Group Members (Last Name, First Name)

Member #1: Algador, Vigomar Kim

Member #2: Chan, Chasey

Member #3: Trinh, Bon

Pre-Lab #5 – PSpice

Theoretical analyses and making predictions regarding the behavior of circuits is one of the most crucial, yet underrated and often ignored, jobs among young engineers. This includes the ability to carry out hand calculations in the abstract. Keep in mind that some of the calculations done here will be directly applicable to the worksheets that will be provided and the circuits you will be assembling and testing for the lab. You may use any technique of circuit analysis in order to obtain the solutions, but you must clearly state which technique of analysis you are using. If you are using a result from a book then you must include the references. You must show all work to receive credit. No credit will be given for answers with no justification. Your work should be neat and organized. If I can't follow your work or read your writing, then you will not get full credit. You may attach extra sheets if you need more space to show all your work. Remember that the ability to clearly explain what you are doing to other engineers is one of the most important skills you need to develop.

Total Score: /25

Work Breakdown Structure: It is important that every group member do their share of the work in these labs. Remember that you will receive no credit for the prelab if you did not contribute. Write in the Table provided below, which group member(s) contributed to the solution of each problem in the prelab. Also remember that only on prelab per group will be turned in to Canvas. If there was any group member that did not contribute, then write their name in the space provided below.

Problem Number	Group member(s) that worked on the problem.
Part 1	Trinh, Bon Chan, Casey Algador, Vigomar Kim
Part 2	Trinh, Bon Chan, Casey Algador, Vigomar Kim
Part 3	Trinh, Bon Chan, Casey Algador, Vigomar Kim
Part 4	Trinh, Bon Chan, Casey Algador, Vigomar Kim
Part 5	Trinh, Bon Chan, Casey Algador, Vigomar Kim

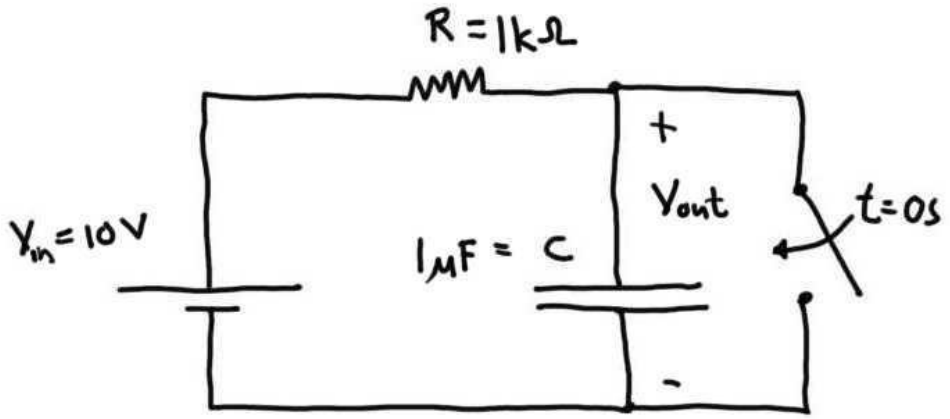


Figure 1. RC Circuit

In the circuit shown in Figure 1, the switch is open for a long time then closed at t = 0 s.

Problem #1: Score: /5

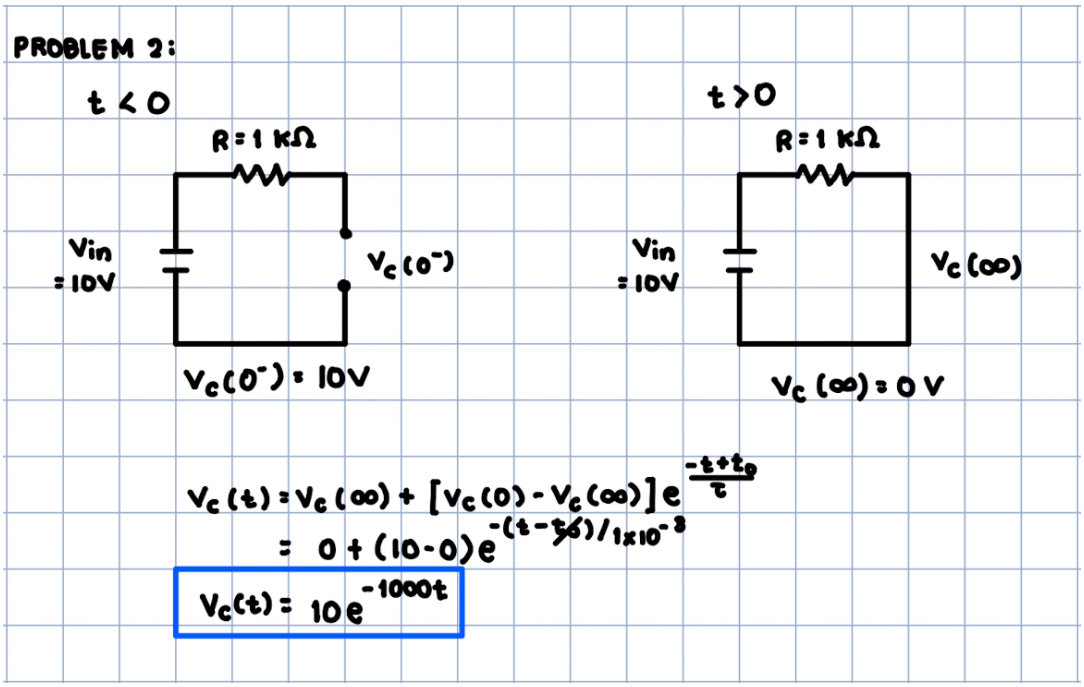
For the circuit shown in Figure 1, calculate the time constant τ. Make sure to show all your work, including units.

