2Ei5
Lab#2

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Lab section: L01
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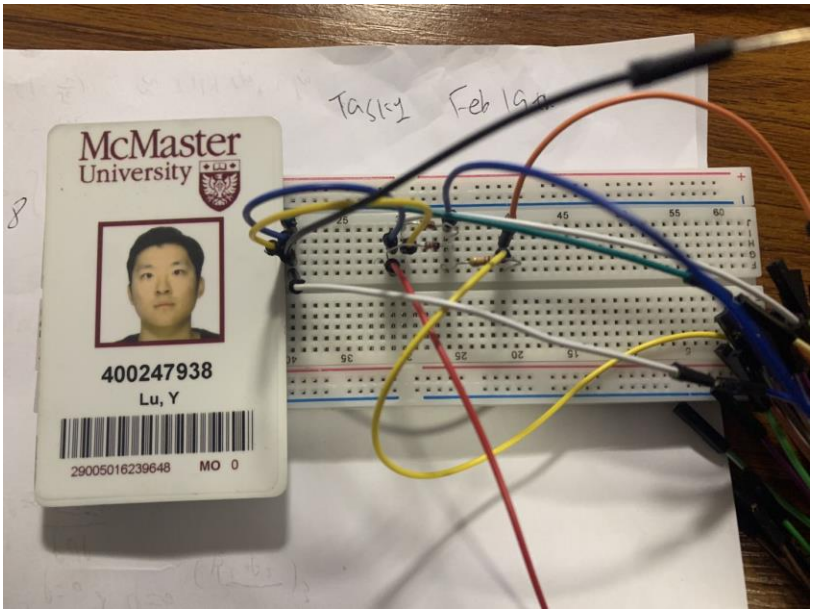
As a future member of the engineering profession, the student is responsible for performing the required work in an honest manner, without plagiarism and cheating. Submitting this work with my name and student number is a statement and understanding that this work is our own and adheres to the Academic Integrity Policy of McMaster University and the Code of Conduct of the Professional Engineers of Ontario.
Submitted by Yichen Lu,luy191,400247938

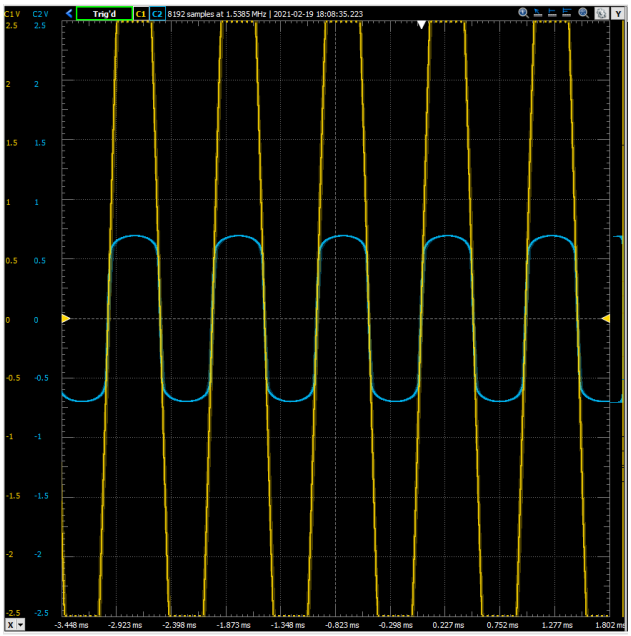
Task 1: a clipper circuit

1. picture of the physical circuit

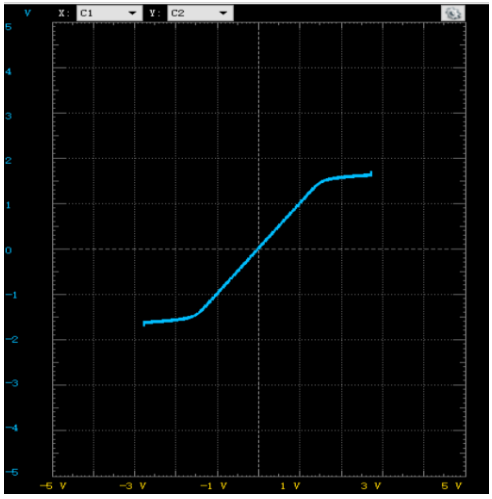


2. screenshots of measurement results

(1) Vi and Vo as a function of time:(Vi is the yellow curve, Vo is the blue curve)



(2) Transfer function (Vi vs Vo): (Vi is x-axis, Vo is y-axis)



3. Brief discussion

Theoretically, the voltage across D1 diode is no larger than 0.7v. Besides that, by adding the 1 V supply voltage V1. Thus, Vo will not be bigger than 1.7v. In addition, Vo similarly will not exceed -1.7V because (-0.7v + -1v). Therefore, the range of Vo is between -1.7v and 1.7v. All in all, the result matches the graph that I generated.

