EE281 EXPERIMENT 5

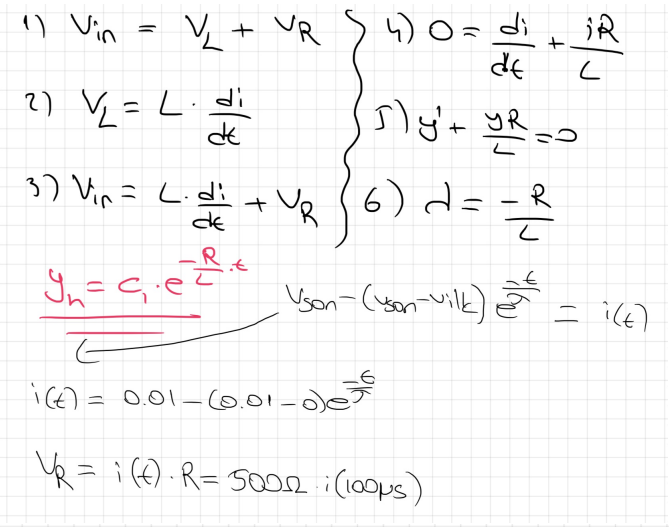
Göktuğ Ekinci
2380343

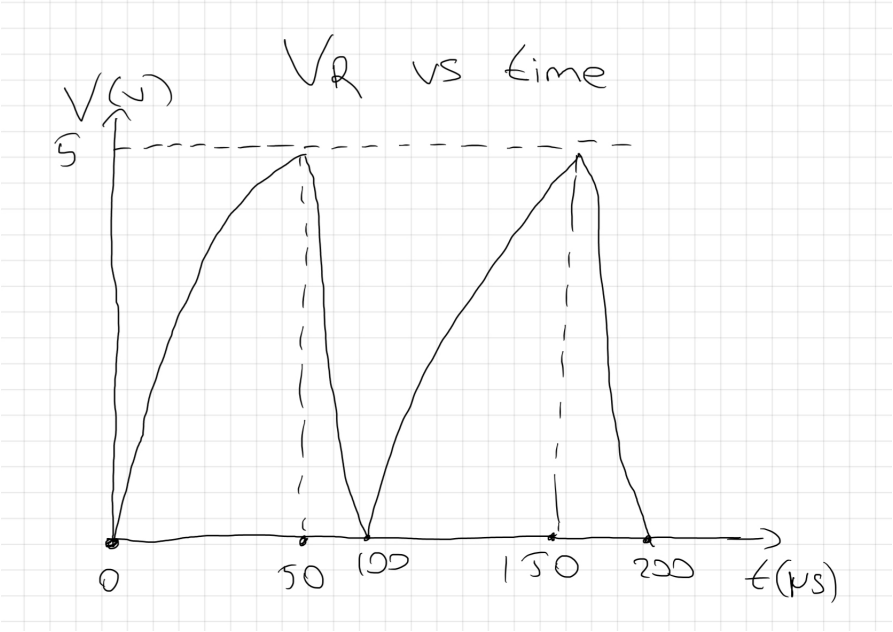
1st of January 2021

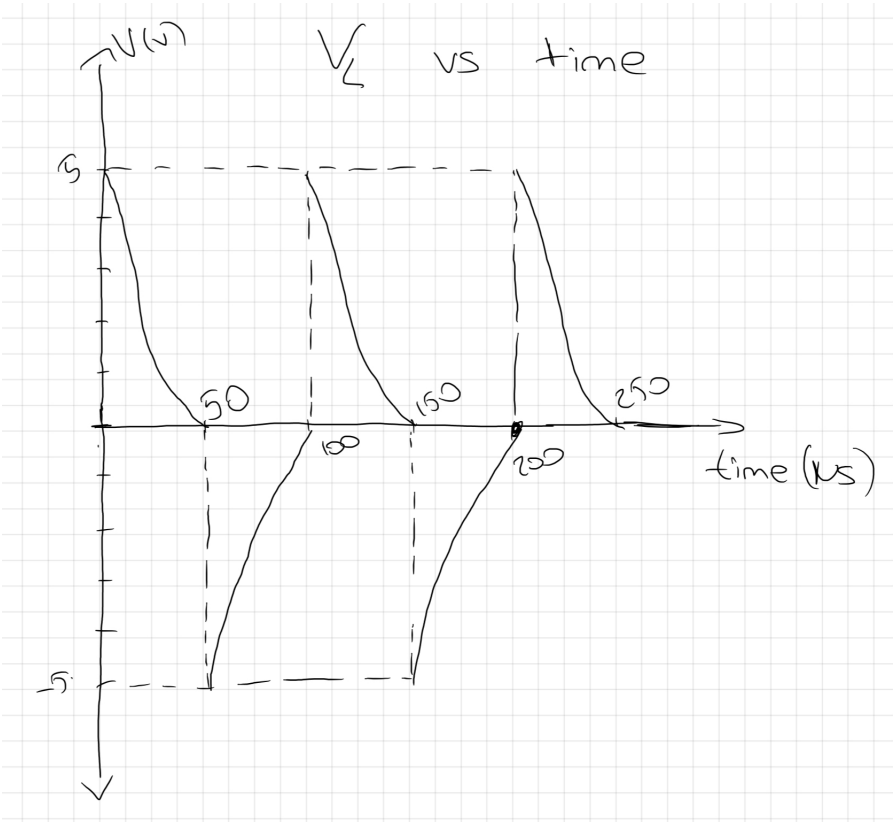
1 Preliminary Work

1

i)





