جامعة بيرزيت

BIRZEIT UNIVERSITY

Faculty of Engineering and Technology

Electrical and Computer Engineering Department

ENEE2103

Circuits and Electronics Lab

Experiment No.7 - Pre Lab No.6

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

Student's Name: Lojain Abdalrazaq. **ID Number:** 1190707.

Instructor's Name: Ali Abdo.

Section: 5.

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Common Emitter Transistor Amplifier:

- **Connecting the circuit in PSpice:**

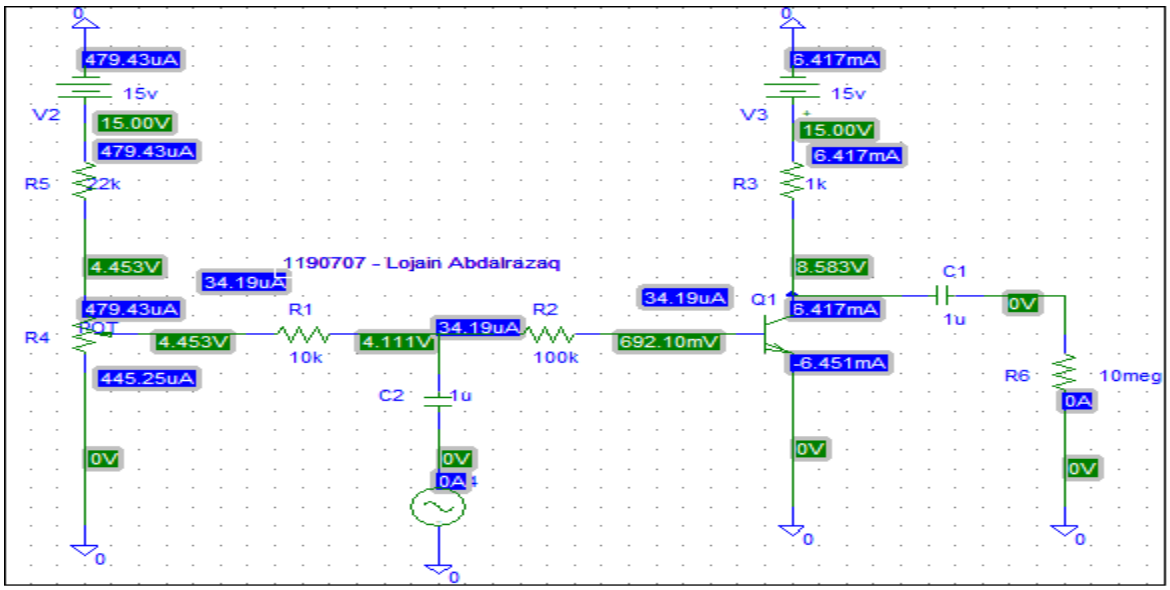

Figure 1 connecting the circuit using PSpice.

- **Measuring Vc, V_{BE}, V_{CE}, Ic, I_B:**

1. Vc = 8.583V.
2. Vbe = 692.10mV.
3. Vce = Vc – Ve =8.583 – 0 = 8.583V.
4. Ic = 6.417V.
5. Ib = 34.19uA.

- **Adjust amplitude of Vi(t) to 1 V and measure Vo(t):**

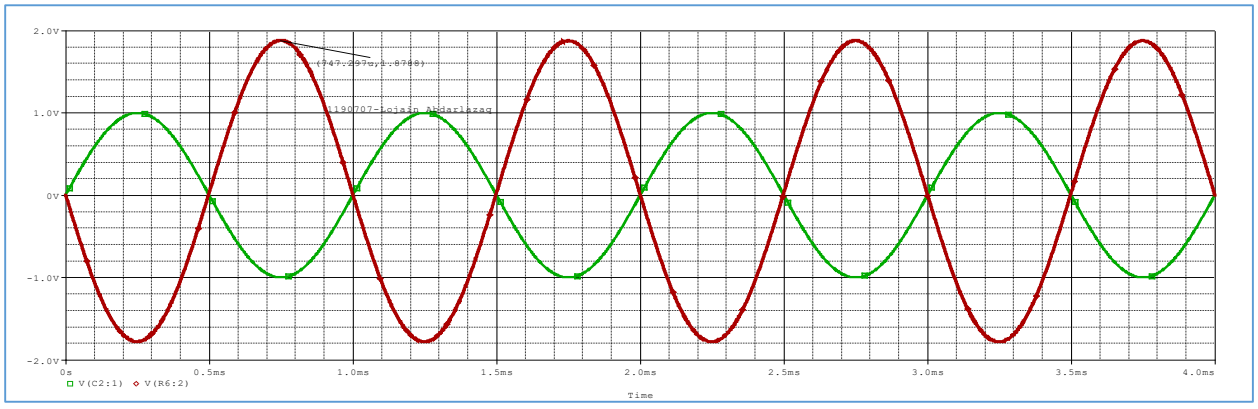

Figure 2 Input Voltage and output voltage with 1.8788 peak value.