$$\tau = RC$$
$$= (1000)(10^{-6})$$
$$= 10^{-3} \approx 0.001\ s$$

Answer: $\tau = 0.001$ seconds

Problem #2: Score: /5

For the circuit shown in Figure 1, calculate the voltage across the capacitor, V_{out}, as a function of time, for t > 0 s. Note that this should be an equation.

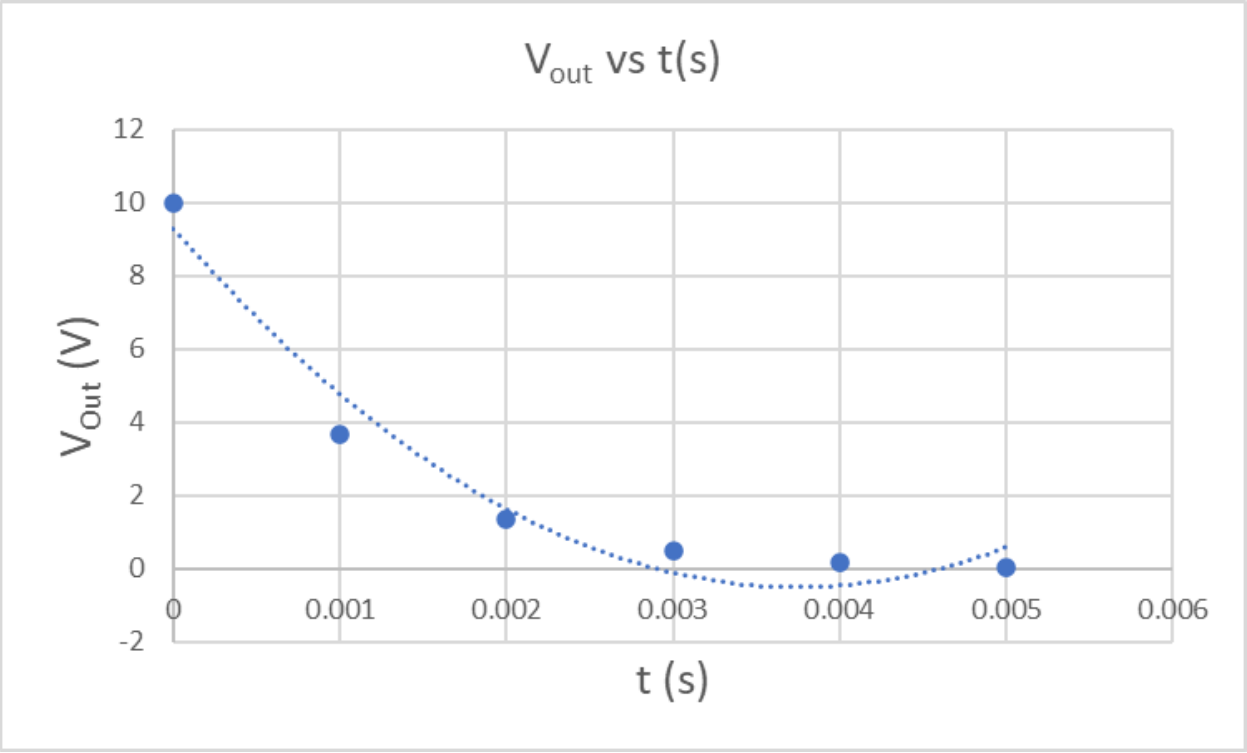


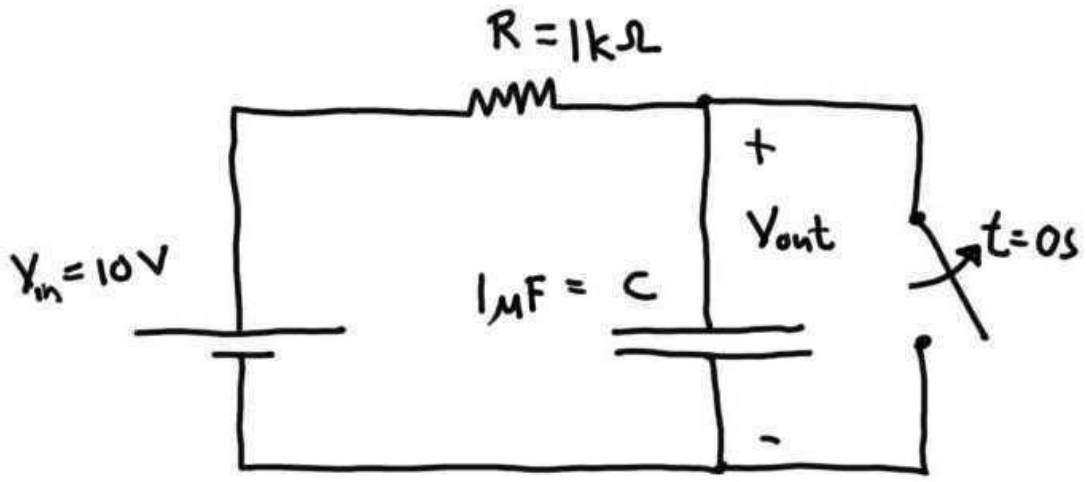
Answer: $V_{out} = 10e^{-1000t}$

Problem #3: Score: /5

Using Excel or some other similar program, plot V_{out} $versus$ t for $0 < t < 5\tau$. Make sure to include all elements of a graph, such as a title, labeled axes along with units, etc. Draw a smooth curve that is the best fit curve. Note that this will be very nonlinear, so do not fit a straight line through the points.

t(s)	V_{out}
0	10
0.001	3.67
0.002	1.35