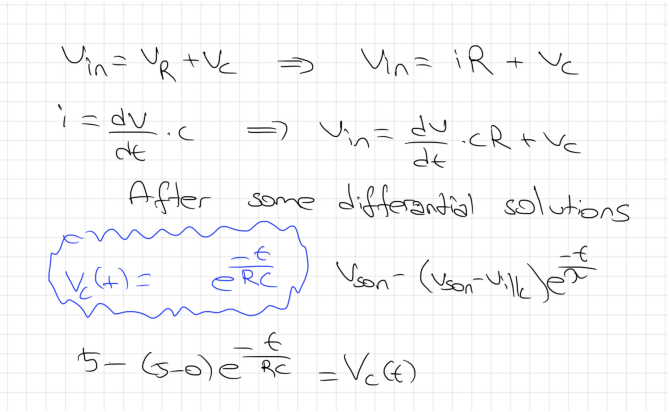


ii)

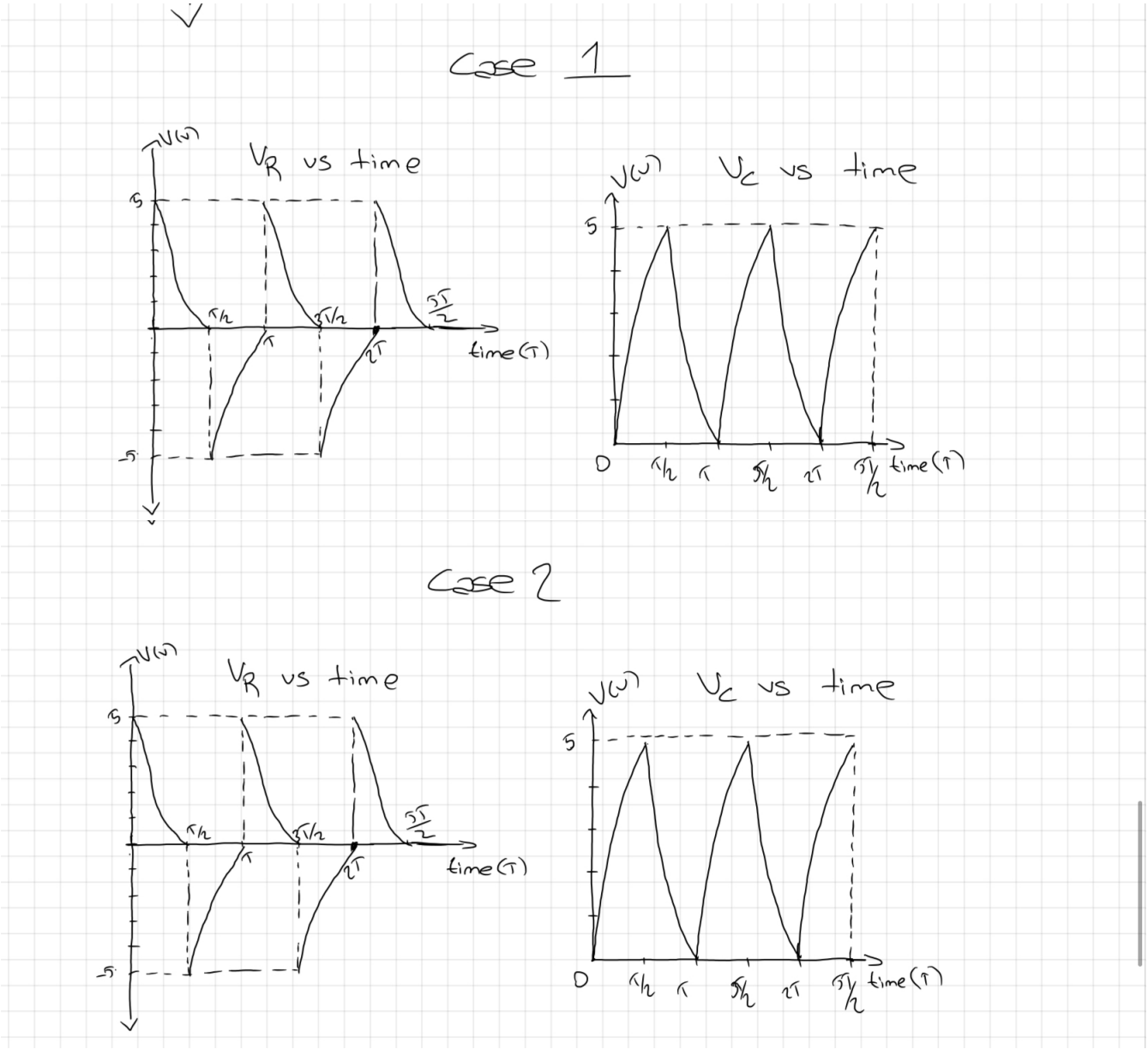
Time constant is equal to $\frac{L}{R} = \frac{3.9}{500} = 7.8ms$

