Note Title 10/21/2007

Lecture 19

From section 7.2 of Text

Repeat all Examples of Lecture 18 Using Circuit Approach

Circuit Approach

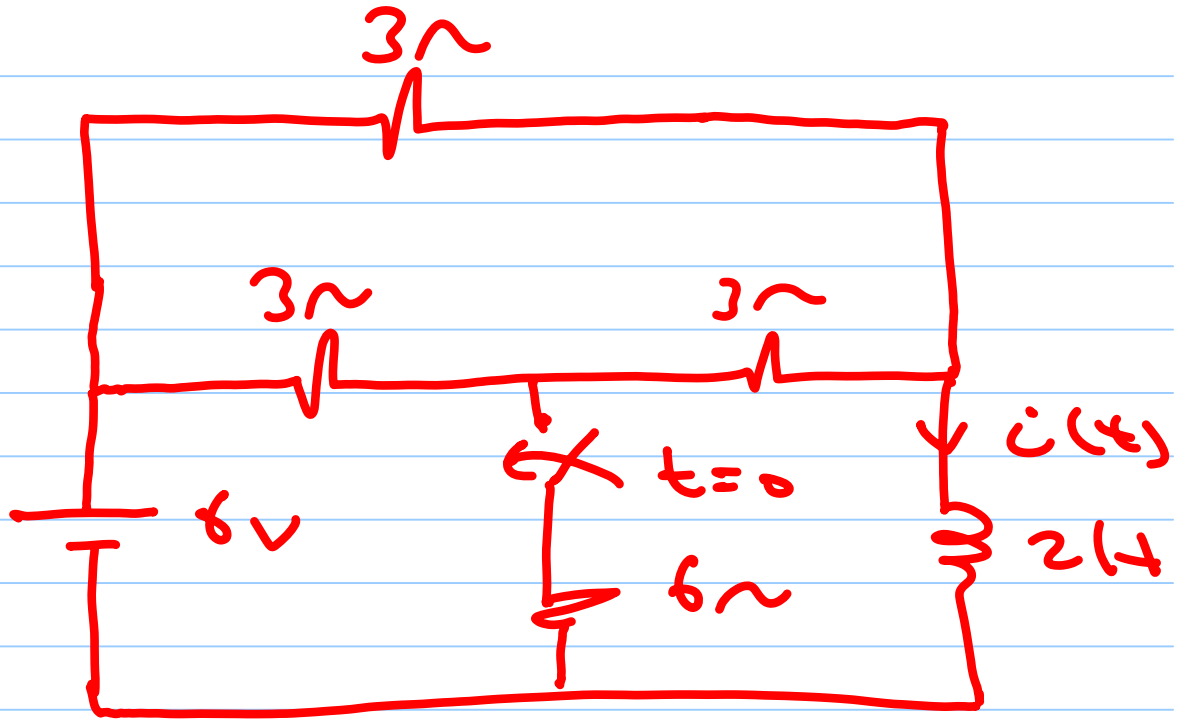
* We know that for a first order circuit, All responses have the form $x(t) = K_1 + K_2 e^{-t/\tau}$
* All three unknowns K_1, K_2 and τ can be found through Circuit Analysis.
* K_1 is the steady state response ($t \to \infty$). Capacitor $\longrightarrow$ O.C., Inductor $\longrightarrow$ S.C.

Circuit Approach

* Initial value of response ($x(0^+)$) is $x(0^+) = K_1 + K_2 \Rightarrow K_2 = x(0) - x(\infty)$

