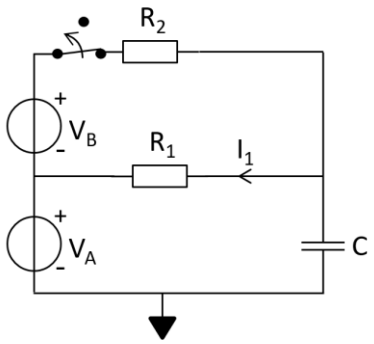
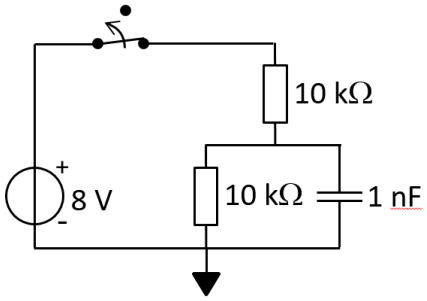
Home Assignment 5, IE1206 & IF1330, VT2020

Problem 1



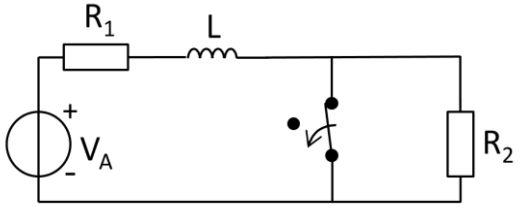
The switch has been closes for a long time. At t=0 s the switch opens. Plot $I_1(t)$ in the interval -1 μs < t < 5 μs. R_1=1 kΩ, R_2=3 kΩ, C= 0.5 nF, V_A=1 V and V_B=2 V.

Problem 2



The switch has been closed for a long time and at t=0 s it opens.
(A) What is the energy stored in the capacitor at t=0 s?
(B) At what time is the energy stored in the capacitor 1 nJ?

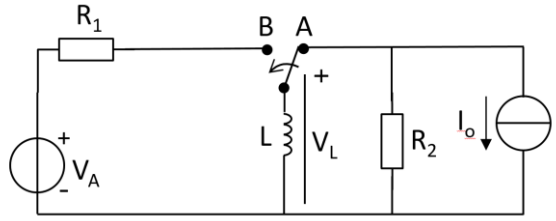
Problem 3



The switch has been closed for a long time. At t=0 s it opens. V_A=10 V, R_1=1 kΩ, R_2=100 kΩ, L=1 mH.

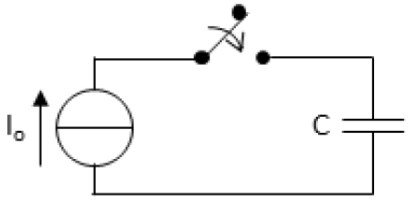
(A) What is the voltage over R_2 at $t=0^+$ s?
(B) What is the time constant τ for the inductor to release its stored energy?

Problem 4



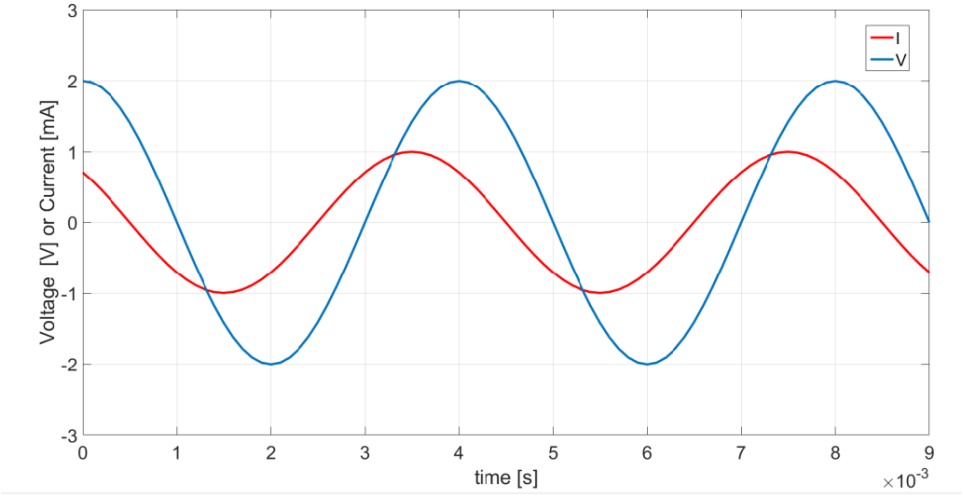
The switch has been in position A for a long time. At t=0 s the switch moves to position B. At what time is the voltage V_L over the inductor equal to V_A?
R_1=3 kΩ, R_2=100 Ω, L=10 mH, I_o=2 mA, V_A=8 V.

Problem 5



Assume the capacitor is discharged at t<0 s. At t=0 s the switch closes. Draw a graph showing the voltage over the capacitor, $V_C(t)$, in the interval -2 ms < t < 2 ms. I_o= 1 mA and C= 1 μF.

Problem 6



The graph shows an ac voltage (blue) and an ac current (red) as a function of time. Determine the frequency of the voltage and current. Using cos(ωt) as reference determine $V(t)=V_o\cos(\omega t+\phi_o)$ and $I(t)=I_i\cos(\omega t+\phi_i)$. That is determine the amplitud, ω and phase angle. Finally write down their representation as complex V and complex I.