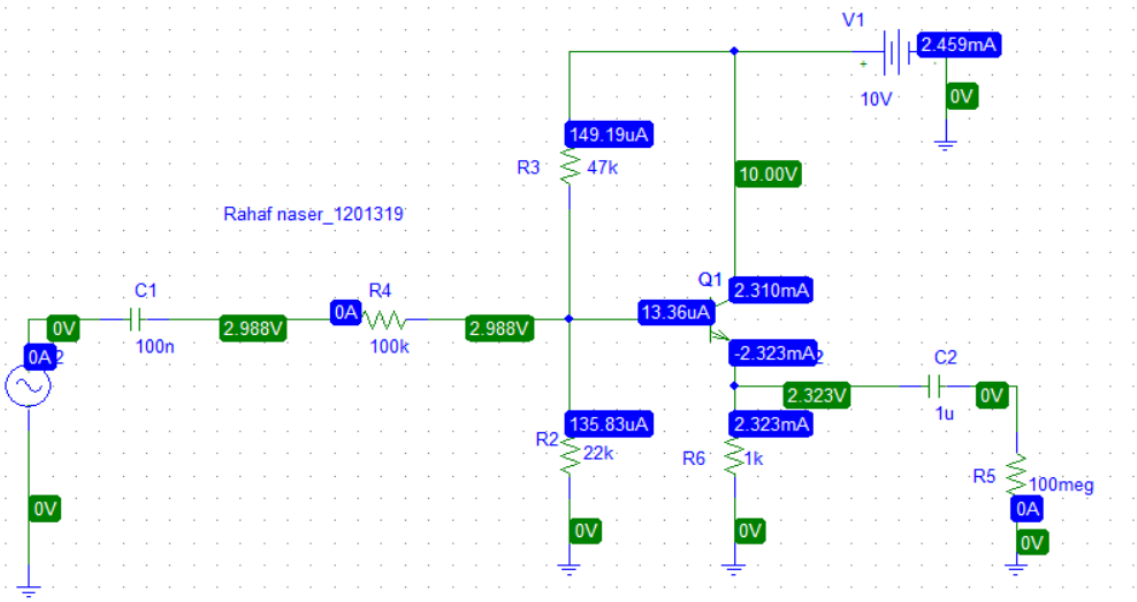

Figure 2.2: Common-Collector transistor simulation

Measured values from figure 2.2 above:

Vb	2.988v
Vc	10v
Ib	13.36uA
Ic	2.323mA

Table 2: Voltage and Current values

To get output amplitude from the amplifier is about 2volts peak-to-peak:

