Faculty of Engineering & Technology
Department of Electrical & Computer Engineering
ENEE2103-Circuit And Electronics Laboratory
PreLab#7

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Part one: CE amplifier with voltage divider - bias

The PCPICE circuit is displayed in the figure below, with the amplitude of the AC voltage source amplitude equals 0v, and frequency 1kHz.

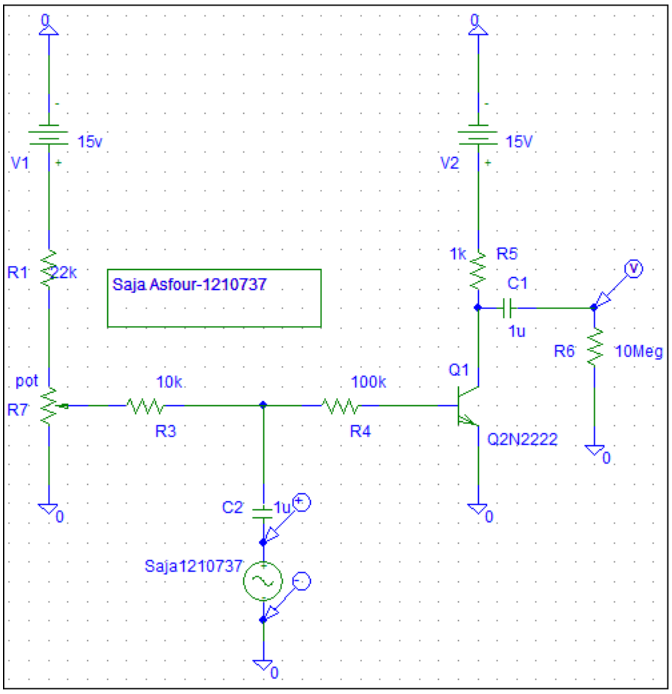

Figure1 : Part1 Circuit in PsPice

Figure 2:part1 potentiometer settings

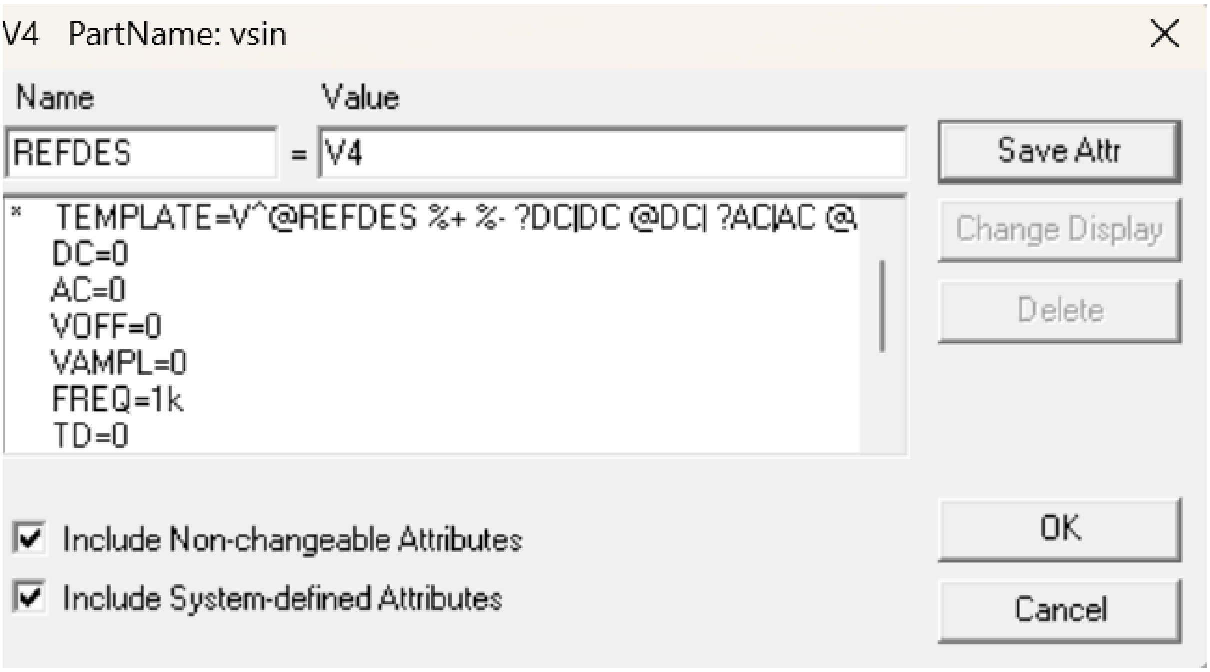

Figure 3:part1 Vsin settings

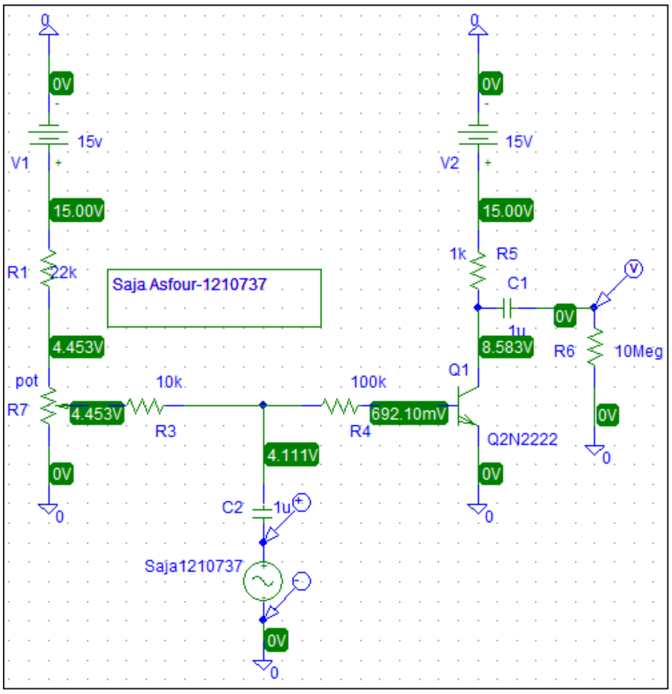

Figure 4:Part1 circuit Voltage

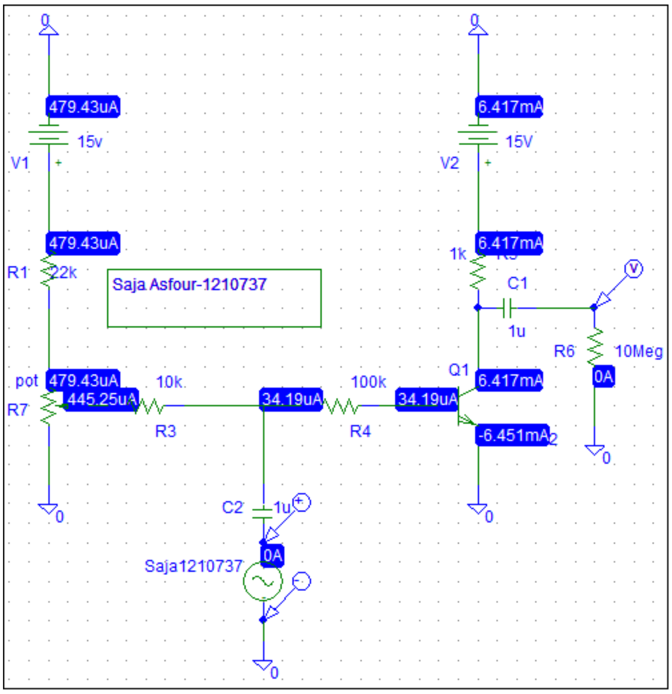

Figure 5:Part1 circuit current

As shown in the previous two figures:

VC = 8.583V, VBE = VB-VE=692.10-0=692.10mV, VCE = VC-VE =8.583-0=8.583V, IC = 6.417mA, IB = 34.19uA.

