Chapter 7, Solution 19.

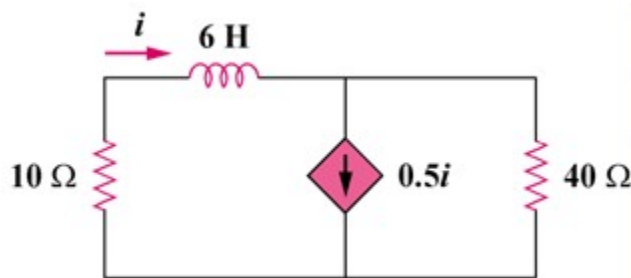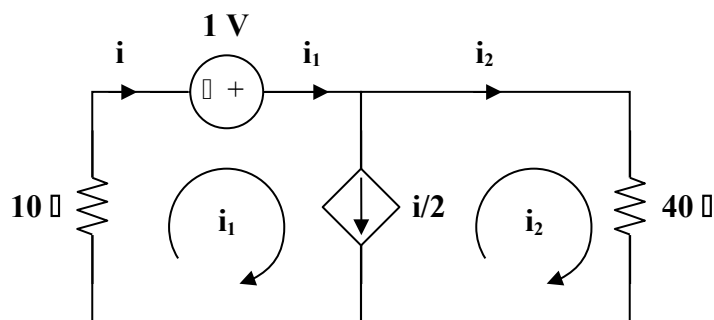In the circuit of Fig. 7.99, find $i(t)$ for $t > 0$ if $i(0) = 6$ A.

Figure 7.99
For Prob. 7.19.

Solution

To find R_{th} we replace the inductor by a 1-V voltage source as shown above.

$$10i_1 - 1 + 40i_2 = 0$$

But $\quad i = i_2 + i/2 \quad$ and $\quad i = i_1$

i.e. $\quad i_1 = 2i_2 = i$

$$10i - 1 + 20i = 0 \quad \longrightarrow \quad i = \frac{1}{30}$$

$$R_{th} = \frac{1}{i} = 30 \, \Omega$$

$$\tau = \frac{L}{R_{th}} = \frac{6}{30} = 0.2 \text{ s}$$

$$i(t) = 6e^{-5t}u(t) \, A$$