Ryerson University

Faculty of Science

Course Number	ELE404
Course Title	Electronic Circuits I
Semester/Year	W2022
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TA Name	Anas Razzaq

Lab/Tutorial Report No.	Design Project

Report Title	BJT Amplifiers

Section No.	01
Submission Date	17-April-2022
Due Date	17-April-2022

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Introduction

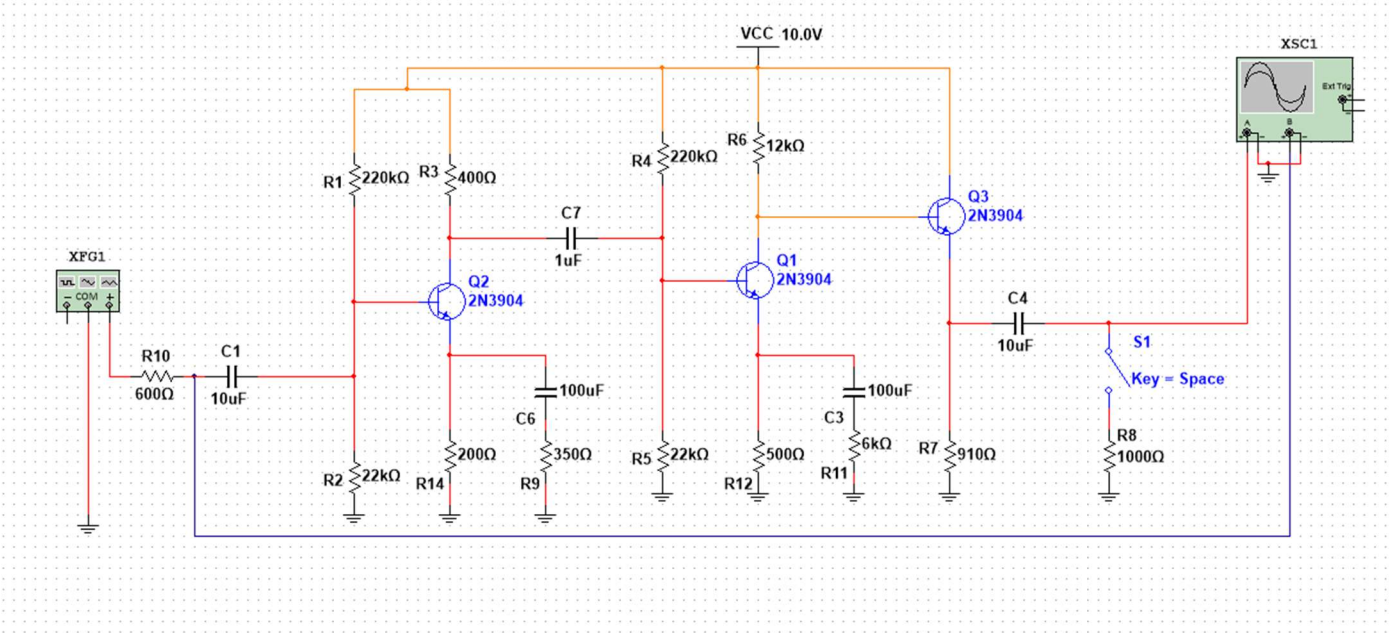
This report is for Design Project “BJT Amplifiers”. The project took place from 1 April 2022 to 17 April.

Objectives

The objective of this lab was to design an amplifier circuit that complies with the following specifications.