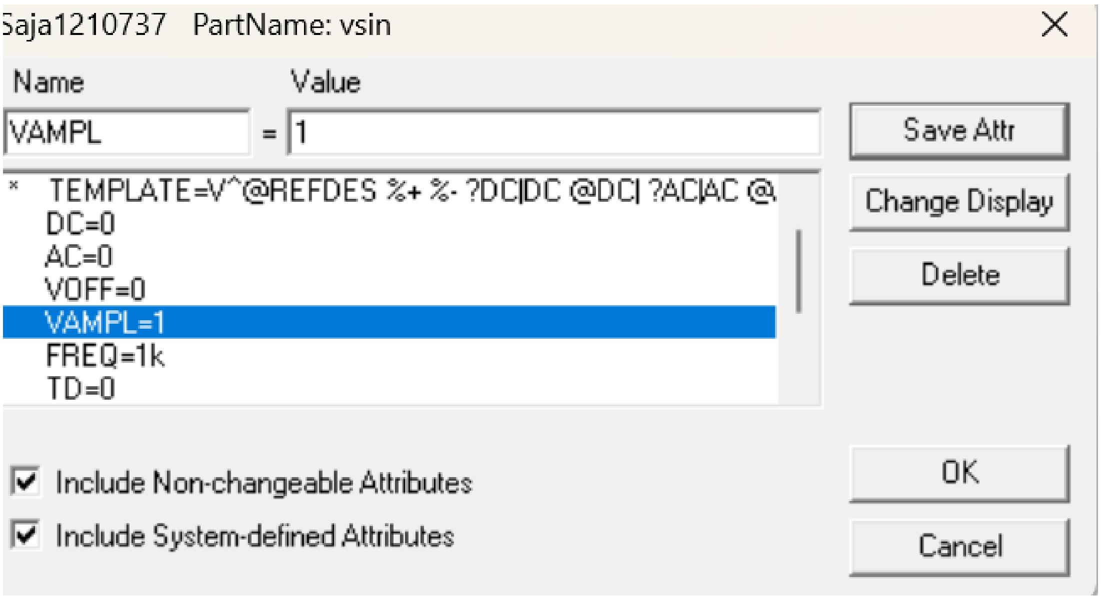

Figure 6:part1 new Vsin setting

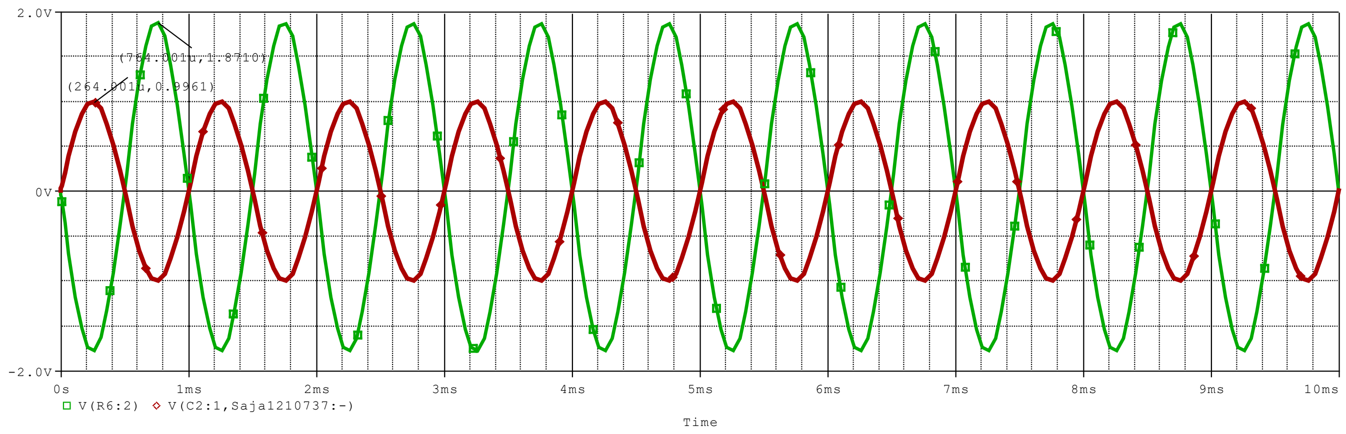

Figure 7:part1 Vi and Vo Waveform

The voltage gain equals = Vo/Vin=1.8710/0.9961= 1.8783, So, in order to have VO = 4v peak,Vin(to get Vo = 4) =4/1.8783= 2.1295V.

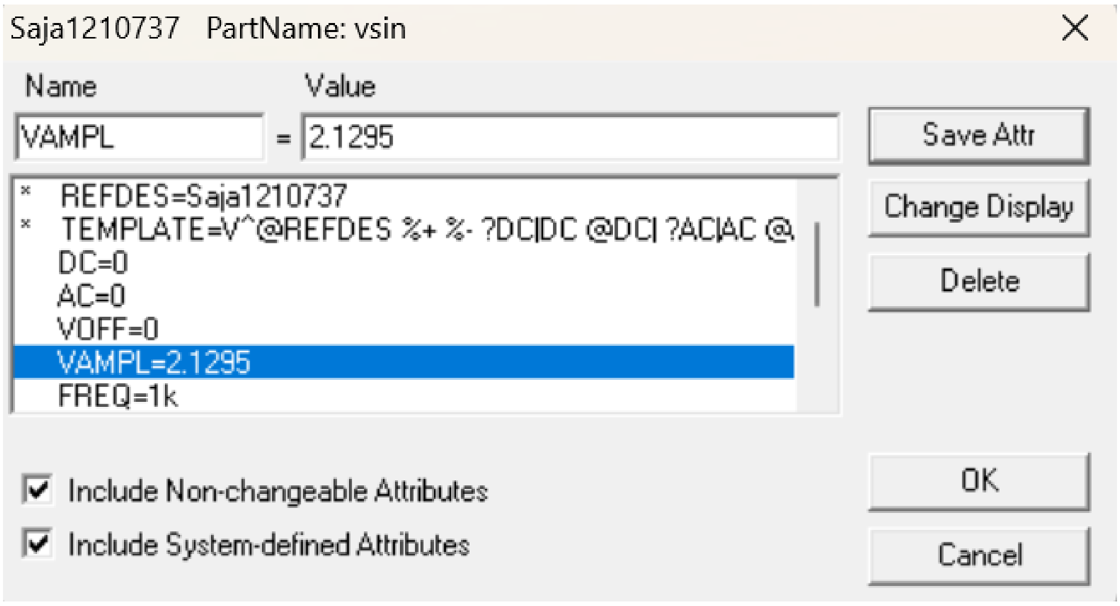

Figure 8:part1 Vsin setting to have Vout=4v

The plot of the input and output voltages when VOUT = 4, is displayed in the figure below.