2

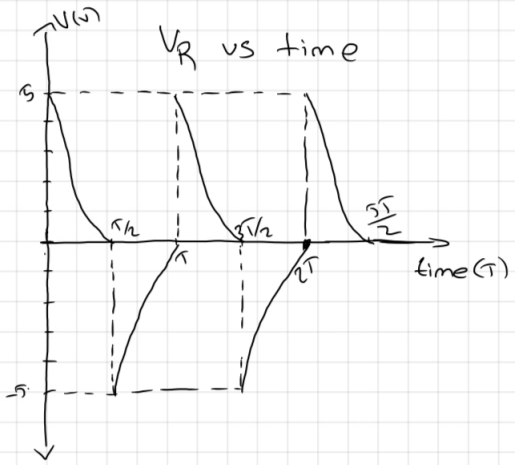
i)

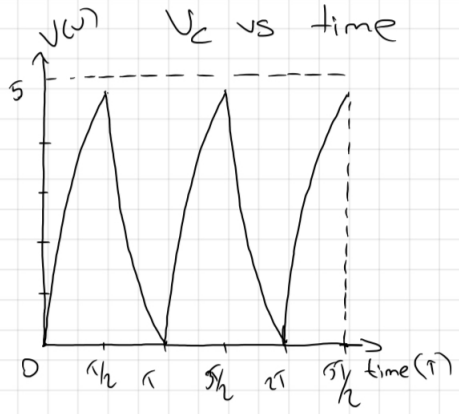


ii)

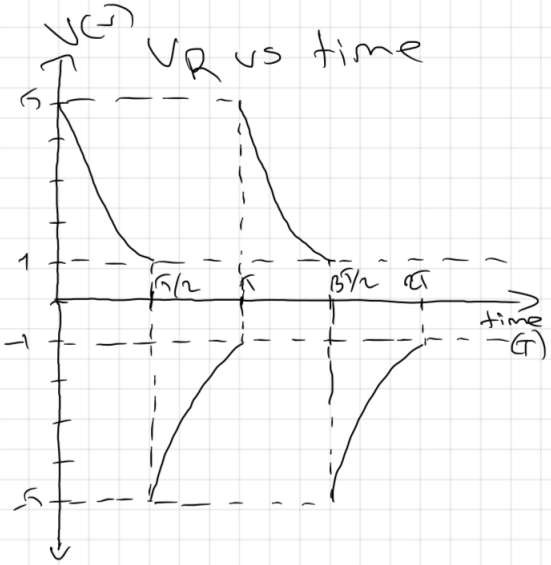

Case 1
V(v)
V_R vs time
5
-5
time(T)
V_C vs time
0
Case 2
V_R vs time
V_C vs time