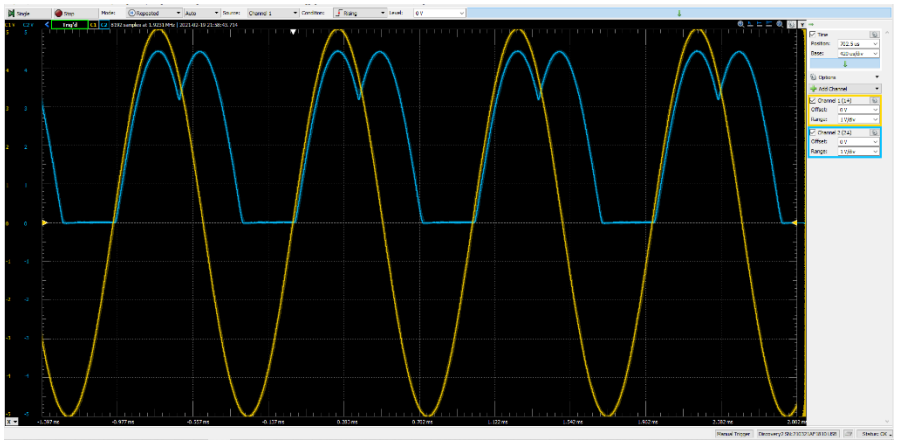
Task 2: Full wave rectifier with 2-phase input

1. picture of the physical circuit

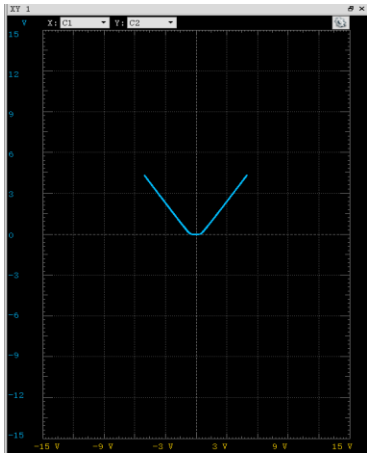
(connecting a capacitor in parallel)

2. screenshots of measurement results

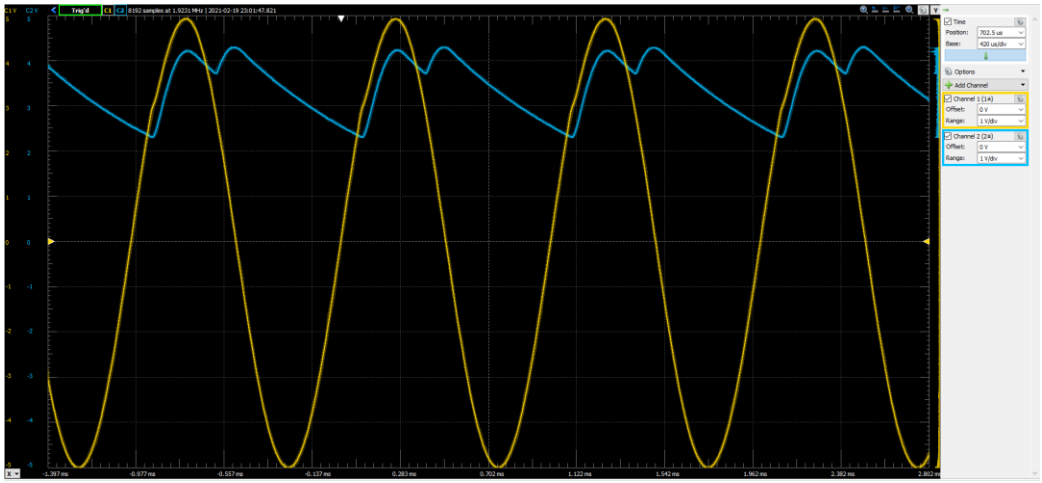
(1) V1 and Vo as a function of time()
(some inaccuracy happens because of AD2 connection)