- **Change peak of Vi(t) such that Vo(t) =4V peak:**

To obtain a 4V for the output, the input voltage peak will be 2.1492V.

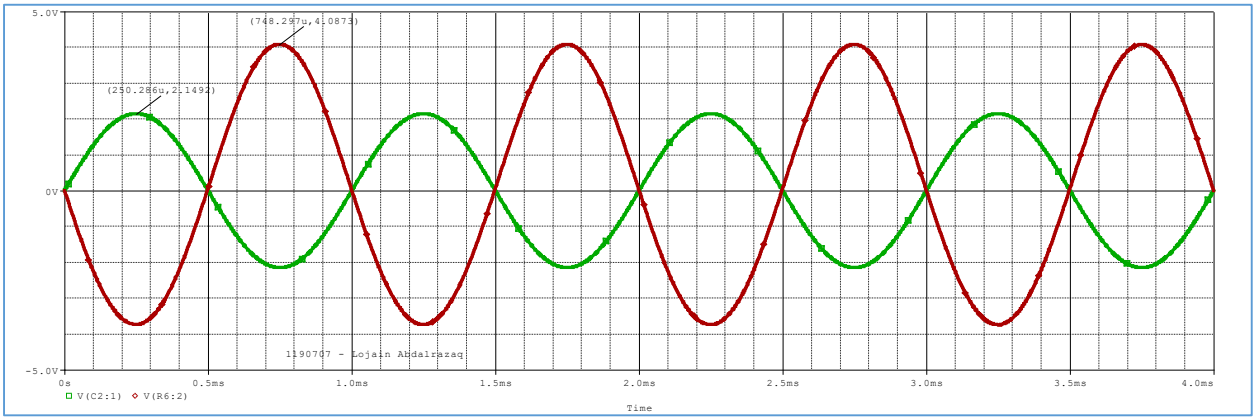

Figure 3 Obtaining output voltage peak = 4V.

- **Calculate the voltage gain of the transistor:**

→Voltage gain (theoritically) $= \frac{4}{2.1492} = 1.86\ V.$

→Voltage gain (practically)= 1.9 V.

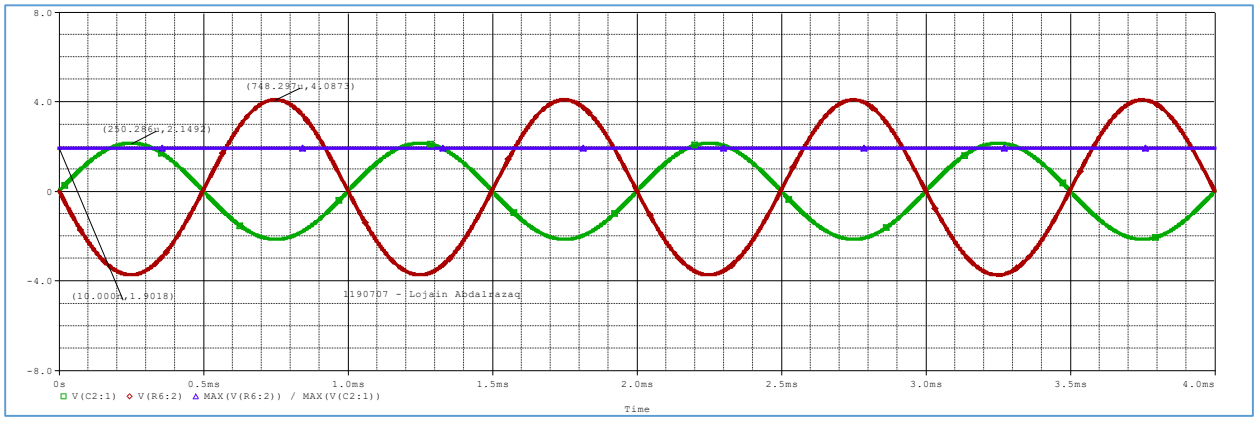

Figure 4 calculating the gain of the transistor.

