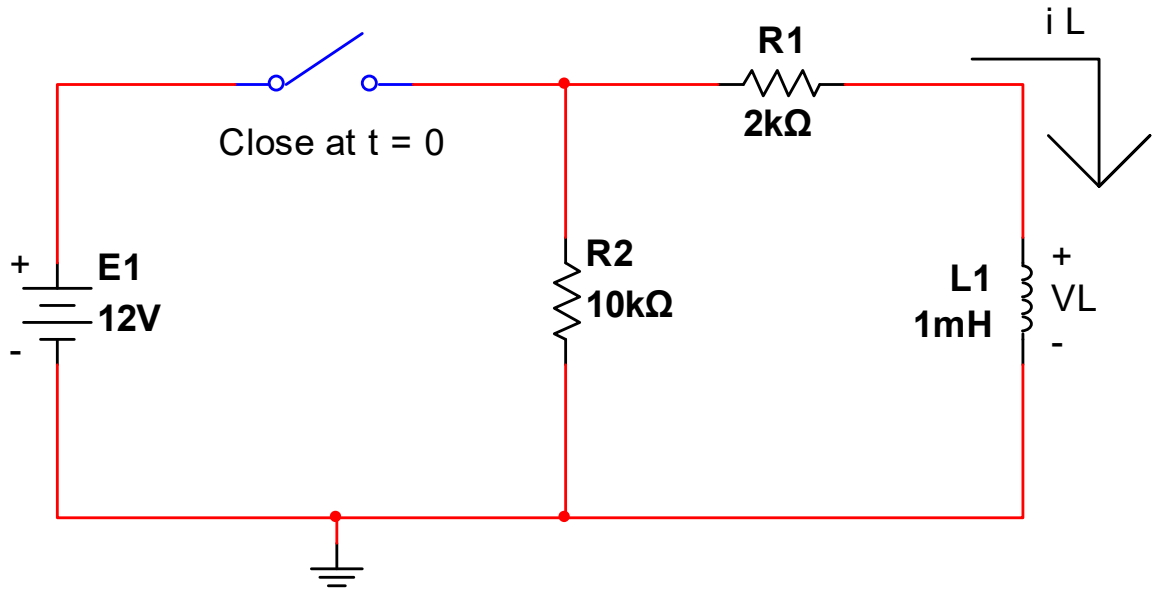
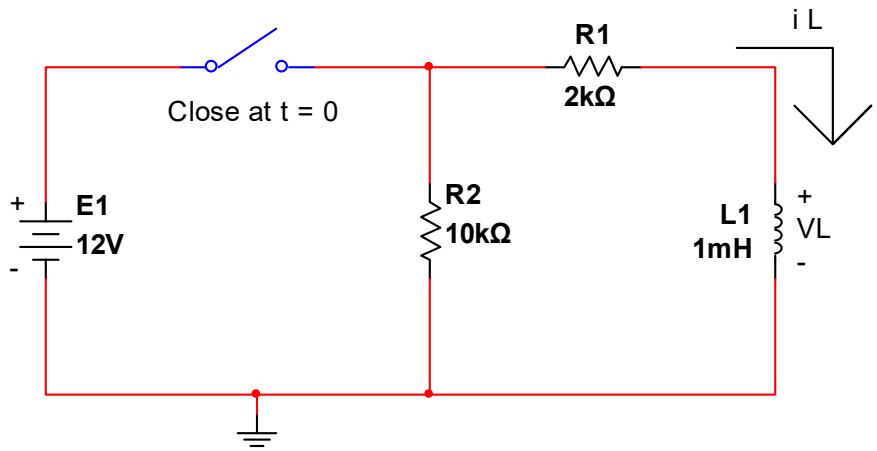
In Class Problem



Find

1. $v_L(t)$ & $i_L(t)$ for t >0
2. $v_L(t)$ & $i_L(t)$ if the switch is opened at t = 1μsec