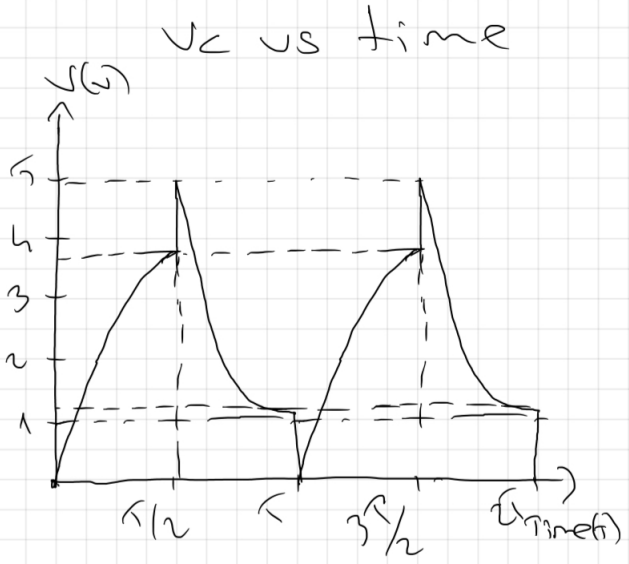
Case 3





Case 4





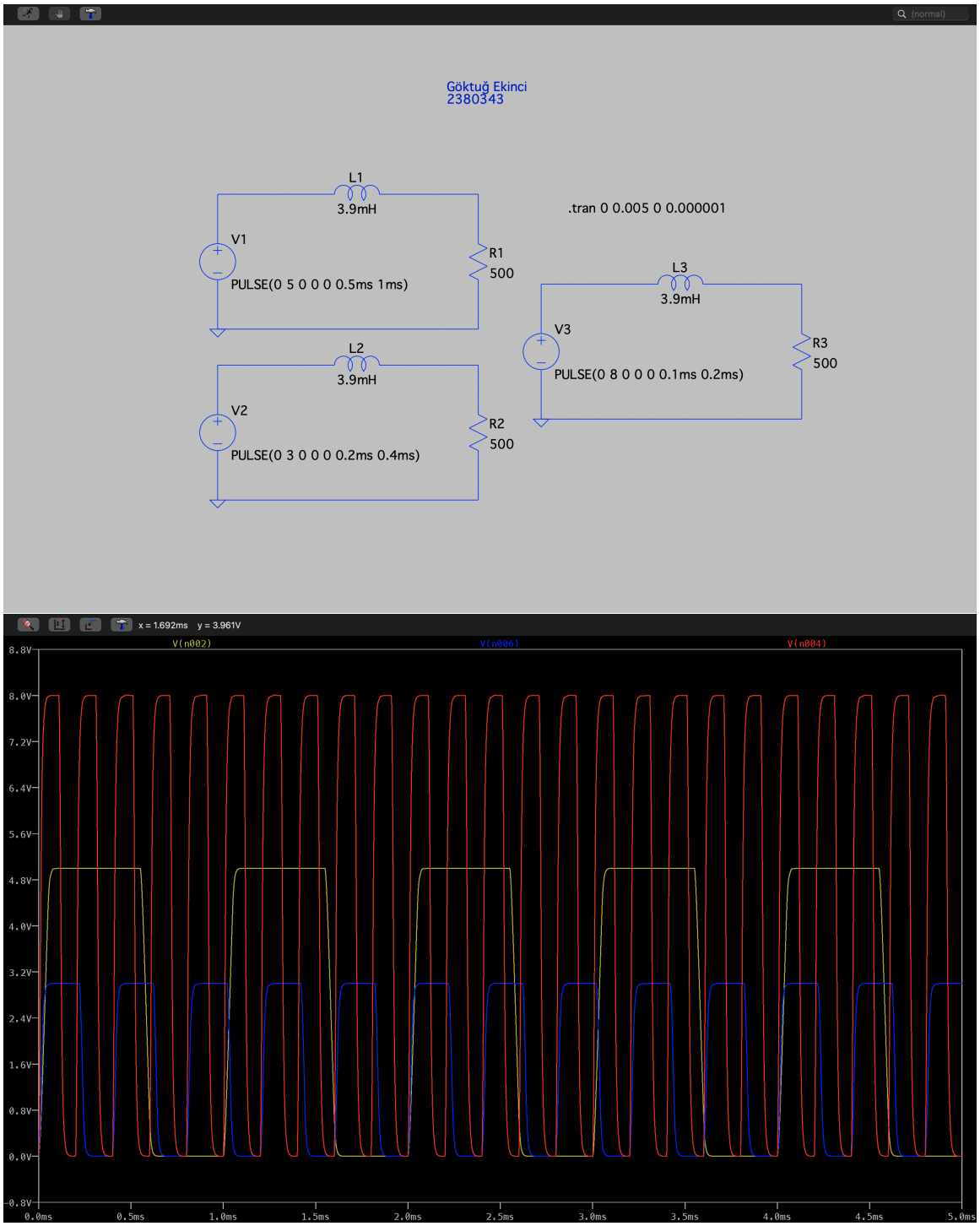
	f (Hz)	R (kΩ)	C (nF)	τ
Case 1	100	3.3	4.7	15.5ns
Case 2	100	33	10	330ns
Case 3	100	33	47	1551ns
Case 4	100	100	47	4700ns

iii)

We know that if we have i(t) and t, we can find the V from the formula V = i(t) × R. This method can be used for $V_R(t)$
$i(t) = i_f - (i_f - i_i) \times e^{\frac{-t}{\tau}}$
Same but voltage style can be valid for the $V_c(t)$
$v(t) = v_f - (v_f - v_i) \times e^{\frac{-t}{\tau}}$, we know V_f,V_i and time.