→Voltage gain (theoritically) $= \frac{4}{696.6m} = 5.74V.$

→Voltage gain (practically)= 5.79 V.

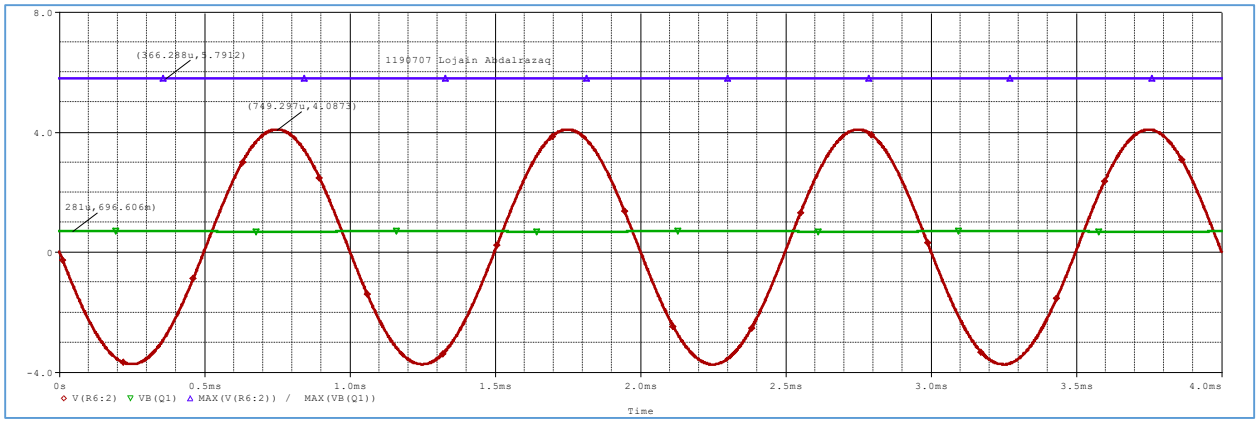

Figure 5 Calculating Voltage gain Av_1.

- **Remove the 100k resistor:**

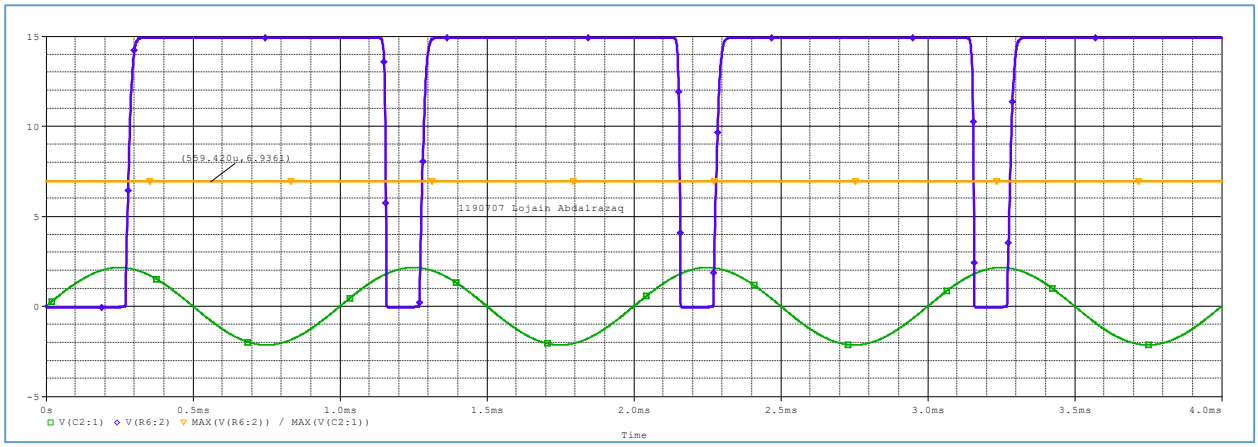

Figure 6 removing the 100 K resistor.