0.003	0.5
0.004	0.18
0.005	0.06

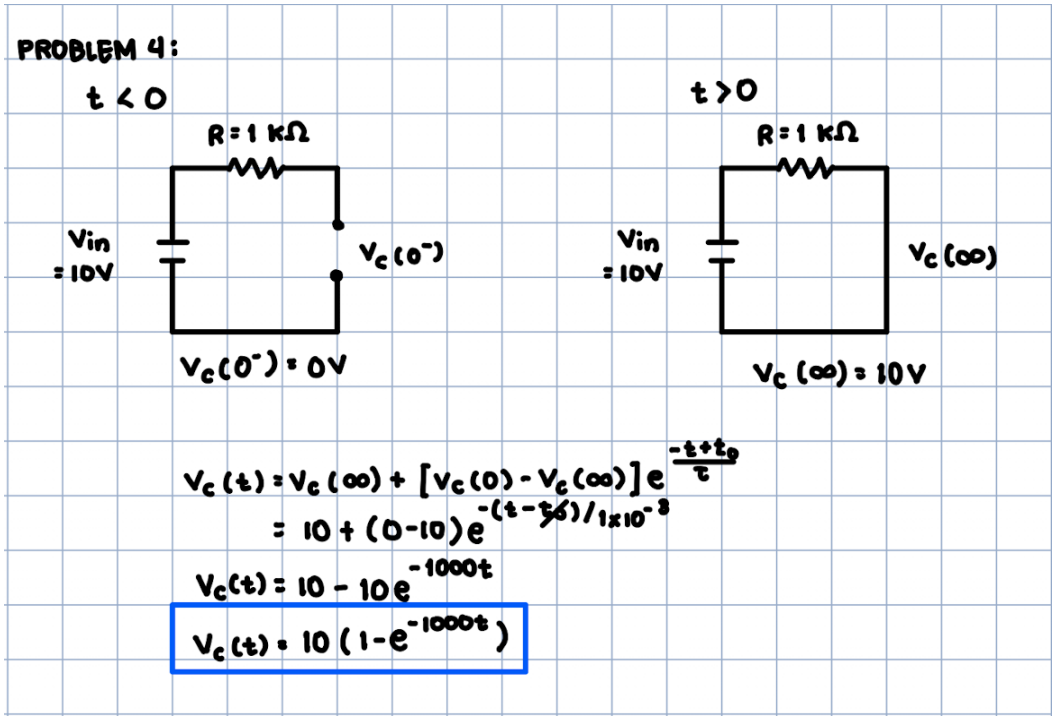




In the circuit shown in Figure 2, the switch is closed for a long time before being open at t = 0 s.

Problem #4: Score: /5

For the circuit shown in Figure 2, calculate the voltage across the capacitor, V_{out}, as a function of time, for t > 0 s. Note that this should be an equation.



Answer: $V_{out} = 10(1 - e^{-1000t})$

Problem #5: Score: /5

Using Excel, plot V_{out} $versus$ t for $0 < t < 5\tau$. Make sure to include all elements of a graph, such as a title, labeled axes along with units, etc. Draw a smooth curve that is the best fit curve. Note that this will be very nonlinear, so do not fit a straight line through the points.

t(s)	V_{out}
0	0
0.001	6.32
0.002	8.64
0.003	9.5
0.004	9.81
0.005	9.93