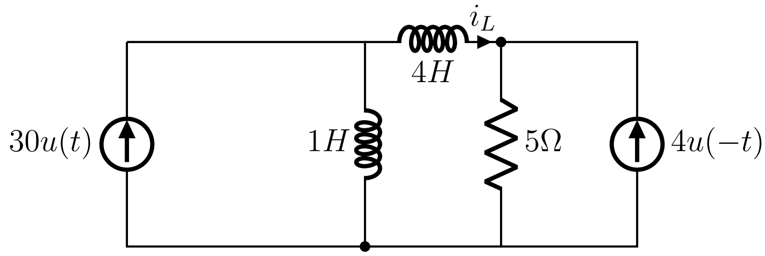
EE2015: Electric Circuits and Networks

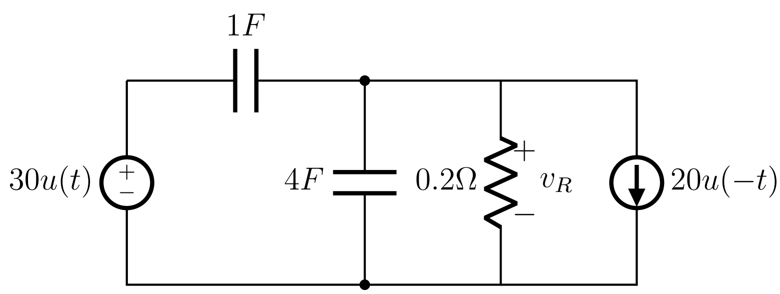
Tutorial 7

(September 27, 2024)

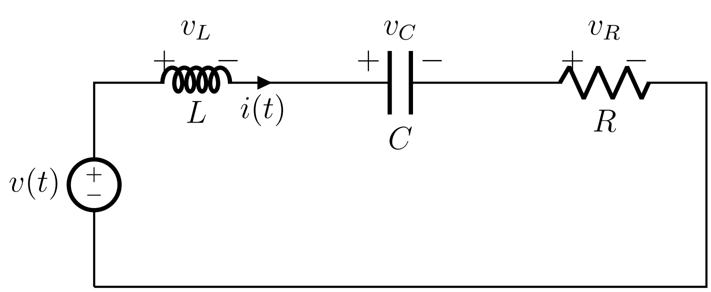
1. Evaluate and sketch the current through the 4 H inductor of the circuit given below using time domain techniques. Write the differential equation for the current and find the (a) Zero state and zero input response and (b) natural and forced response.



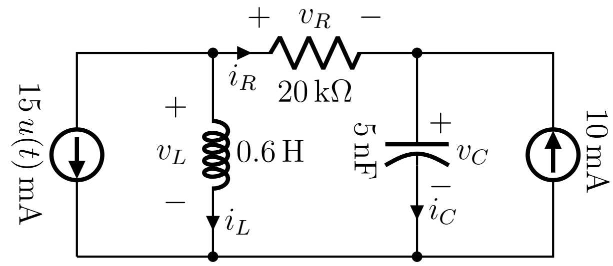
2. Evaluate and sketch the voltage across the resistor of the circuit given below using time domain techniques. Write the differential equation for the voltage and find the (a) Zero state and zero input response and (b) natural and forced response.



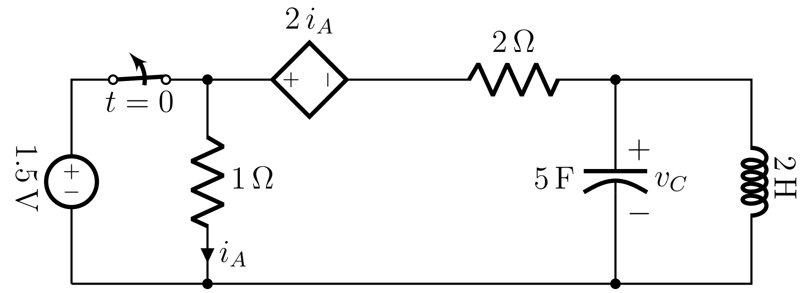
3. For the RLC cicuit given below, i) write the differential equation relating these combination of excitation and responses: a) v and i b) v and v_C c) v and v_L. ii) If $i(0^-) = I_0$ and $v_C(0^-) = V_0$, find $i(s)$, $v_C(s)$ and $v_L(s)$ by taking the Laplace transform of the differential equations. iii) In the case of $v_C(t)$, show that the ZSR with $\delta(t)$ as the input is same as the ZIR with initial conditions $v_C(0^-) = 0$ and $i(0^-) = 1/L$



4. For the RLC cicuit given on the right, evaluate at $t = 0^+$ the derivative of each current and voltage variable labelled in the figure.



5. For the RLC cicuit given on the right, obtain an expression for the energy stored in the capacitor that is valid for all $t > 0$.



6. Consider the circuit shown on the right. Draw the s-domain representation of the circuit. Find the energy stored in the inductor and each of the capacitors at time $t = \pi$ sec. Assume that the inductor current and capacitor voltages are zero for $t < 0$. Verify your answer by applying the principle of conservation of energy at $t = 0$ and $t = \pi$ sec.