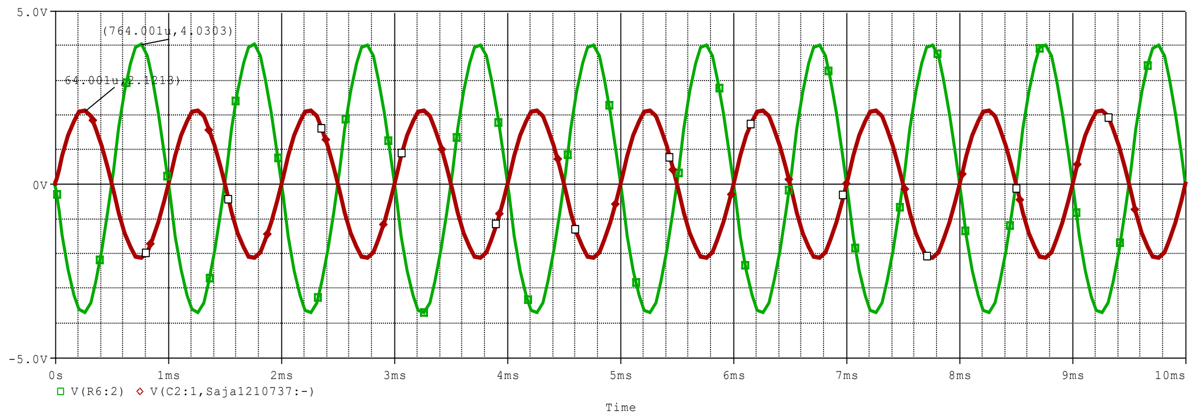

Figure 9:part1 Vi and Vo Waveform to have Vo=4V

Then to Calculate Av1=Vo(t)/VB(t)

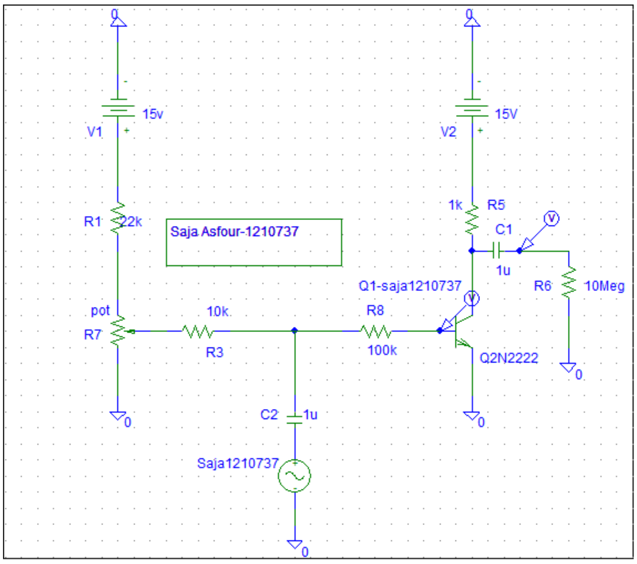

Figure 10:Part1 circuit to find Av1

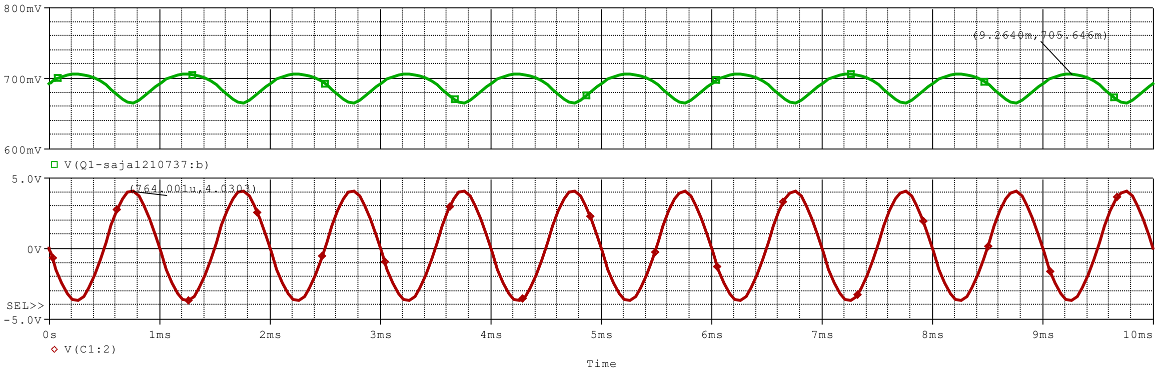

Figure 11:part1 Vo and VB waveform to find Av1

AV1 =VO(t)/VB(t)=4.0303/705.646m= 5.7115

Then if I removed the resistor with value 100kΩ like figure below:

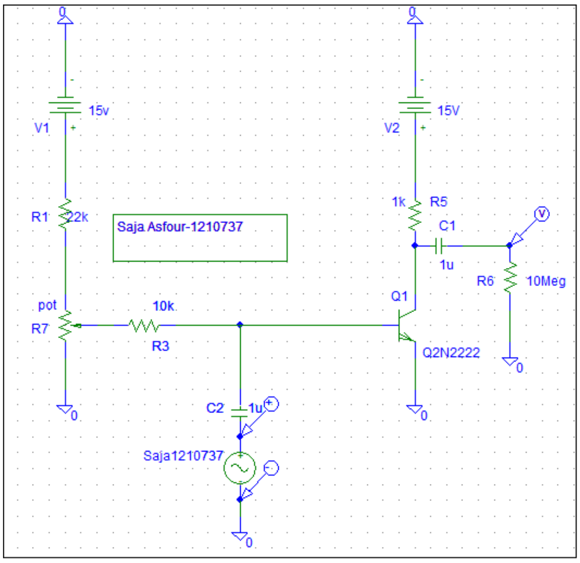

Figure 12:Part1 circuit without 100k resistor

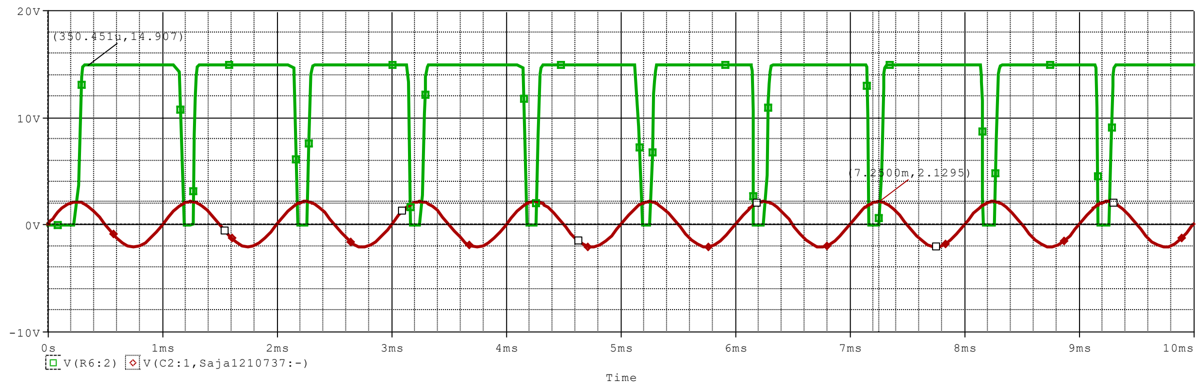

Figure 13:part1 Vi and Vo waveform without 100k

The voltage gain = 14.907/2.1295= 7.0002 , which is much increased because vi is increased.