In Class Problem



1. $v_L(t)$ & $i_L(t)$ for t >0
   - Storage Phase

$$\tau = \frac{L}{R} = \frac{1mH}{2k\Omega} = 500 \text{ ns}$$

i_L Max = 12V/2kΩ

$$i_{L_1}(t) = \frac{E_1}{R_1}(1 - e^{-t/\tau})A, t \geq 0$$

$$\boxed{i_{L_1}(t) = 6 \cdot 10^{-3}(1 - e^{-t/500 \text{ ns}}, A}$$

$$v_{L_1}(t) = E_1 - i_{L_1}(t) \cdot R_1$$

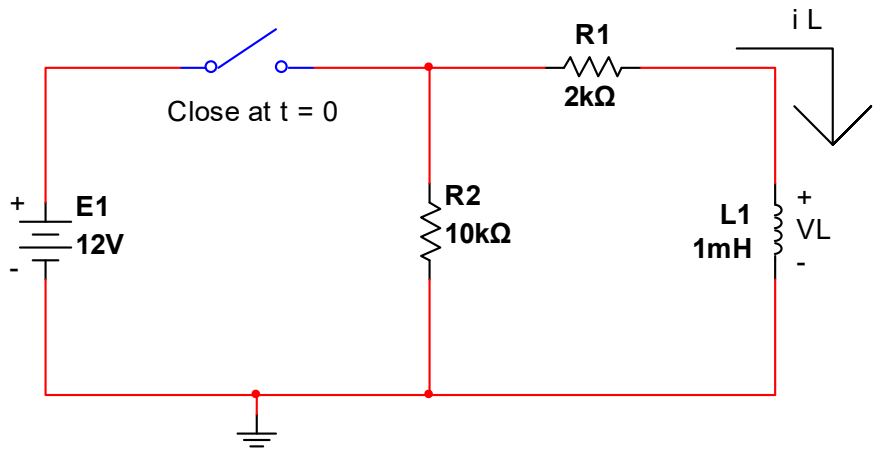
$$v_{L_1}(t) = 12V - 12(1 - e^{-t/500 \text{ ns}}, V$$

$$\boxed{v_{L_1}(t) = 12e^{-t/500 \text{ ns}}, V}$$

NP

In Class Problem

2. $v_L(t)$ & $i_L(t)$ if the switch is opened at t = 1μsec (this is less than 5*tau)
   - **Decay Phase**