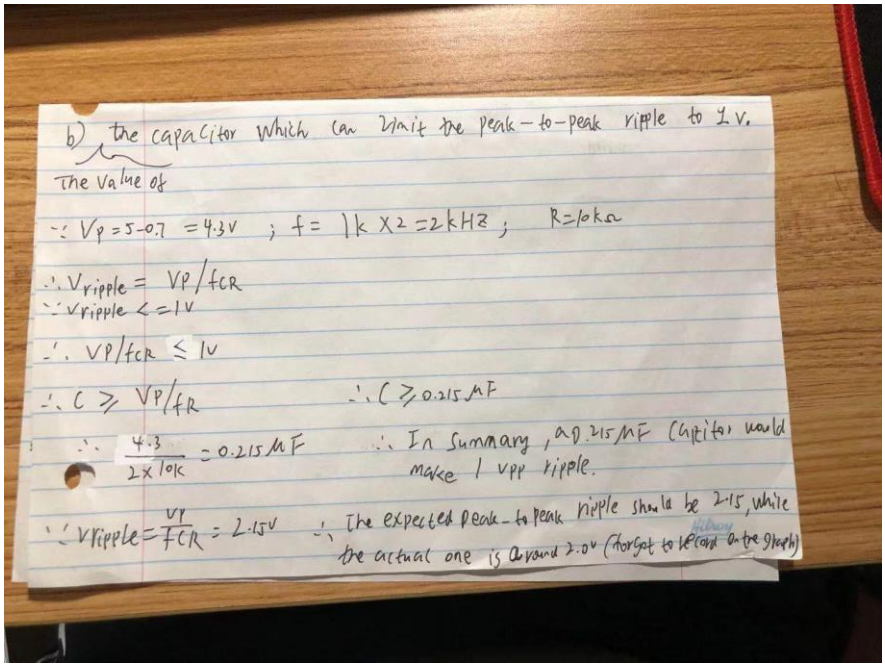
(2) Vo vs V1(x axis for V1 and y axis for Vo)



(3) Peak-to-Peak ripple after connecting a capacitor in parallel



3. Brief discussion
    a. For the first two graphs that I generated, it matches that what I expected. Vo should behave like a sine wave with its negative part reversed.
    b. For the graph that I generated by connecting a capacitor in parallel, I can see that



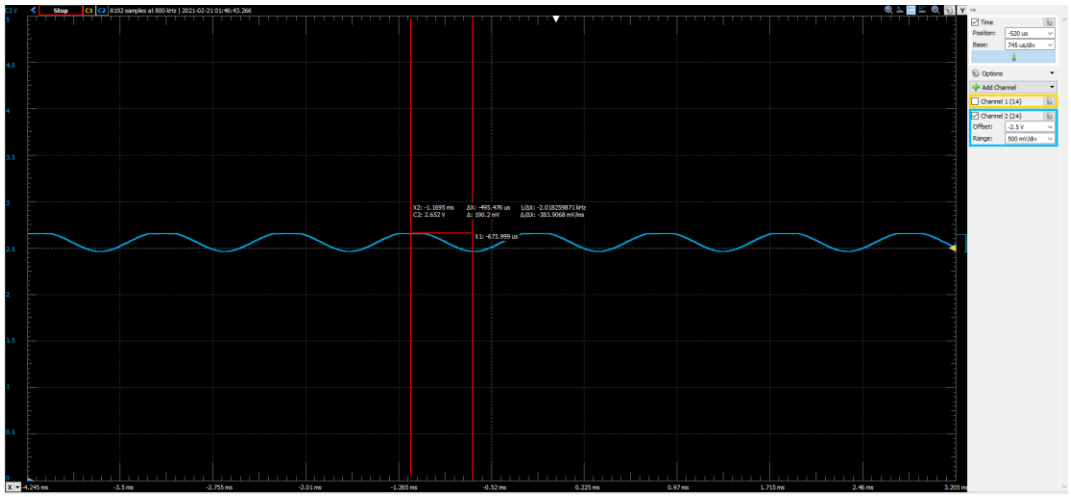
In conclusion, the expected value basically matches. But there still are inaccuracy, because the diode is not ideal which may affect the accuracy.