➔ **It is noticed that the voltage gain has increased to 100K.**

Common Collector Transistor Amplifier:

- **Connecting the circuit in PSpice:**

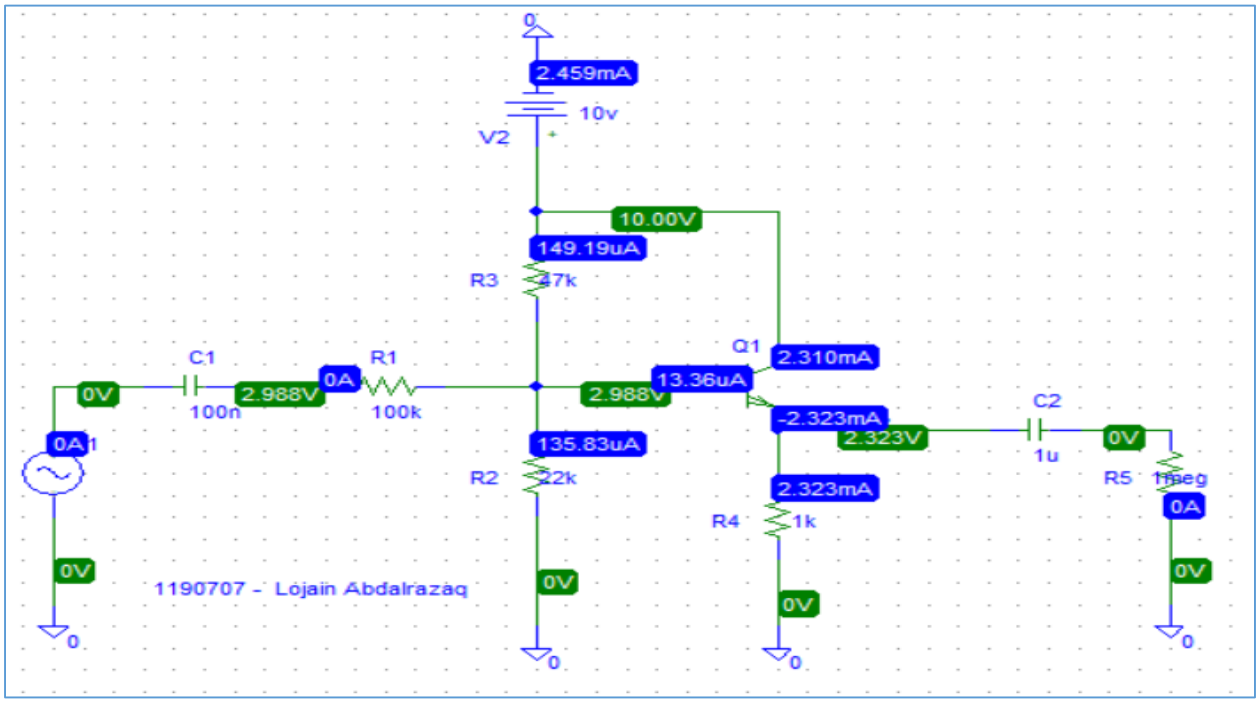

Figure 7 connecting the circuit using PSpice.

- **Measuring the values of VB, VC, IB,IC:**
  1. Vb=2.988 V
  2. Vc=10V
  3. Ib=13.36 uA
  4. Ic=2.310 mA

- **Adjust the amplitude of the sine wave generator:**

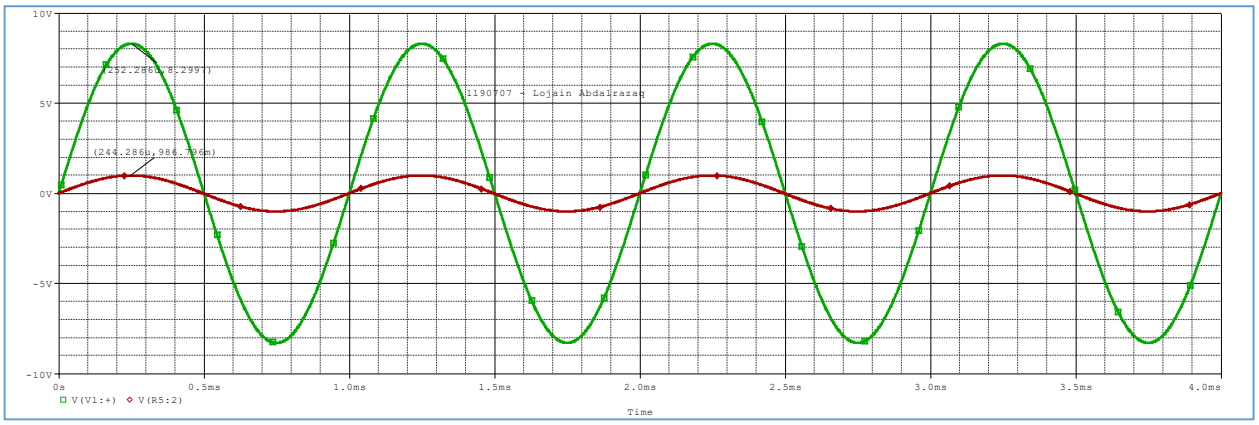

Figure 8 adjusting the amplitude of the input voltage.