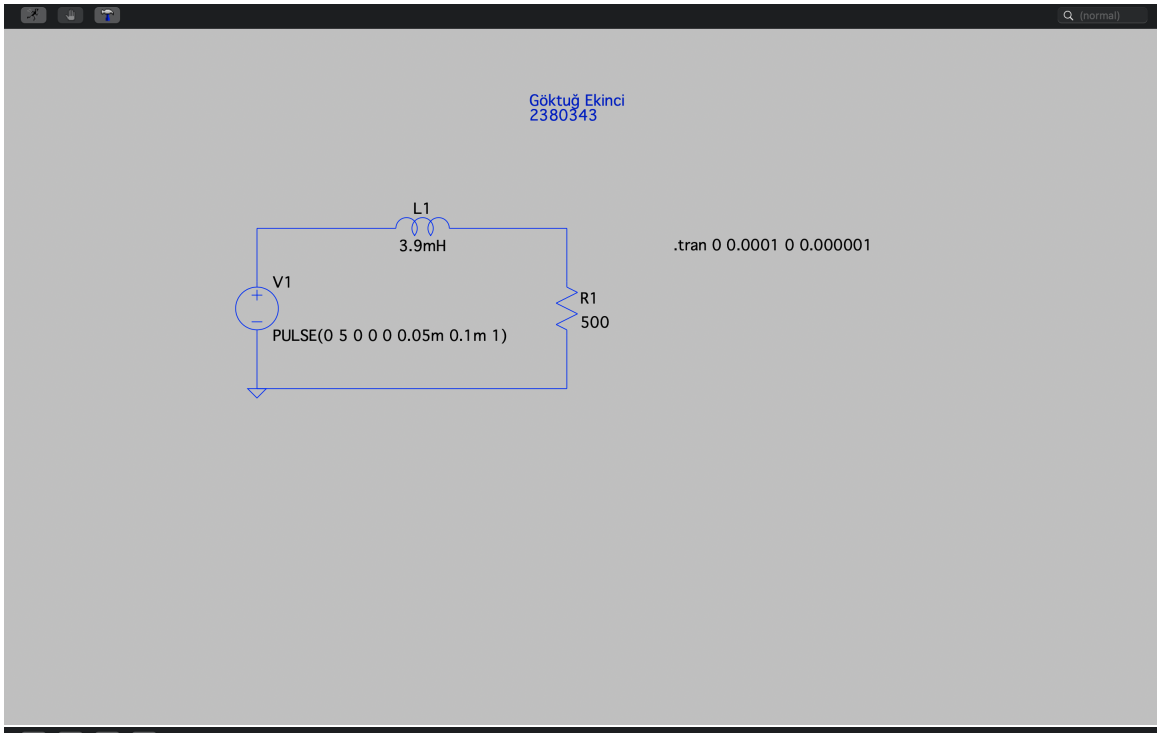
2 Experimental Work

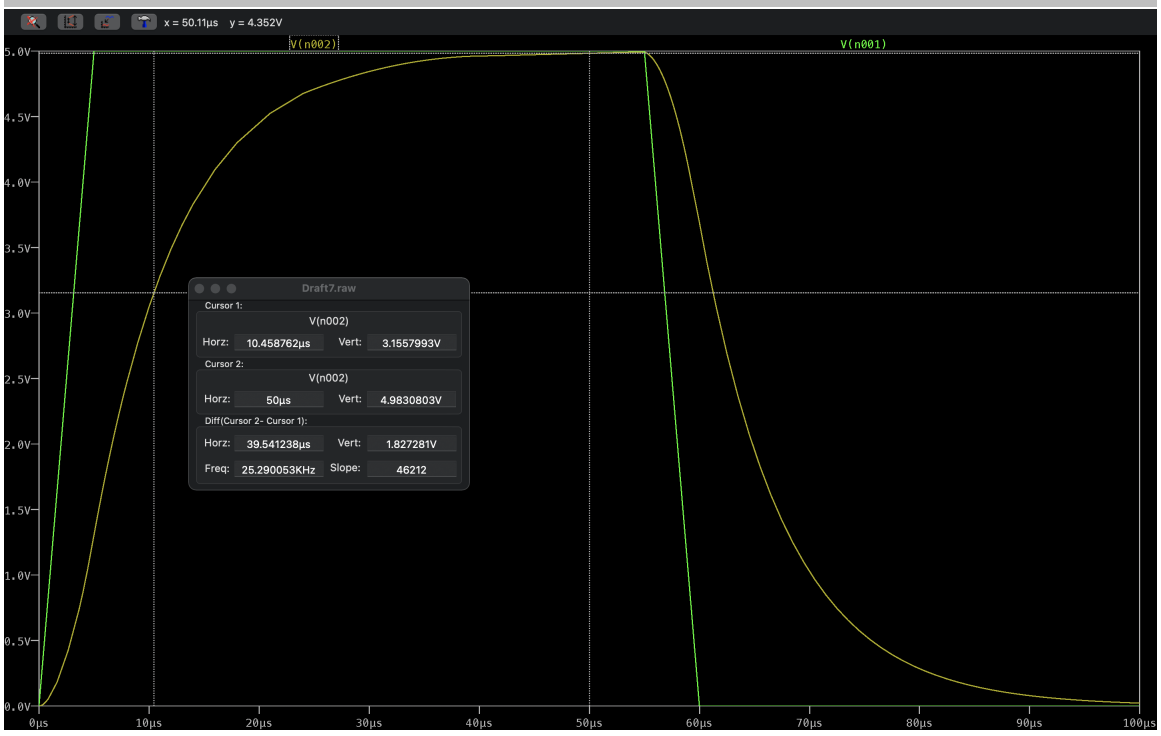
1. Provide the image of the schematic and plot all the signals in a single scope output. Comment on differences.



Comment: there is a positive correlation between frequency and wave number.

2. Provide the image of the schematic and plot the signals in a single scope output. Determine the time constant τ and briefly explain how you find it.





Time Constant: We should check the t where $VR = V_{in}0.63$ since in this case time constant is equal to t, which is 10.45μs

3. Provide the image of the schematic and plot Vin(t) and VR(t) in a single scope output. Also, plot VC(t) in a different scope output. Determine the time constant τ and briefly explain how you find it. Perform these steps for each case. Comment on your findings.