- Power supply: $+\mathbf{10}\boldsymbol{V}$ relative to the ground;
- Quiescent current drawn from the power supply: ***no larger than*** $\mathbf{10}\ \boldsymbol{mA}$;
- No-load voltage gain (at 1 kHz): $|\boldsymbol{A_{vo}}| = \mathbf{50}\ (\pm\ \mathbf{10}\%)$;
- Maximum no-load output voltage swing (at 1 kHz): ***no smaller than 8 V peak to peak;***
- Loaded voltage gain (at 1 kHz and with $R_L = 1\ k\Omega$): ***no smaller than*** $\mathbf{90}\%$ ***of the no-load voltage gain;***
- Maximum loaded output voltage swing (at 1 kHz and $R_L = 1\ k\Omega$): ***no smaller than 4 V peak to peak;***
- Input resistance (at 1 kHz): ***no smaller than*** $\mathbf{20}\ \boldsymbol{k\Omega}$;
- Amplifier type: ***inverting or non-inverting;***
- Frequency response: ***20 Hz to 50 kHz*** $(-\mathbf{3}\boldsymbol{dB}$ ***response);***
- Type of transistors: ***BJT;***
- Number of transistors (stages): ***no more than 3;***
- Resistances permitted: ***values smaller than*** $\mathbf{220}\ \boldsymbol{k\Omega}$ ***from the E24 series;***
- Capacitors permitted: $\mathbf{0.1}\ \boldsymbol{\mu F}$, $\mathbf{1.0}\ \boldsymbol{\mu F}$, $\mathbf{2.2}\ \boldsymbol{\mu F}$, $\mathbf{4.7}\ \boldsymbol{\mu F}$, $\mathbf{10}\ \boldsymbol{\mu F}$, $\mathbf{47}\ \boldsymbol{\mu F}$, $\mathbf{100}\ \boldsymbol{\mu F}$, $\mathbf{220}\ \boldsymbol{\mu F}$;
- Other components (BJTs, diodes, Zener diodes, etc.): ***only from your ELE404 lab kit.***

Circuit Made



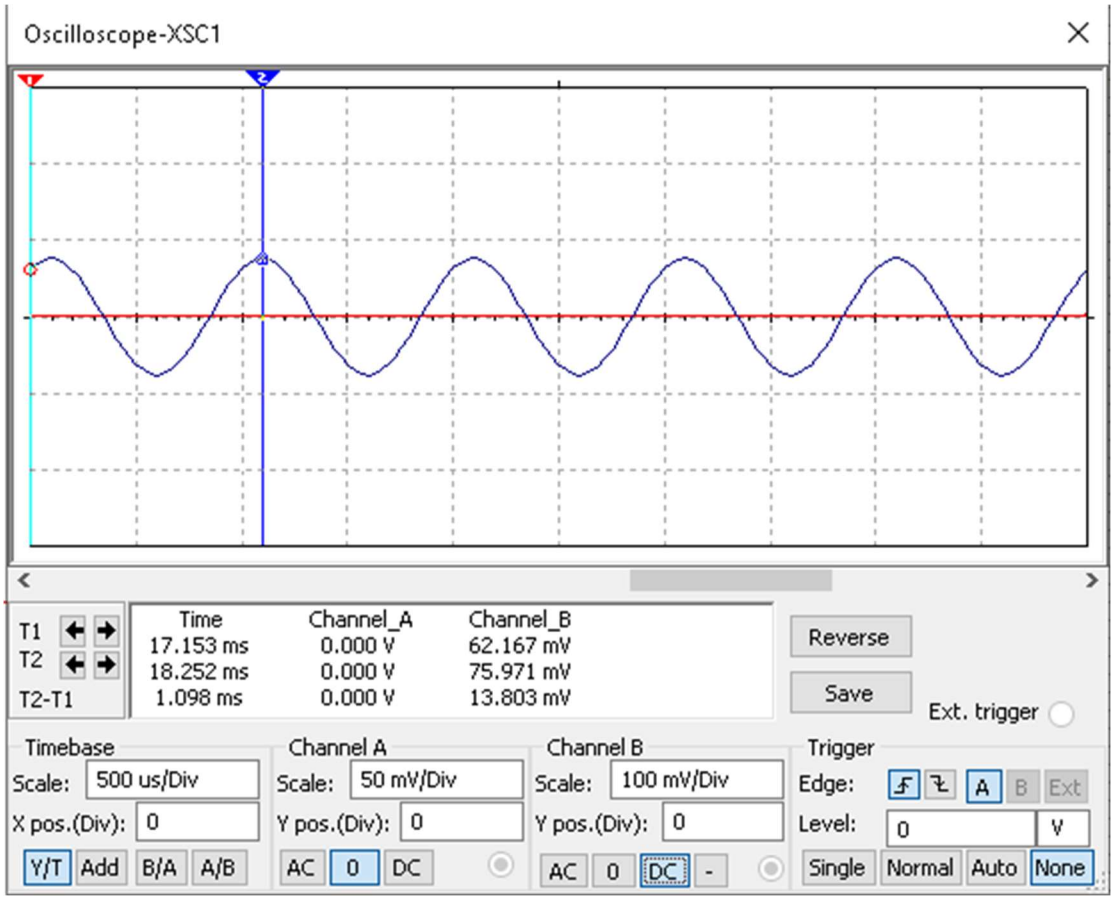
The Circuit shows 3 stage amplifiers CE then CE then CC Amplifiers.