- **Calculating the voltage gain Av:**

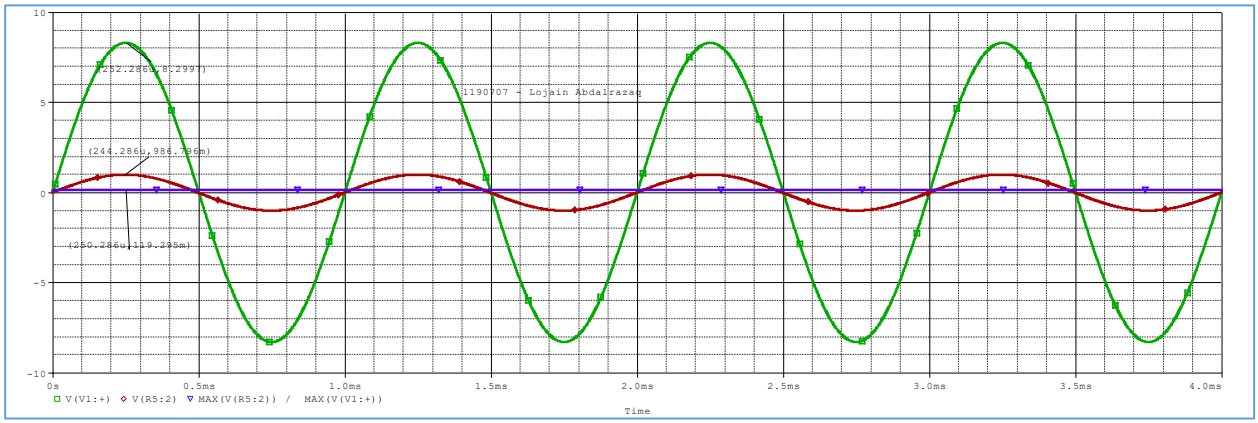

Figure 9 calculating the voltage gain.

➔ Voltage gain = 0.986V.

- **Calculate the current gain Ai:**

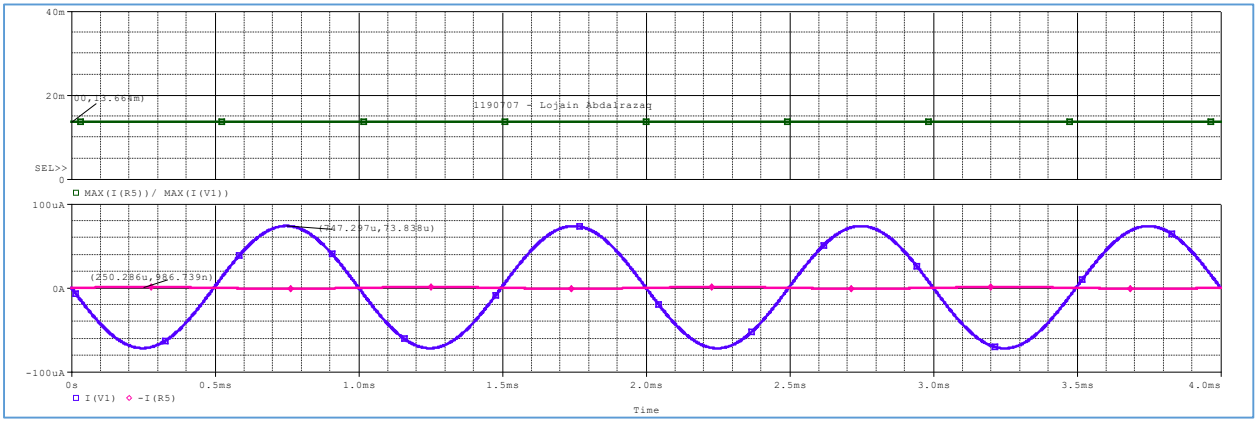

Figure 10 calculating the current gain.

Ai (experimentally) = 13.66 mA.

Ao(theoretically)= $\frac{986.739n}{73.838u}$ =0.01336 A.