Vin amplitude =16.6v

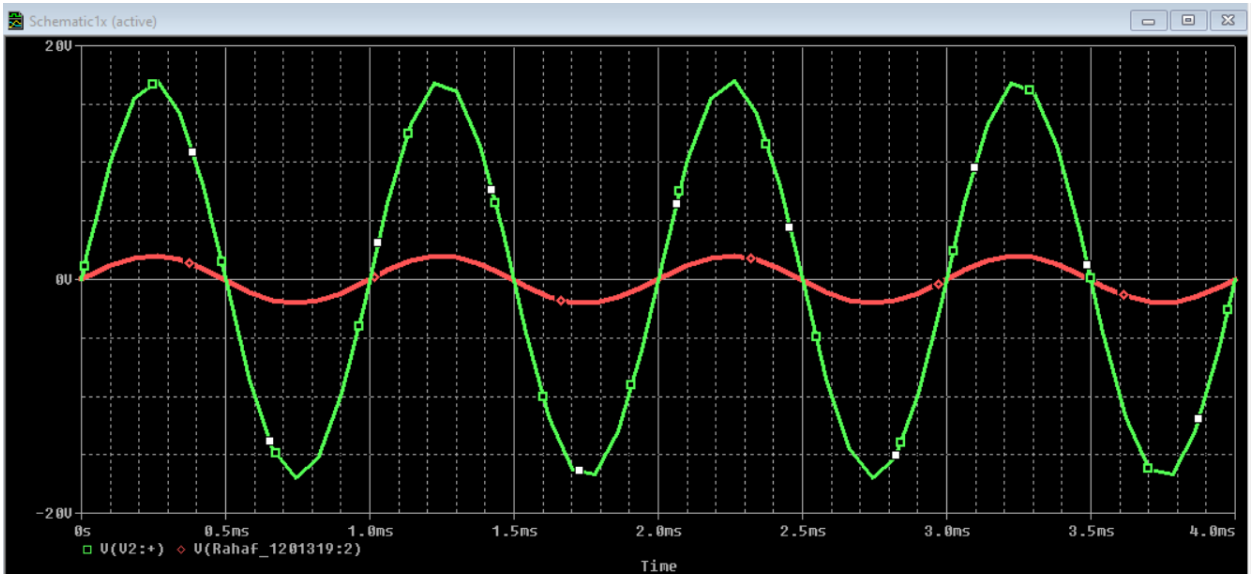

Figure 2.3: Vo=2.04v

Av = 2.04/16.6= 0.12

To calculate Ai=Io/Iin and Zi from figure 2.4 below:

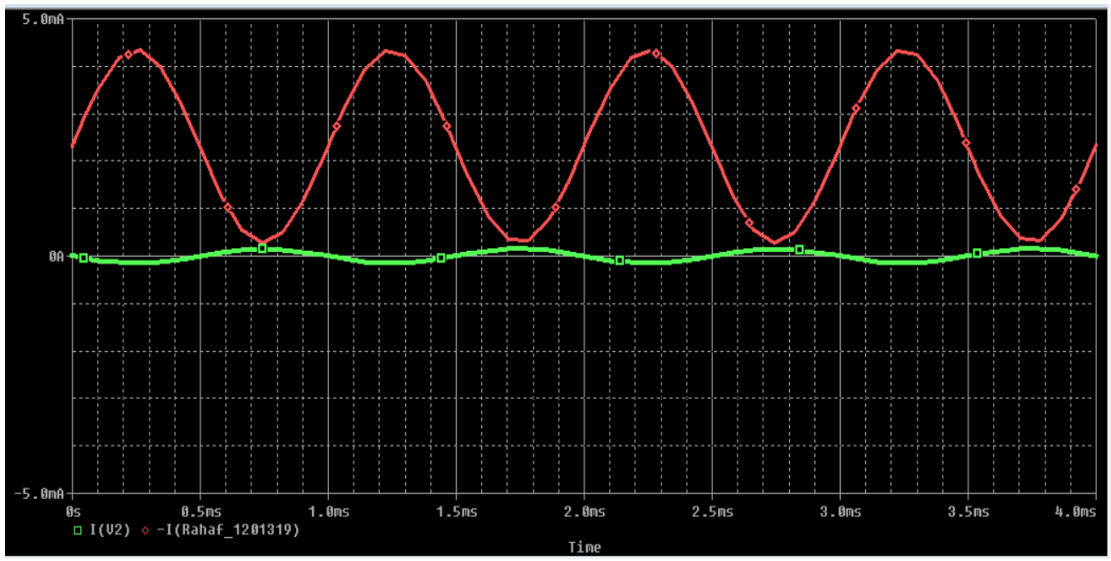

Figure 2.4: Input/Output Current

Ai =Io/Iin = 2.03/0.15= 13.53

Zi = Vin / Iin = 16.6/0.15 = 110.66 kohm

Now To find Zo, I take off the input sine wave generator and replace it with a short circuit, then I connect the generator to the output (emitter) via a capacitor, and measure its output voltage and current, as shown in figure 2.5 below.

