Chapter 6, Solution 40.

$$i = \begin{cases} 5t, & 0 < t < 2ms \\ 10, & 2 < t < 4ms \\ 30 - 5t, & 4 < t < 6ms \end{cases}$$

$$v = L\frac{di}{dt} = \frac{5x10^{-3}}{10^{-3}}\begin{cases} 5, & 0 < t < 2ms \\ 0, & 2 < t < 4ms \\ -5, & 4 < t < 6ms \end{cases} = \begin{cases} 25, & 0 < t < 2ms \\ 0, & 2 < t < 4ms \\ -25, & 4 < t < 6ms \end{cases}$$

At t = 1ms, v = **25 V**
At t = 3ms, v = **0 V**
At t = 5ms, v= **–25 V**

Chapter 6, Solution 54.

$$L_{eq} = 4 + (9+3)\|(10\|0 + 6\|12)$$

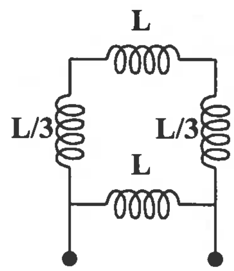
$$= 4 + 12\|(0+4) = 4 + 3$$

L_{eq} = **7H**

Chapter 6, Solution 56.

$$L\|L\|L = \frac{1}{\frac{3}{L}} = \frac{L}{3}$$

Hence the given circuit is equivalent to that shown below:



$$L_{eq} = L \Big\| \left(L + \frac{2}{3}L \right) = \frac{Lx\frac{5}{3}L}{L + \frac{5}{3}L} = \frac{5}{8}L$$

Chapter 6, Solution 62.

(a) $L_{eq} = 25 + 20 // 60 = 25 + \dfrac{20x60}{80} = 40 \text{ mH}$

$$v = L_{eq}\frac{di}{dt} \longrightarrow i = \frac{1}{L_{eq}}\int v(t)dt + i(0) = \frac{10^{-3}}{40x10^{-3}}\int_0^t 12e^{-3t}dt + i(0) = -0.1(e^{-3t} - 1) + i(0)$$

Using current division and the fact that all the currents were zero when the circuit was put together, we get,

$$i_1 = \frac{60}{80}i = \frac{3}{4}i, \quad i_2 = \frac{1}{4}i$$

$$i_1(0) = \frac{3}{4}i(0) \longrightarrow 0.75i(0) = -0.01 \longrightarrow i(0) = -0.01333$$

$$i_2 = \frac{1}{4}(-0.1e^{-3t} + 0.08667)\text{ A} = \text{-}25\text{e}^{-3t} + 21.67\text{ mA}$$

$$\mathbf{i_2(0) = -25 + 21.67 = \underline{-3.33\text{ mA}}}$$

(b) $\mathbf{i_1 = \frac{3}{4}(-0.1e^{-3t} + 0.08667)\text{ A} = \underline{\text{-}75\text{e}^{-3t} + 65\text{ mA}}}$

$$\mathbf{i_2 = \underline{\text{-}25\text{e}^{-3t} + 21.67\text{ mA}}}$$

Chapter 6, Solution 72.

The output of the first op amp is

$$v_1 = -\frac{1}{RC}\int v_i\, dt = -\frac{1}{10x10^3 x2x10^{-6}}\int_0^t v_i dt = -\frac{100t}{2}$$

$$= -50t$$

$$v_o = -\frac{1}{RC}\int v_i\, dt = -\frac{1}{20x10^3 x0.5x10^{-6}}\int_0^t (-50t)dt$$

$$= 2500t^2$$

At t = 1.5ms,

$$v_o = 2500(1.5)^2 x10^{-6} = \mathbf{5.625\ mV}$$