- **Estimate Zi from Ii and Vi values:**

$$Zi = \frac{Vi}{Ii} = \frac{8.229}{73.838u} = 111446.68\ ohm.$$

- **Finding the output impedance:**

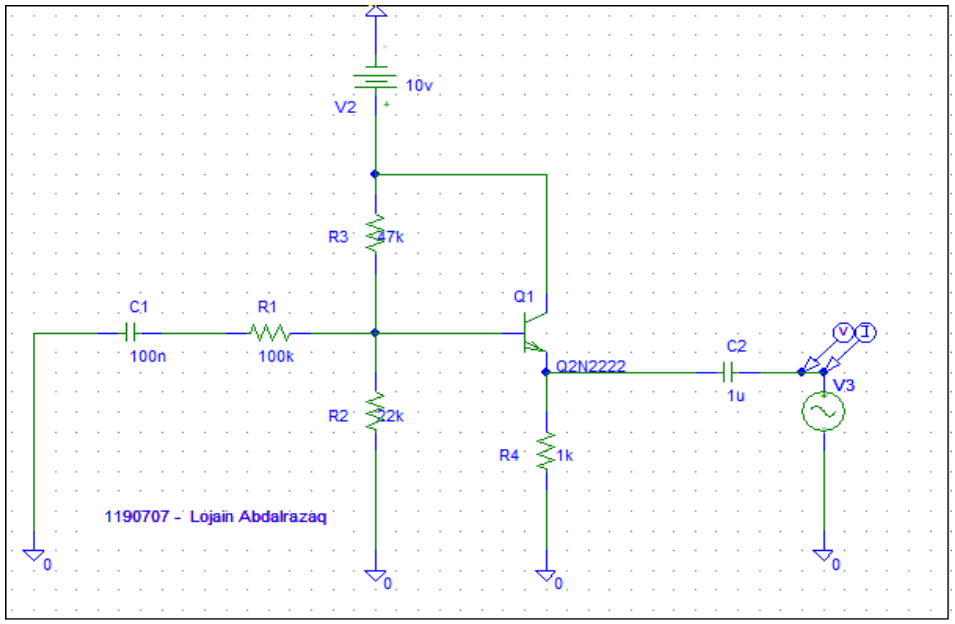

Figure 11 connectng the circuit using PSpice to find output impedance.

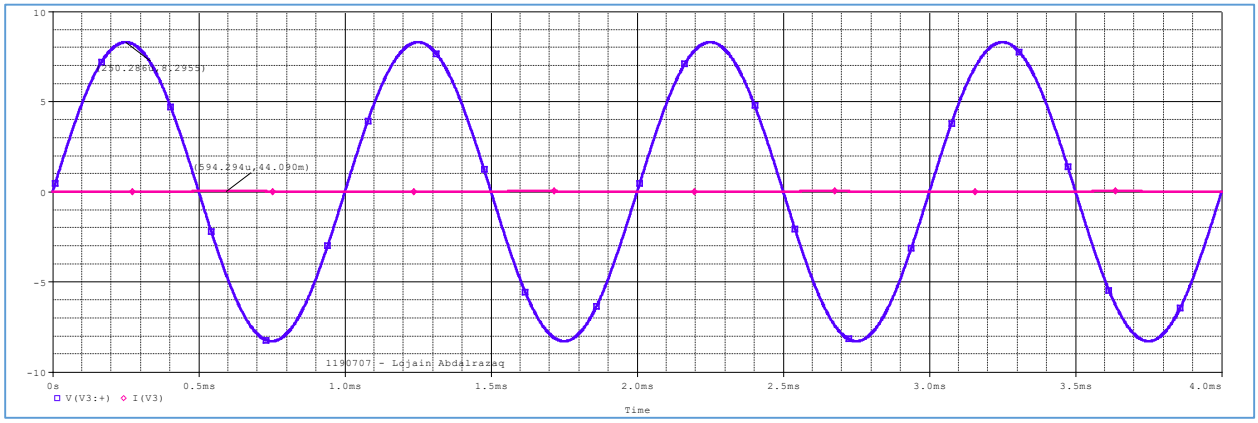

Figure 12 output voltage and current simulation.

➔ $Zout = \frac{Vout}{Iout} = \frac{8.2955}{44.09m} = 188.1\ ohm.$

Table 1 Table of values.

Quantity	Measured Values
Vin	8.229
Vout	986.79m
Iin	73.838u
Iout	986.739n
	Calculated Values
Av=Vo/Vi	0.119295
Ai=iout/iin	0.01336 A
Zin=Vin/iin	111446.68 ohm
Zout=VT/iT	188.1 ohm