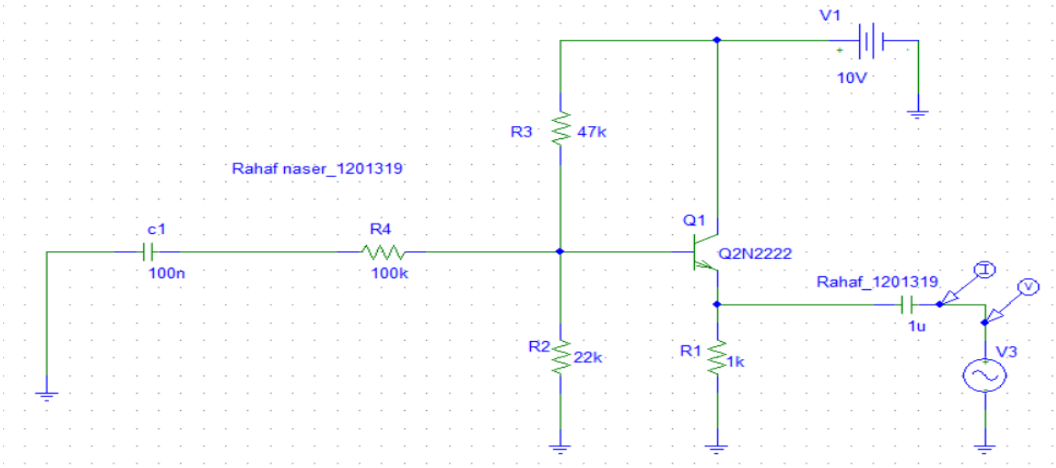

Figure 2.5: Common-Collector transistor simulation to find Zo

Simulation result->

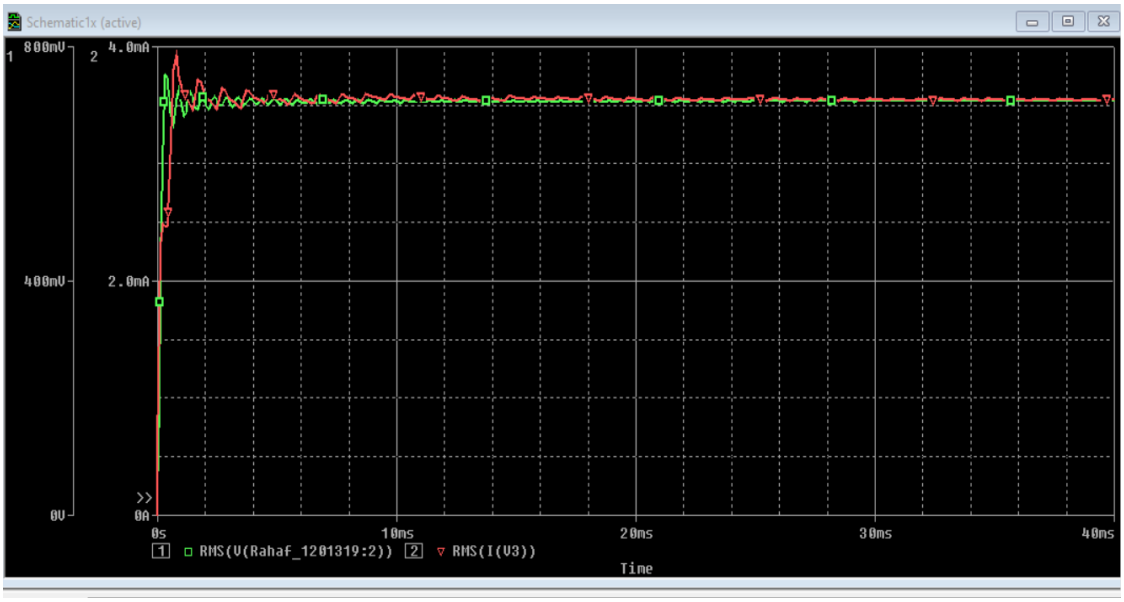

Figure 2.6: Output Voltage and Current

From figure 2.6 above: Zo=Vo/Io = 708/3.5 = 212.3 Ohm

Conclusion values:

Quantity	Measured value
Vin	16.6v
Vout	2.04
V100k_RMS	10
Iout	2.03
	Calculated value
Av=Vout/Vin	0.12
Iin = v100k_RMS/100k	0.15
Ai= Iout/Iin	13.5
Zin= Vin/Iin	110.66k
Zout=Vt/It	212.3

Table 3: Conclusion values