First CE has an amplification of x2 second one has an amplification of x25.

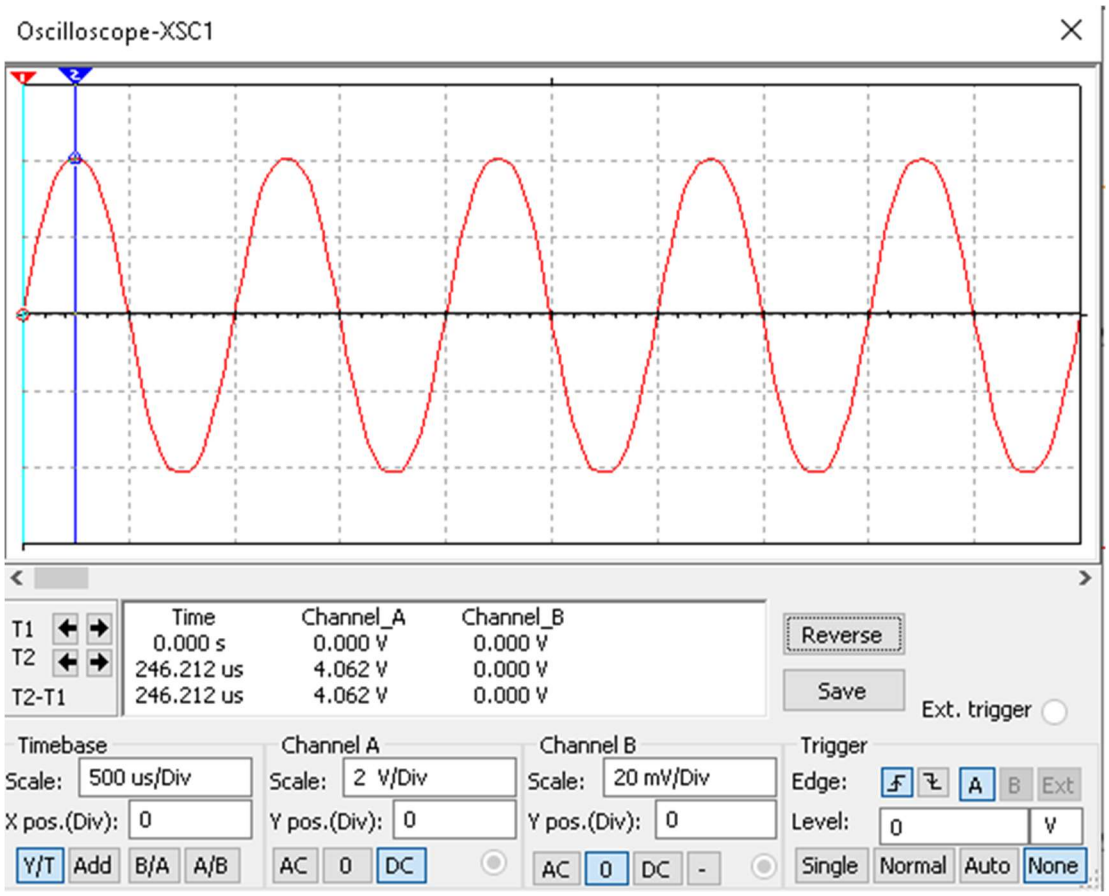
CC has amplification of x1.