Case 1

Figure 6, blue = V_{in}, green = V_R

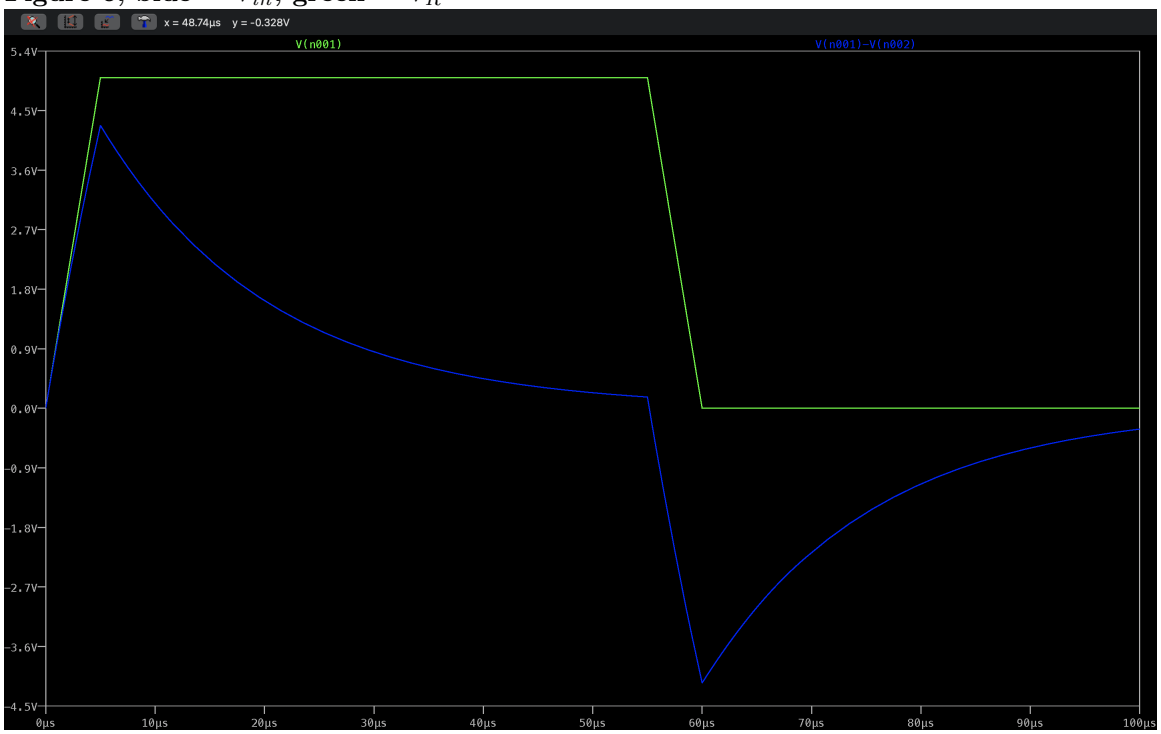
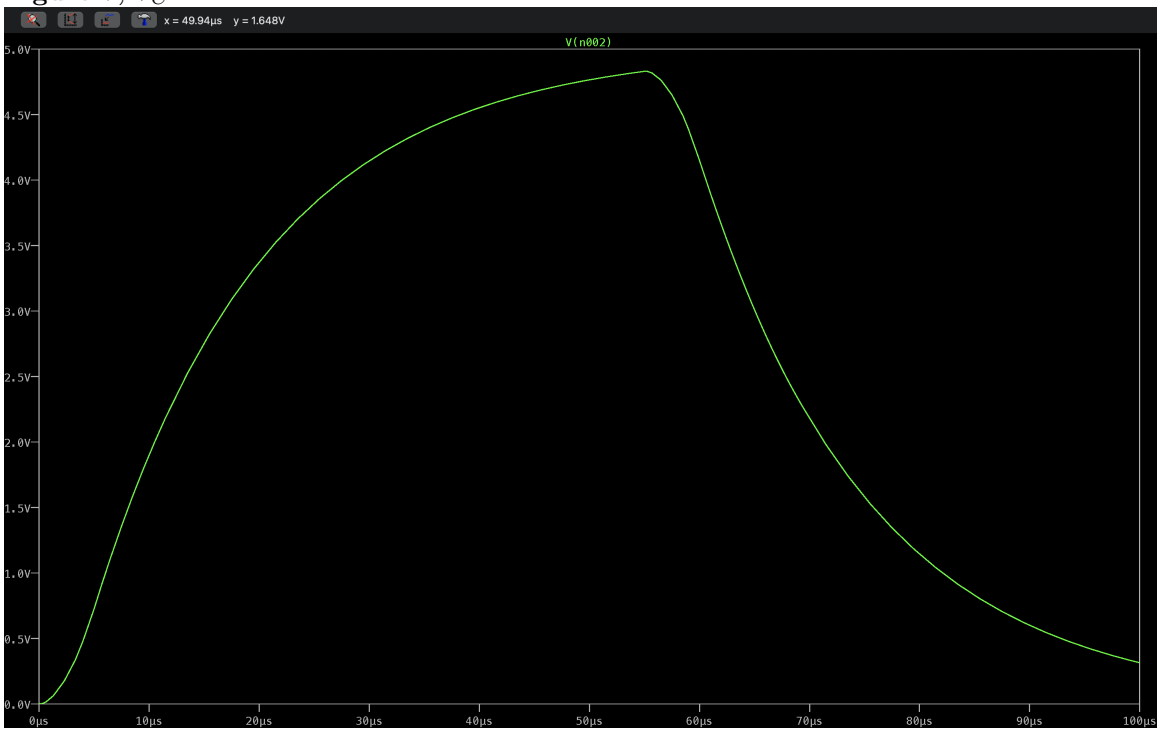