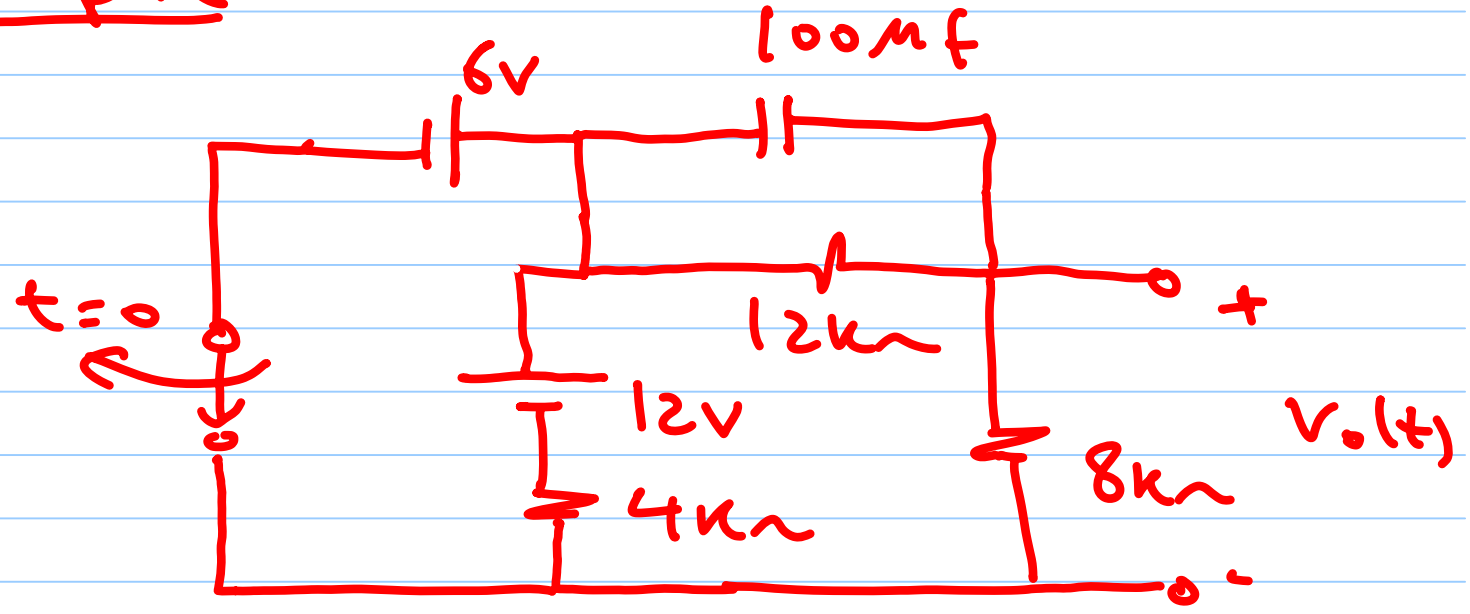
* Building a Thevenin looking into the energy storage element we get R_{TH}. τ, the time constant, is given by $\tau = R_{TH}C$ or $\frac{R_{TH}}{L}$

Example



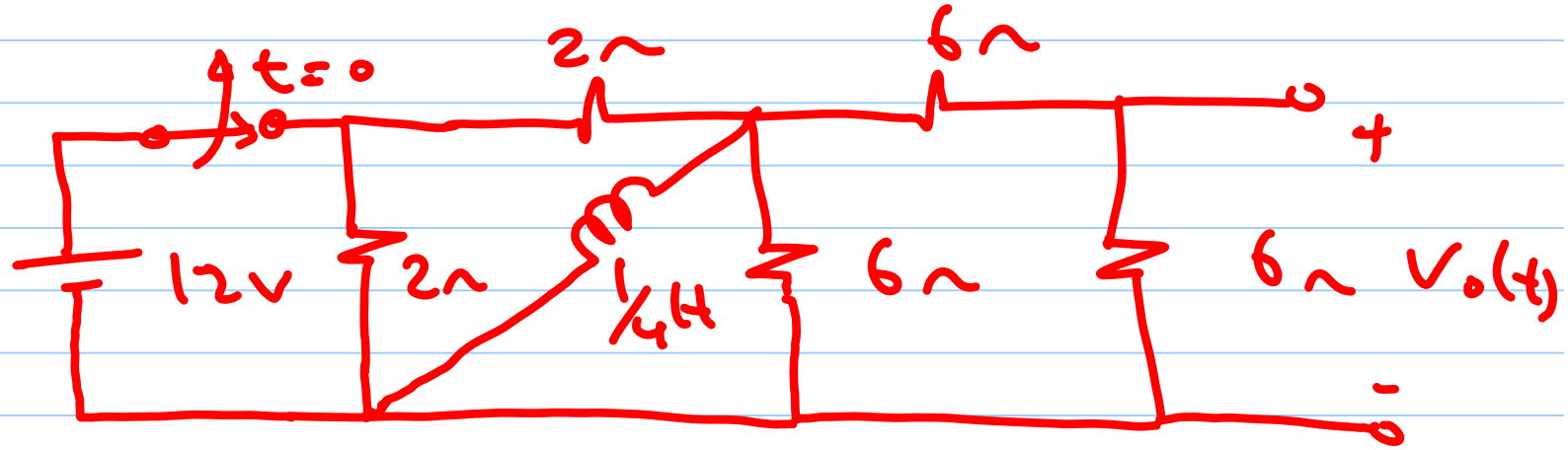
Using step by step approach, find $i(t)$. Switch is closed at $t=0$.