Results

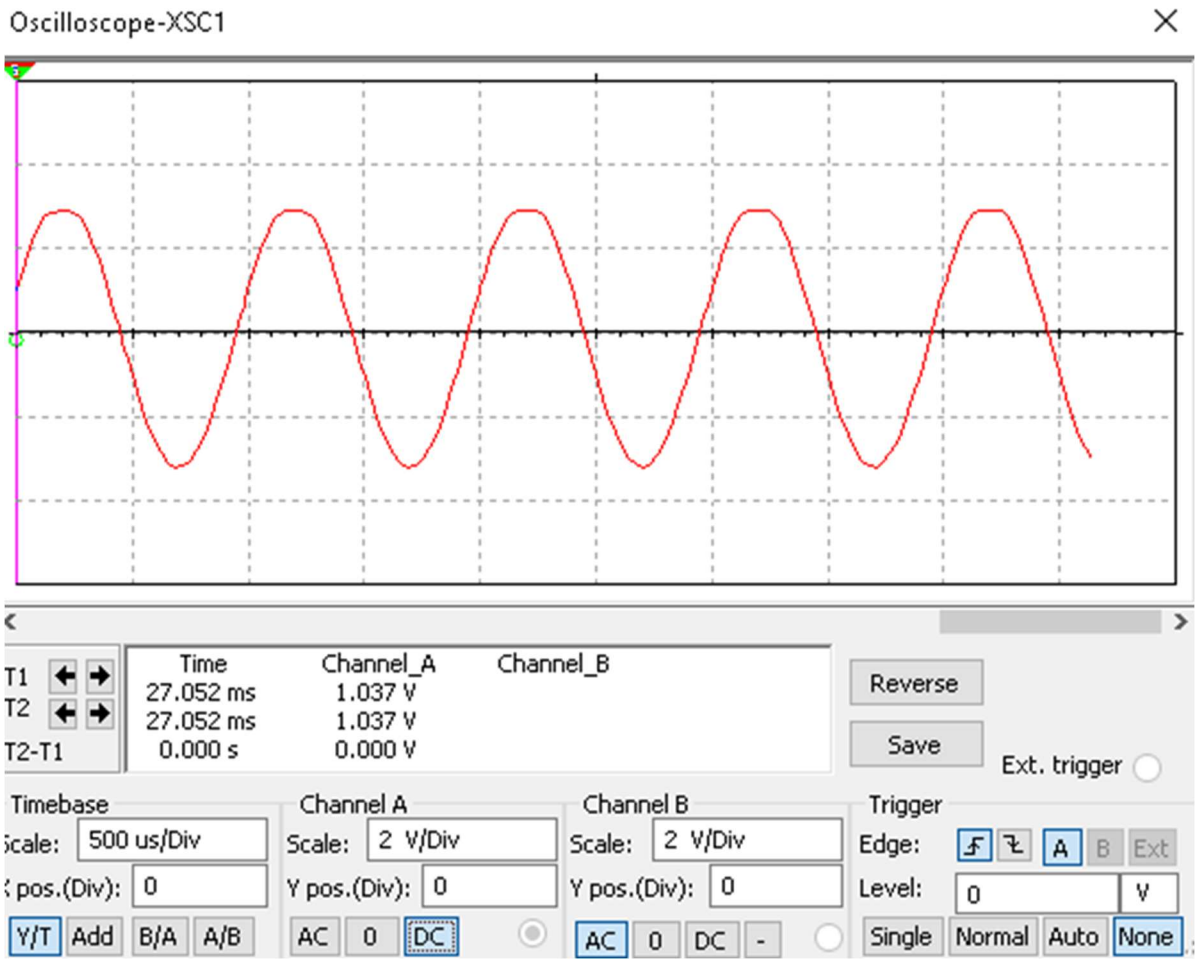
Input:



Output: 8V p2p without load



Output: more than 4 p2p with load



Av without load:

Vin = 0.075V

Vo= 4

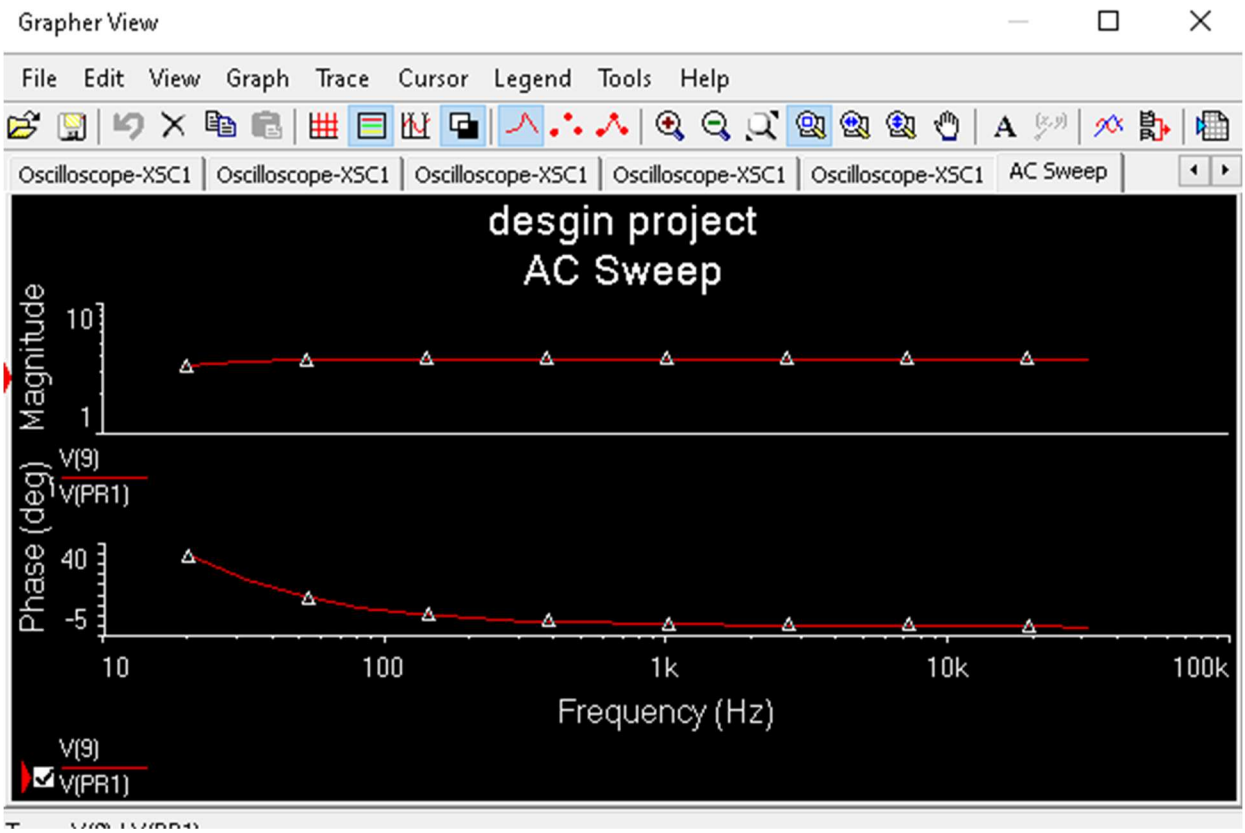
Vin/Vo=53.333

Av with load:

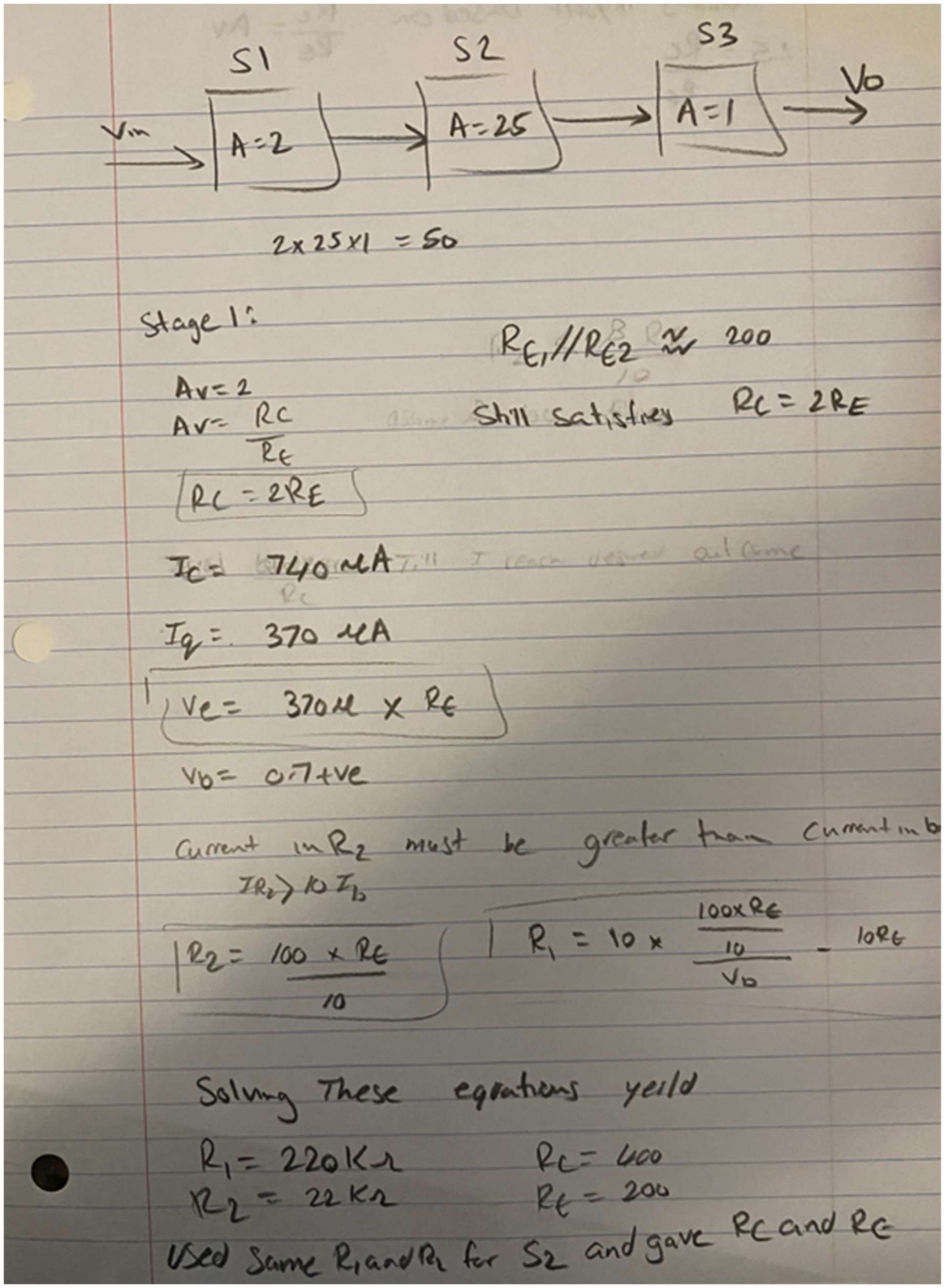
Vin = 0.075V

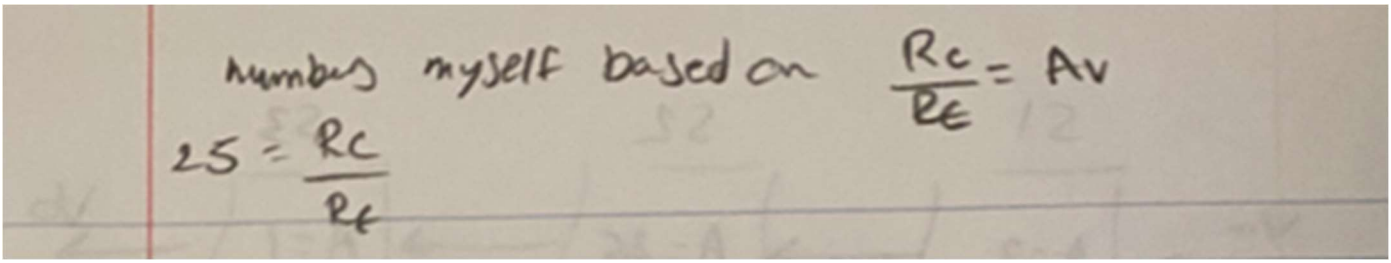
Vo= 3.31

Vin/Vo= 44.1333


Grapher View
File Edit View Graph Trace Cursor Legend Tools Help
Oscilloscope-XSC1 Oscilloscope-XSC1 Oscilloscope-XSC1 Oscilloscope-XSC1 Oscilloscope-XSC1 AC Sweep
desgin project
AC Sweep
Magnitude
10
1
V(9)
V(PR1)
Phase (deg)
40
-5
10
100
1k
10k
100k
Frequency (Hz)
V(9)
V(PR1)

Calculations





Calculations

In conclusion, the circuit was mostly calculated except for the RC and RE in S2 these were picked based on trial and error. And the S3 circuit was based on the Lab 7 CC circuit with the resistor put as 1k to minimize clipping.