Task 3: Voltage regulation

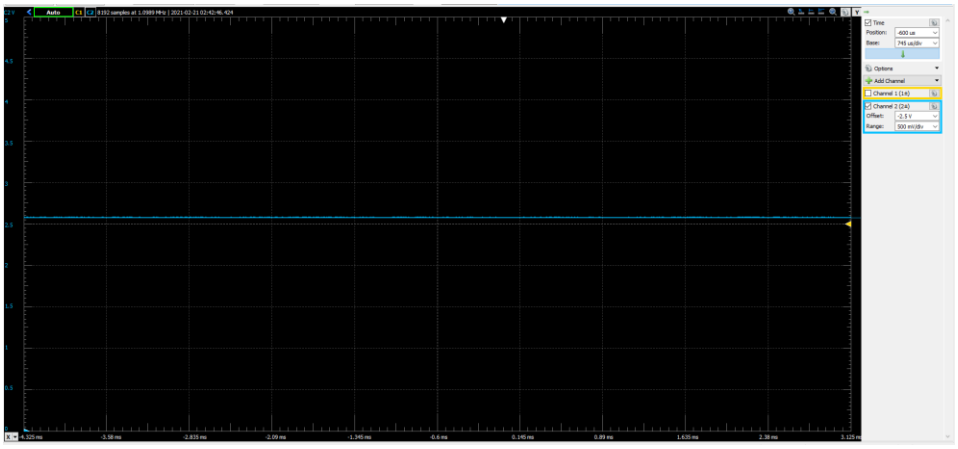
1. picture of the physical circuit

2. screenshots of measurement results

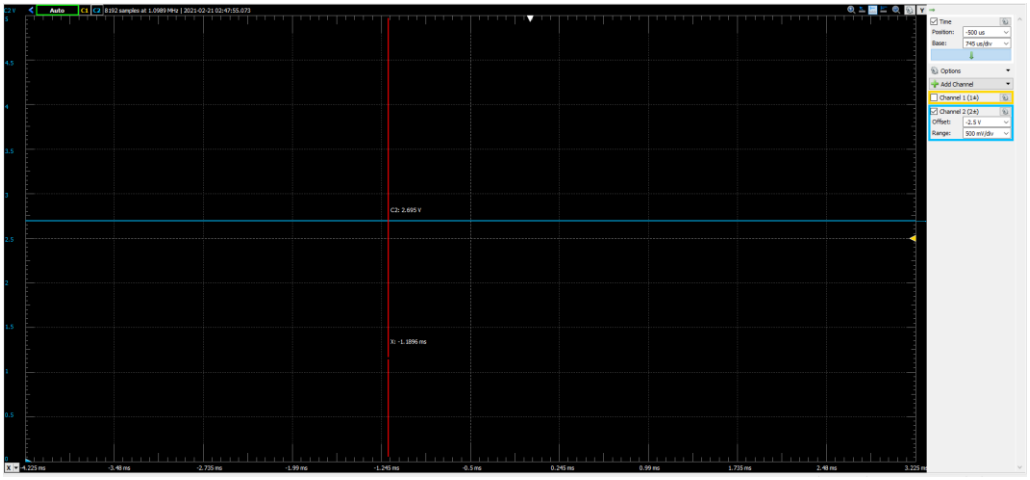
(1) VL with a triangular voltage source and the load resistor
(VL fluctuates between 2.459V and 2.652V)



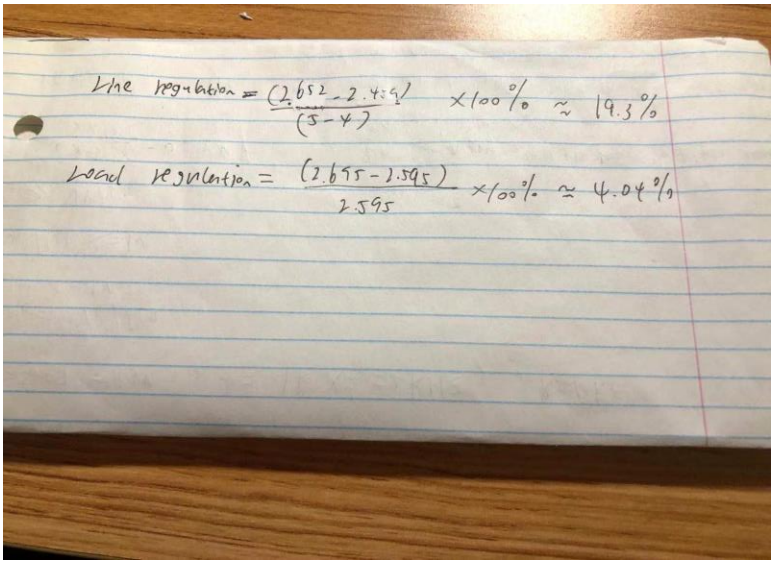
(2) VL with a 4.5 DC voltage source
With the load resistor, VL = 2.595V