Figure 7, V_C

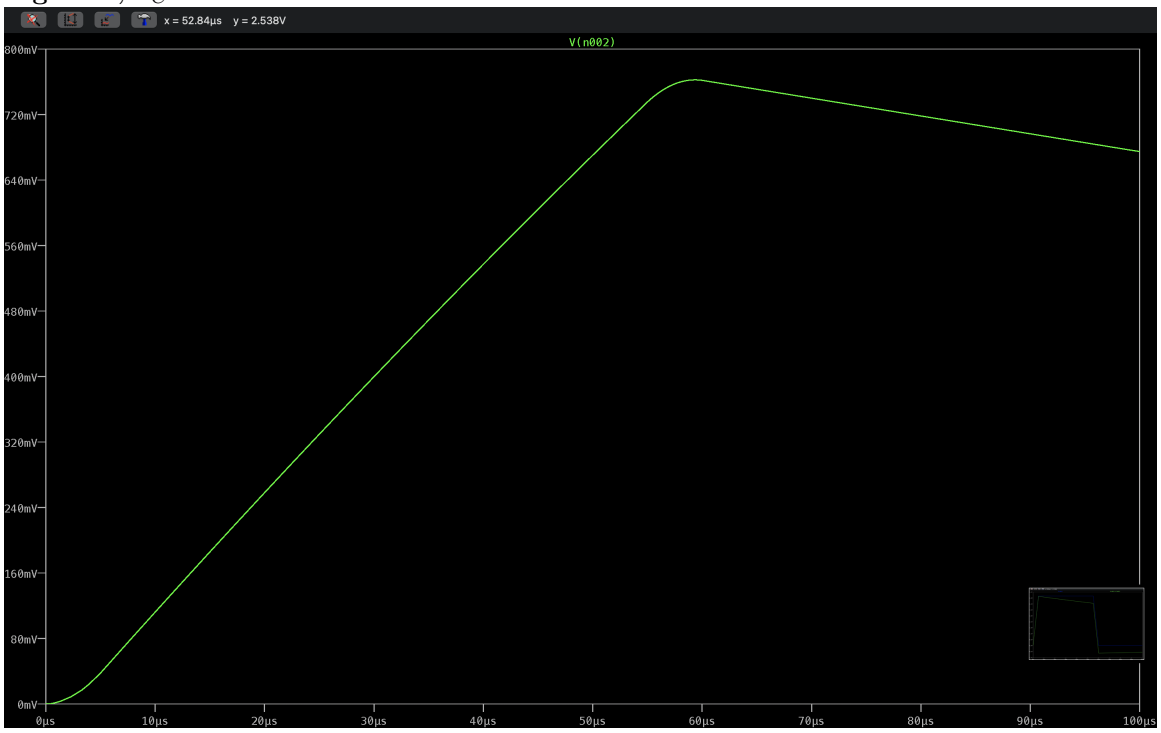


Time Constant: 333.09μs

Case 2

Figure 8, green = V_{in}, blue = V_R

Figure 9, V_C

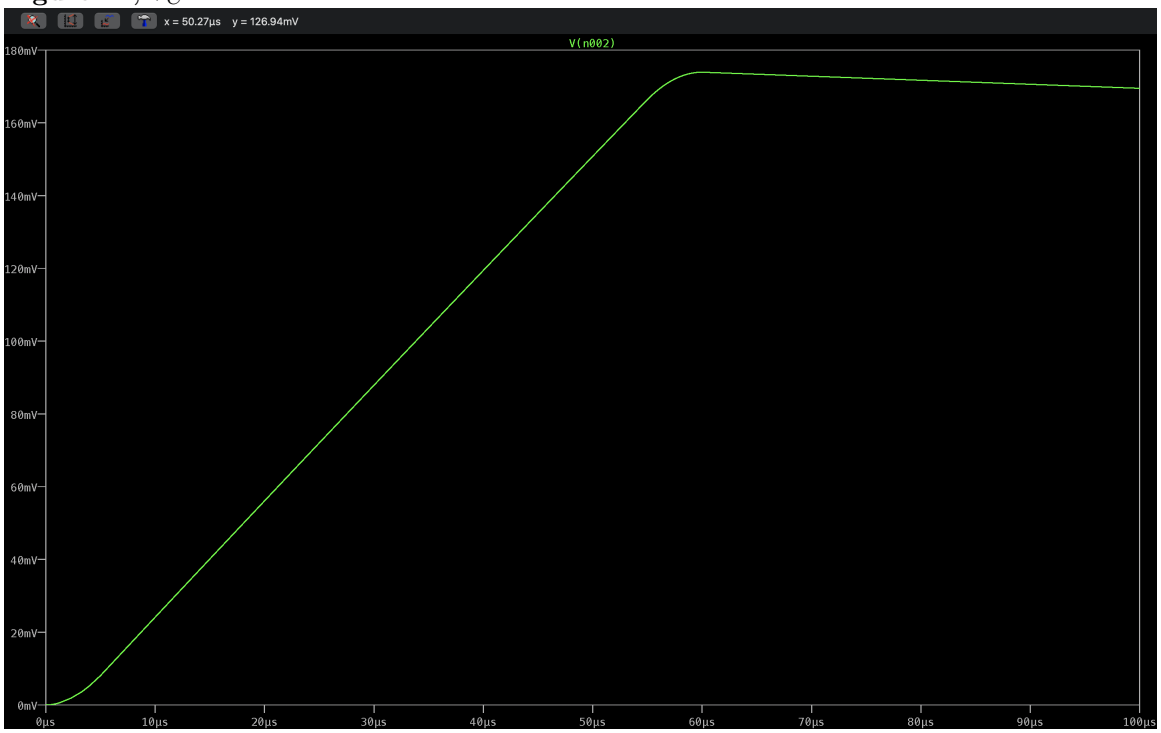


Time Constant: 611.14μs

Case 3

Figure 10, blue = V_{in}, green = V_R

Figure 11, V_C

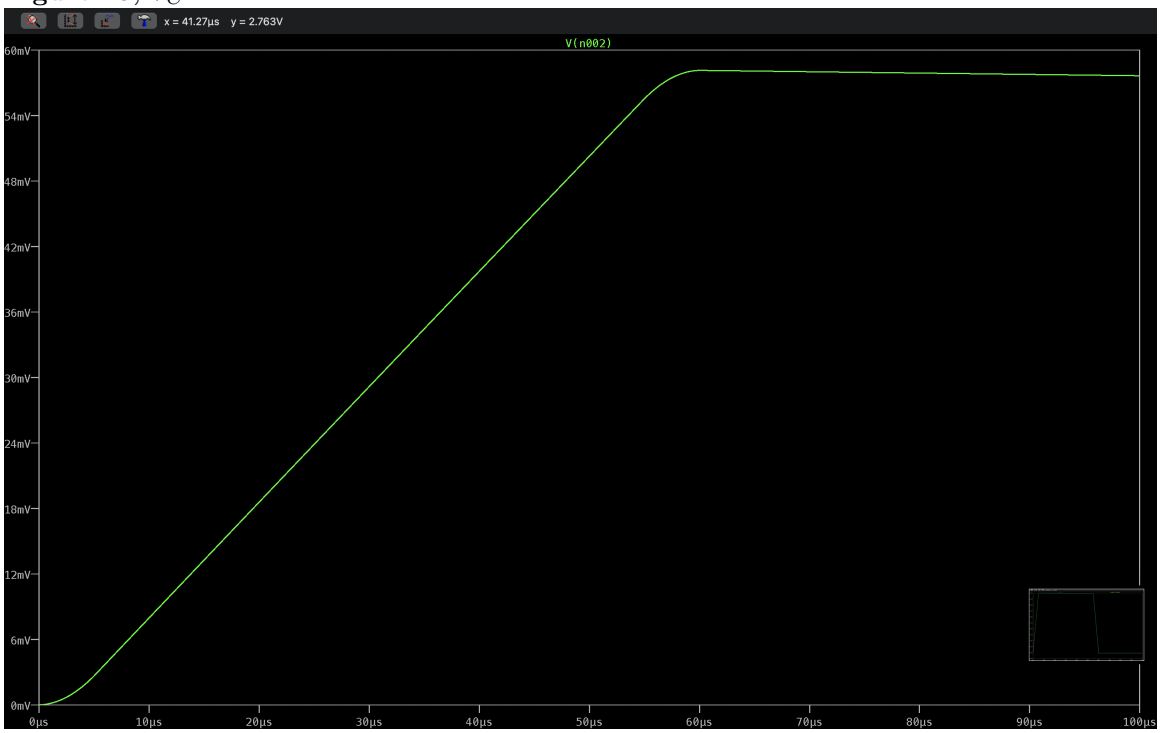


Time Constant: 1.8ms

Case 4

Figure 12, blue = V_{in}, green = V_R

Figure 13, V_C



Time Constant: 4.96ms

Time Constant Explanation: I found the all time constants with the method I mentioned before where t is equal to time constant. In order to find this we should consider the equality; $VR = V_{in}0.63$. I used the cursor.

2.0.1 Comments:

First there are dissimilarities due to cursor stopping point. Results are similar but there are differences due to the real life condition mimicking of LTSpice.