$$i_{L_1}(1\mu s) = 6{\cdot}10^{-3}(1-e^{-1\mu s/500\ \text{ns}}, A = 5.188mA$$

Starting current for decay phase

$$\tau_{decay} = \frac{L}{R_{TH}} = \frac{1mH}{10k\Omega + 2k\Omega} = 83.33ns$$

$$\boxed{i_{L_1}(t) = 5.188 \cdot 10^{-3} e^{-t/83.33ns} A}$$

$$\boxed{v_{L_1}(t) = -i_{L_1}(t)(R_1{+}R_2) = -62.26e^{-t/83.33ns} V}$$

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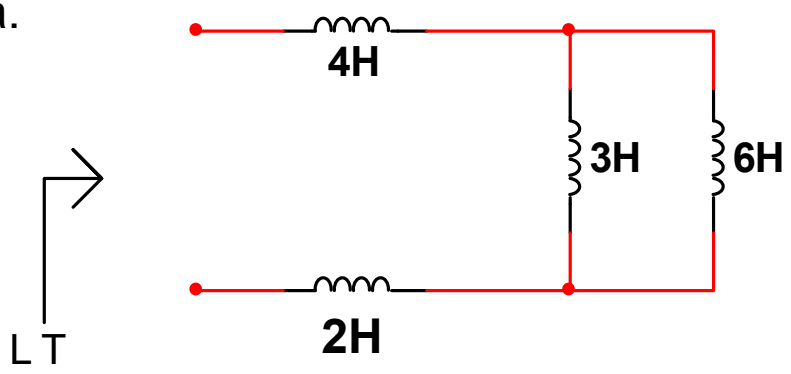
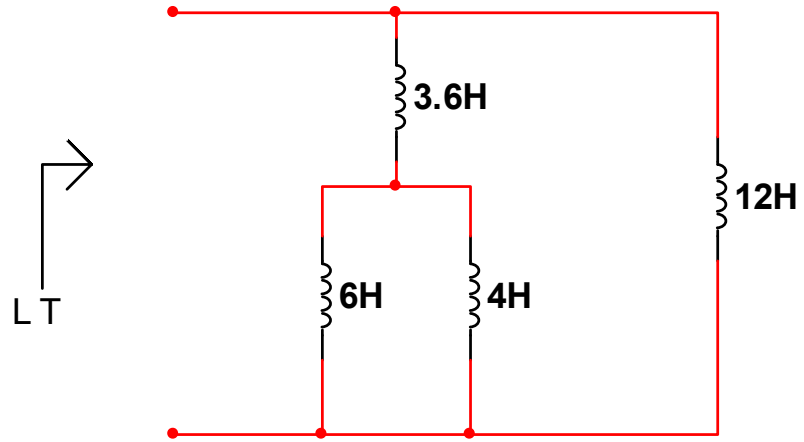
In Class Problem

Find L_T

a.



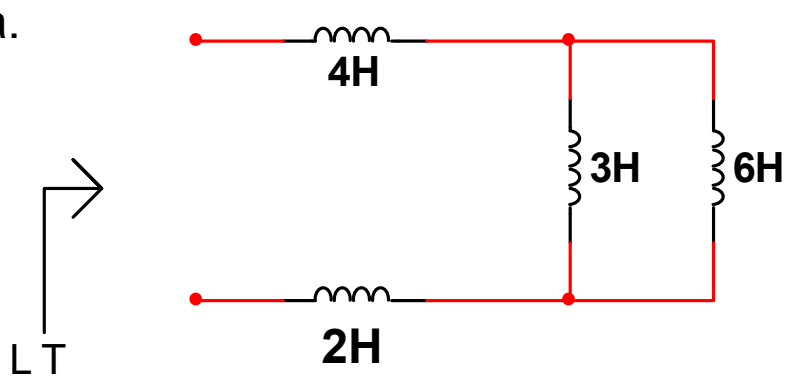
b.



In Class Problem

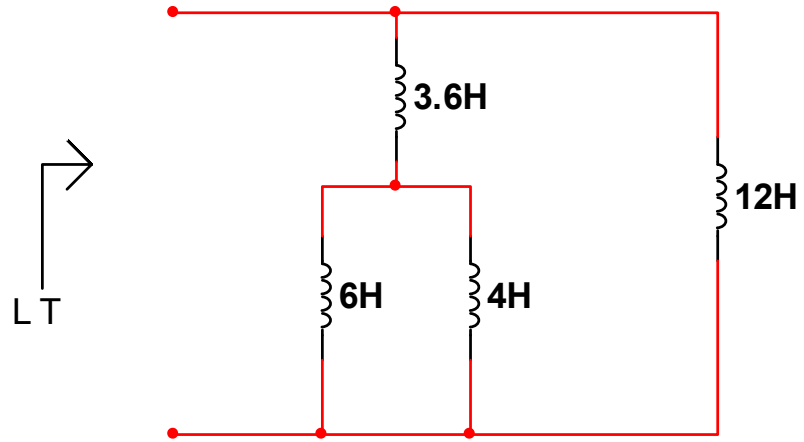
Find L_T

a.



$$L_T = \frac{1}{\frac{1}{3H} + \frac{1}{6H}} + 4H + 2H = 8H$$

b.



6H // 4H = 2.4H

2.4H + 3.6H = 6H

L_T = 6H // 12H = 4H

NP