Without the load resistor, VL = 2.695V



(3) Calculations



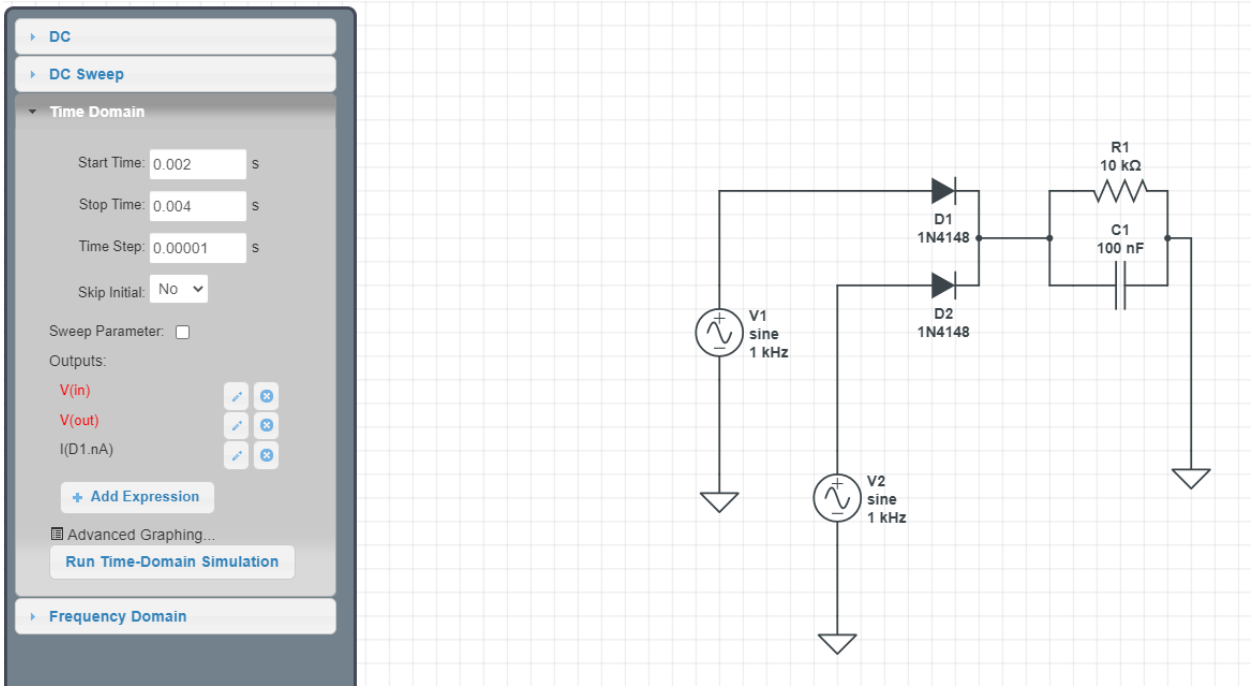
4. Brief discussion

The voltage for VL should be the breakdown voltage of the Zener diode. It is known as 3V from the datasheet. However, my range of VL is between 2.459V and 2.652V. The experimental value basically matches the expected value.