Example



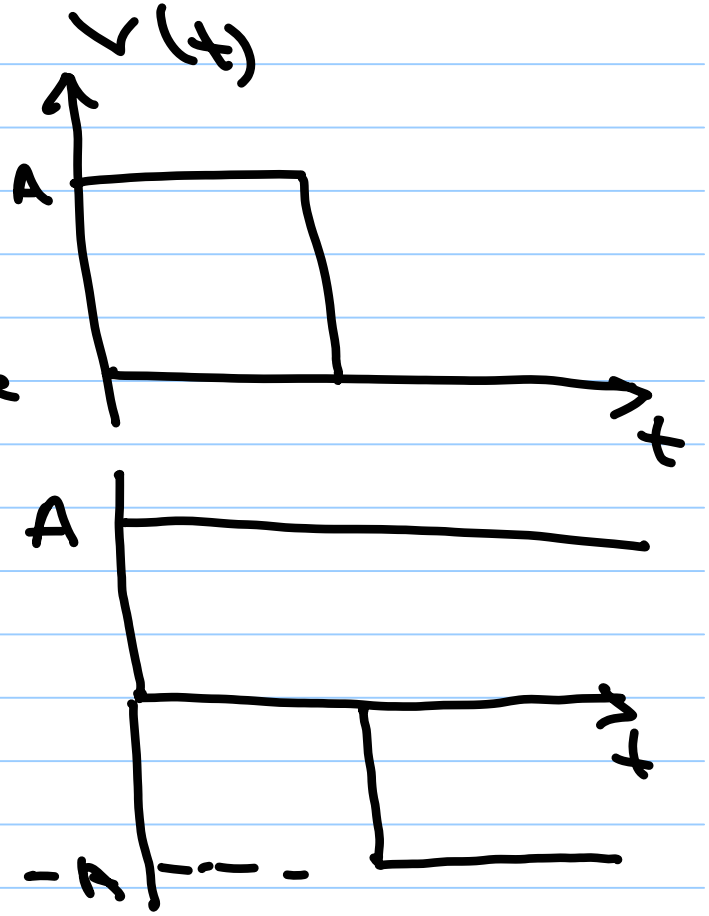
Use Circuit approach to find $v_o(t)$ for $t > 0$

Example



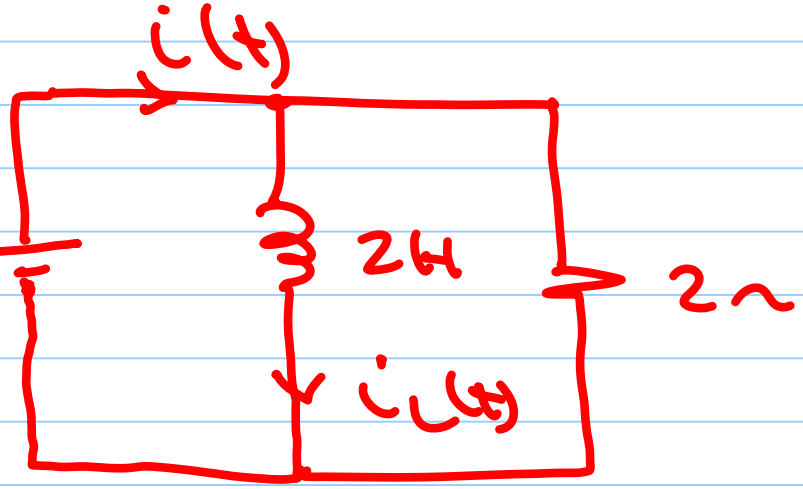
Use the step by step approach to find $v_o(t)$

Pulse Excitation

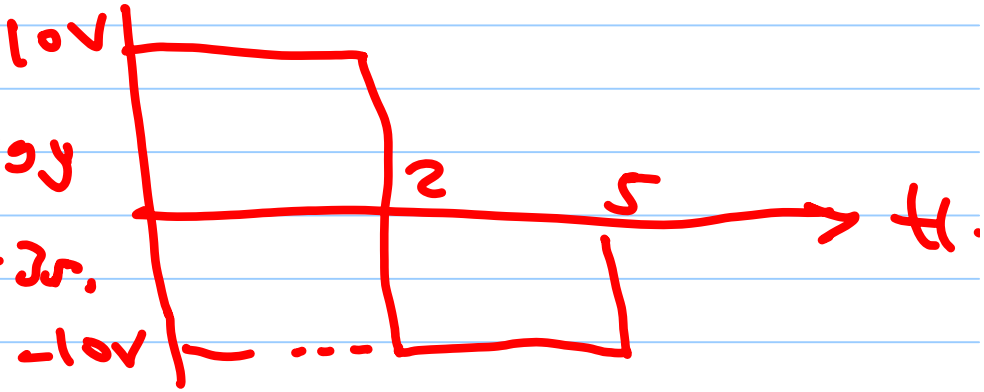


* A pulse can be considered as the sum of two sources
* The circuit can be analyzed for each segment using the response in the previous segment as the initial response.

Example



* Find $i_L(t)$ for the shown excitation.



How much energy is stored at $t = 2s$.

How much power is supplied by the source at $t = 4s$?