Part two: COMMON COLLECTER TRANSISTOR AMPLIFIER

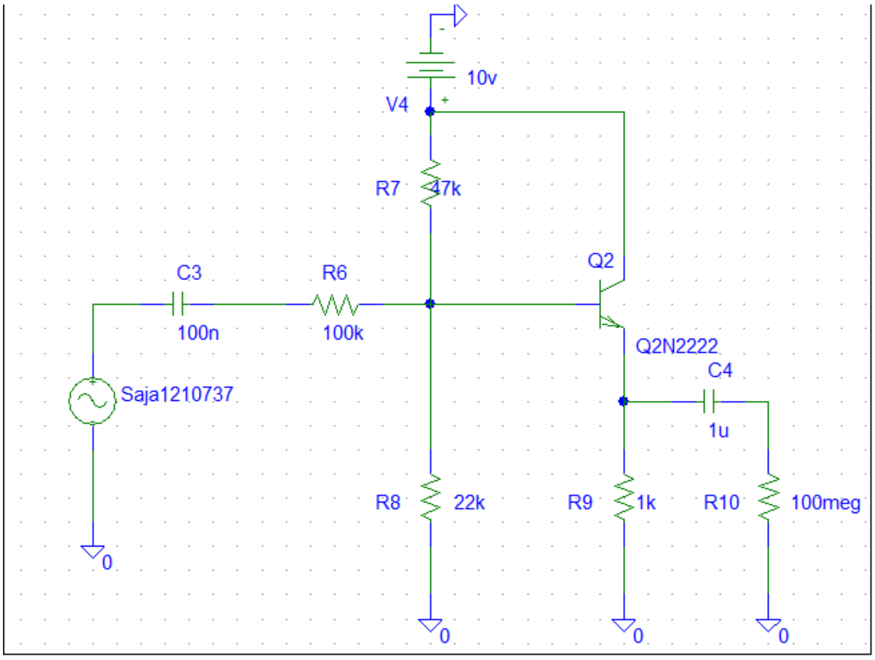

Figure 14:CC circuit

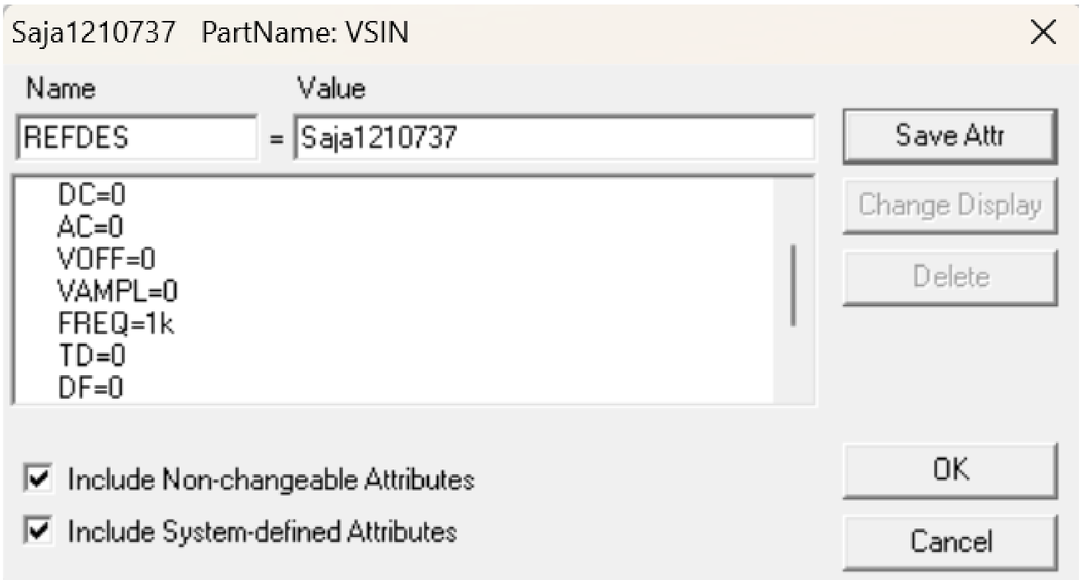

Figure 15:CC circuit Vsin setting

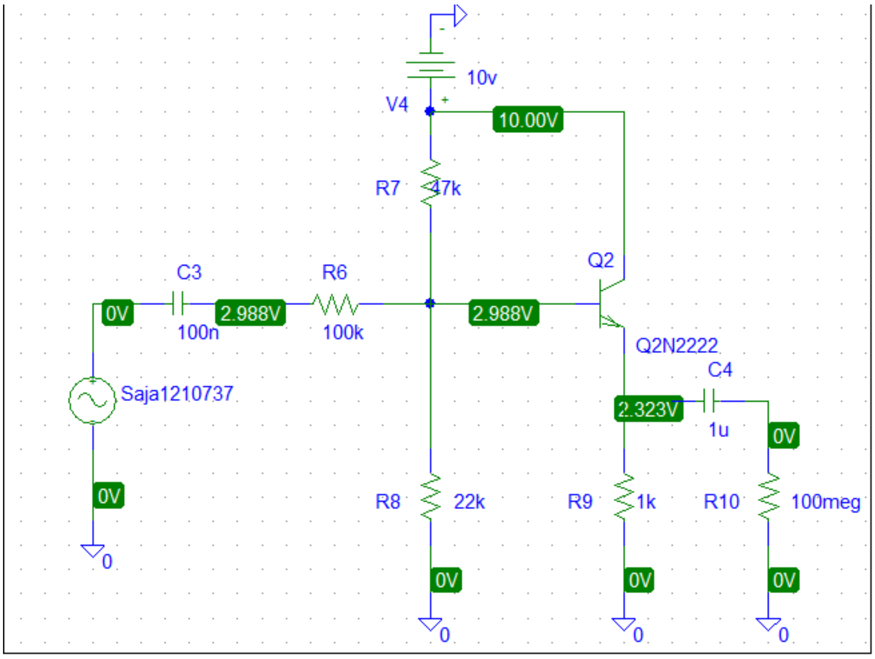

Figure 16:CC circuit voltage

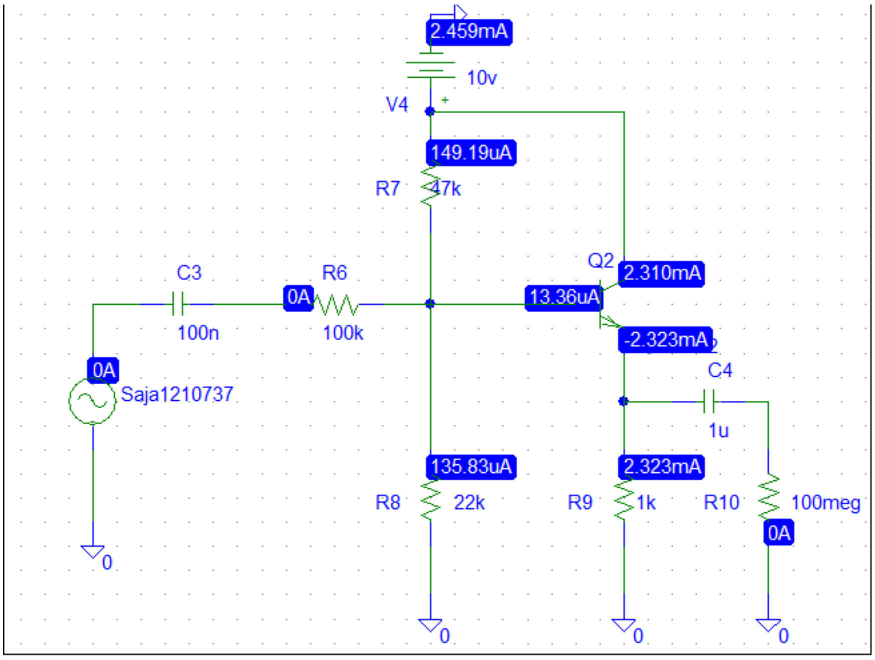

Figure 17:CC circuit Current

VB = 2.988V, VC = 10V, IB = 13.36uA , IC = 2.310 mA.

In order to get the input voltage that gives an output voltage 2volts peaks-peak, the voltage gain must be calculated, so the input voltage will be 1V amplitude in order to see the behavior of the output voltage to calculate the gain. The graph is displayed in the figure below.