Task 4: Simulation

a. Simulation of Task 2

1. Schematic design on Circuit lab

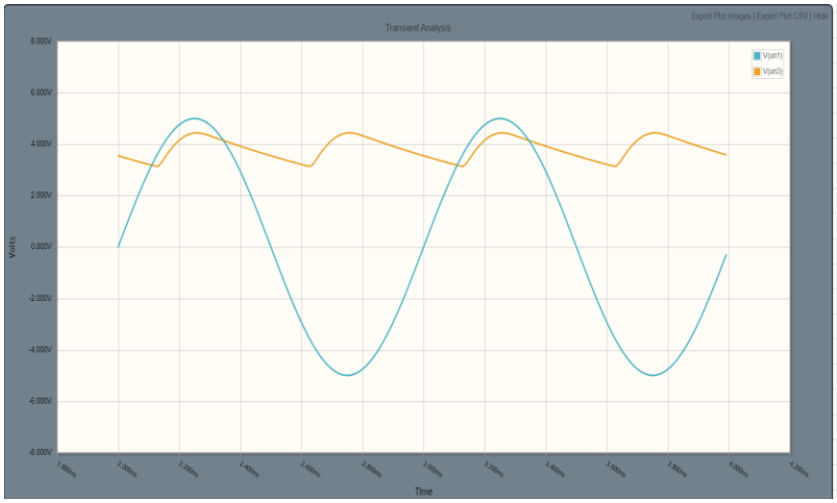


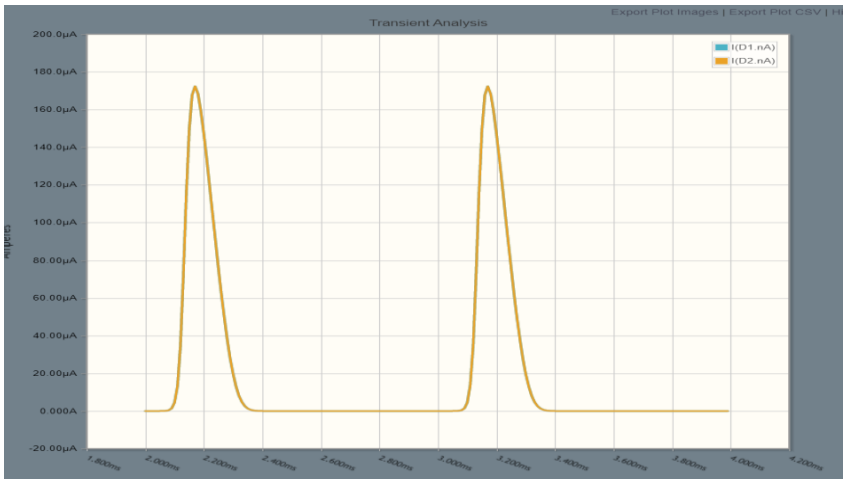
2. Simulation settings

For the transient analysis, the setting of start time of 0.002s, stop time of 0.004s and timestep of 0.00001s,

The reason for setting 2ms to be start time rather than 0 is to avoid any unstableness at the beginning of the simulation.

3. Simulation results

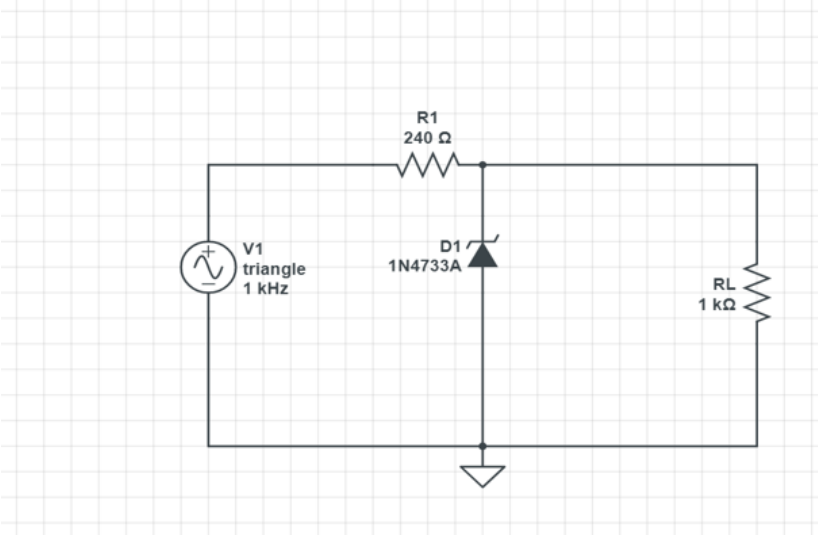




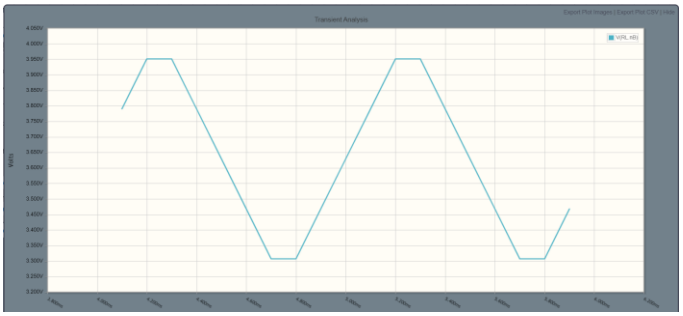
4. Brief discussion
   In conclusion, the simulation graphs are the same that I expected.

b. Simulation of Task 3

1. Schematic design on Circuit lab



2. Simulation settings
   Since there is no 1N5225B Zener diode in Circuit lab, I used 1N4733A Zener diode to replace it. As a result, the simulation graph is kind of incorrect because of the incorrect diode.
   I set that the beginning time is 0.004 s, the time step
   0.00001s and the end time is 0.006 s.
3. Simulation results



4. Brief discussion
   In conclusion, the simulation graphs are the same that I expected.