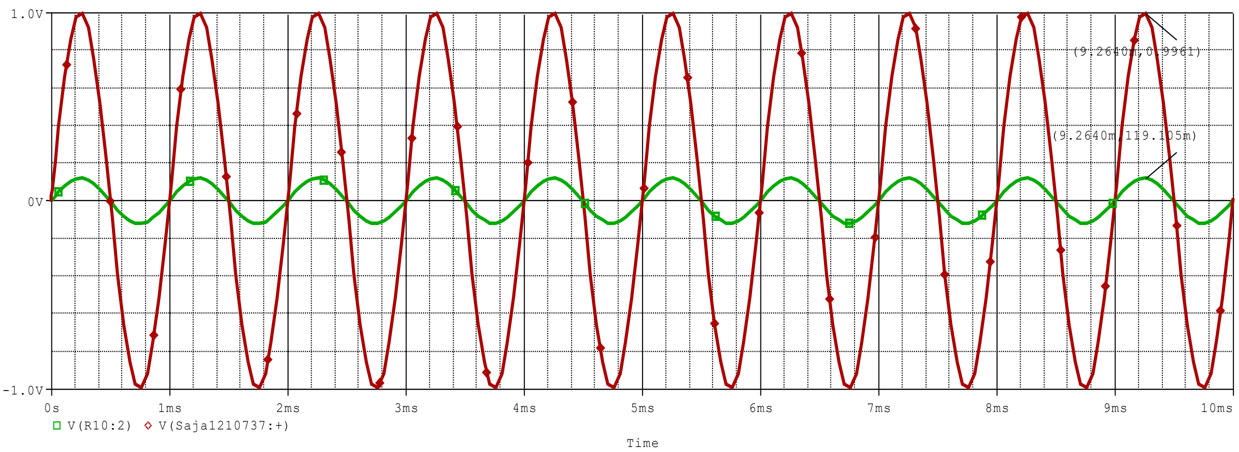

Figure 18:CC Vo and Vi waveforms in order to calculate the gain

Av=Vo/Vi=119.105mv/0.9961=0.1196

So , if Vo=2V peak-to-peak(1 volt amplitude) then Vin=1/0.1196=8.3612v amplitude which equals to 16.7224v.

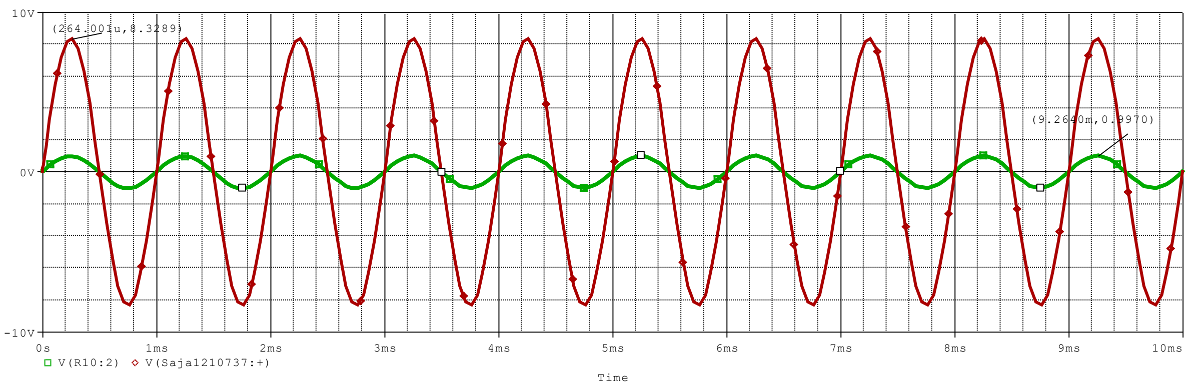

Figure 19:CC Vi and Vo waveforms when Vo = 2V peak-to-peak

Vout = 0.9970 V ≈ 1 V → Vout = 2 V peak to peak

Vin =8.3289 ≈ 8.4 V

AV = 0.119

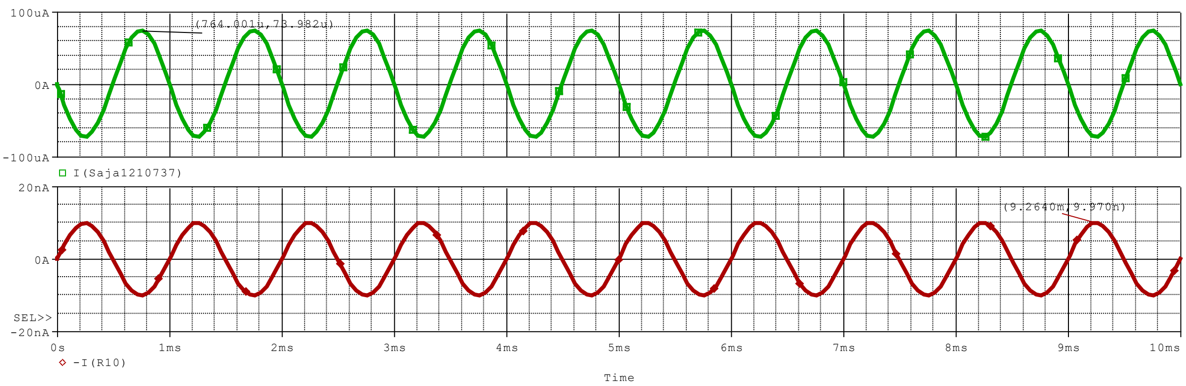

Figure 20:CC Input and output currents

Iin=73.982uA , Io=9.972nA so the current gain Ai=Io/Iin=0.1347m.
Zin=Vin/Iin=8.3289/73.982uA=112.58kΩ.

In order to calculated Zo, the input voltage source will be replaced by a short circuit, and the source will be added to the output after a capacitor as shown in the figure below.

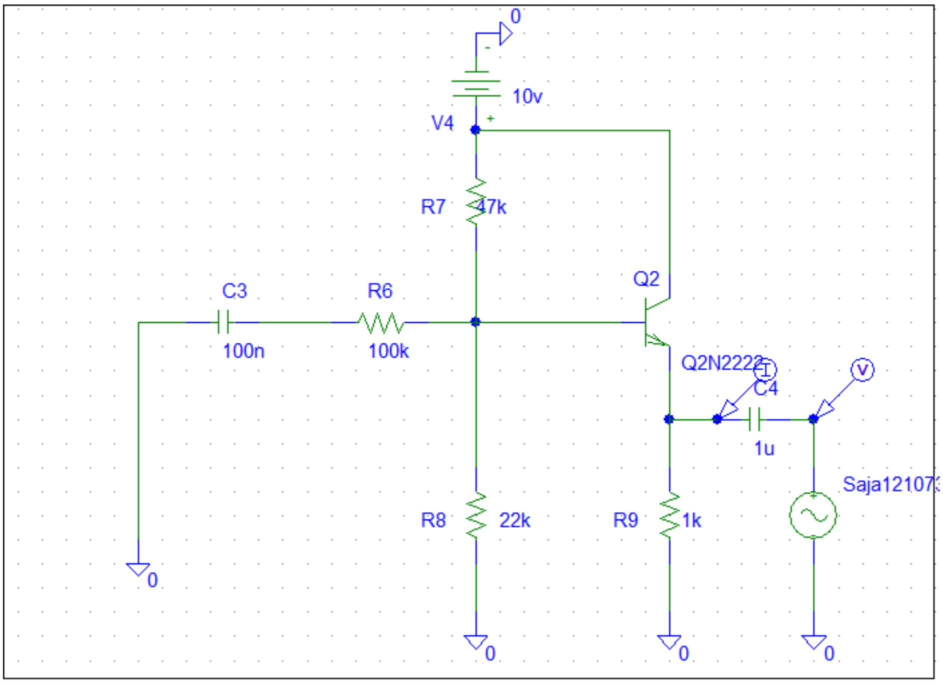

Figure 21:CC Output impedance measuring circuit

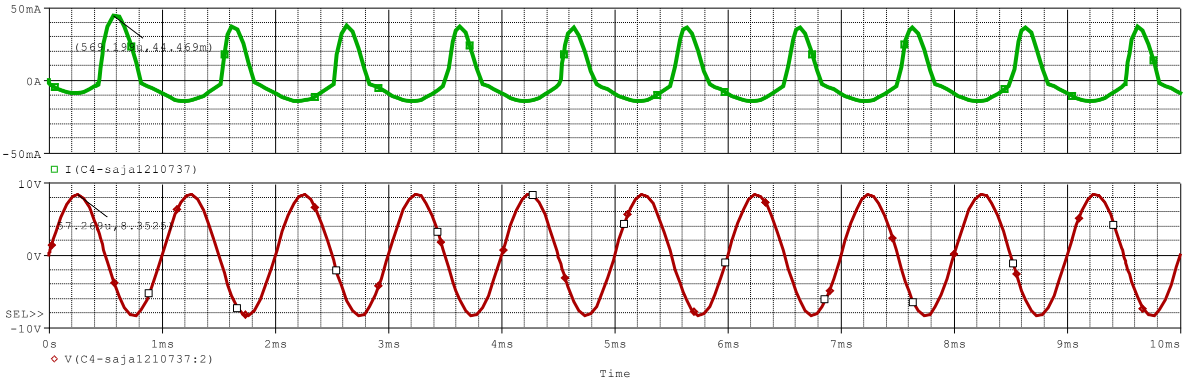

Figure 22:CC output voltage and current for the impedance

Zo=Vo/Io=8.3525/44.469mA=187.8275Ω

Table 1: CC measured and calculated value

Quantity	Measured value
Vin	8.3289v amplitude
Vout	0.9970v amplitude
v100k_RMS	7.3982V amplitude
Iout	9.972nA
	Calculated Value
Av=Vout/vin	0.1196 v/v
Iin = v100k_RMS /100k	73.982uA
Ai=Iout/Iin	0.1347m
Zin=Vin/Iin	112.58kΩ.
Zout=Vt/It	187.8275Ω