Practice Problem 6.1

What is the voltage across a 4.5-μF capacitor if the charge on one plate is 0.12 mC? How much energy is stored?

Answer: 26.67 V, 1.6 mJ.

Practice Problem 6.2

If a 10-μF capacitor is connected to a voltage source with

$$v(t) = 75 \sin(2,000t) \text{ V}$$

determine the current through the capacitor.

Answer: $1.5 \cos(2,000t)$ V.

Practice Problem 6.3

The current through a 100-μF capacitor is $i(t) = 50 \sin 120\pi t$ mA. Calculate the voltage across it at $t = 1$ ms and $t = 5$ ms. Take $v(0) = 0$.

Answer: 93.14 mV, 1.736 V.

Practice Problem 6.4

An initially uncharged 1-mF capacitor has the current shown in Fig. 6.11 across it. Calculate the voltage across it at $t = 2$ ms and $t = 5$ ms.

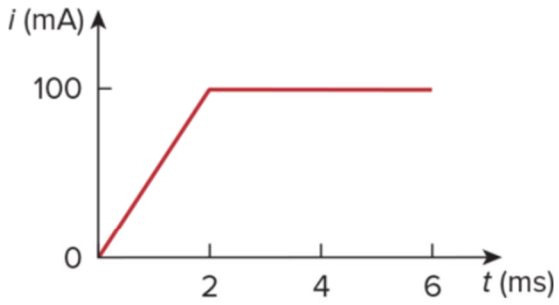

Figure 6.11
For Practice Prob. 6.4.

Answer: 100 mV, 400 mV.

Practice Problem 6.5

Under dc conditions, find the energy stored in the capacitors in Fig. 6.13.

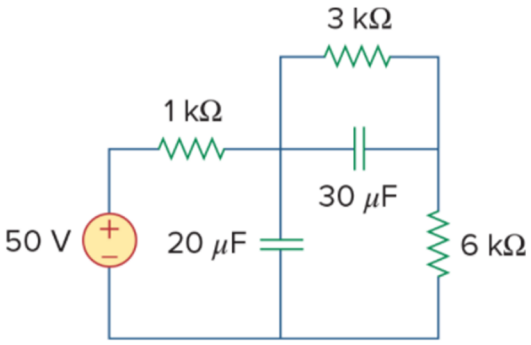

Figure 6.13
For Practice Prob. 6.5.

Answer: 20.25 mJ, 3.375 mJ.

Practice Problem 6.6

Find the equivalent capacitance seen at the terminals of the circuit in Fig. 6.17.

Answer: 40 μF.

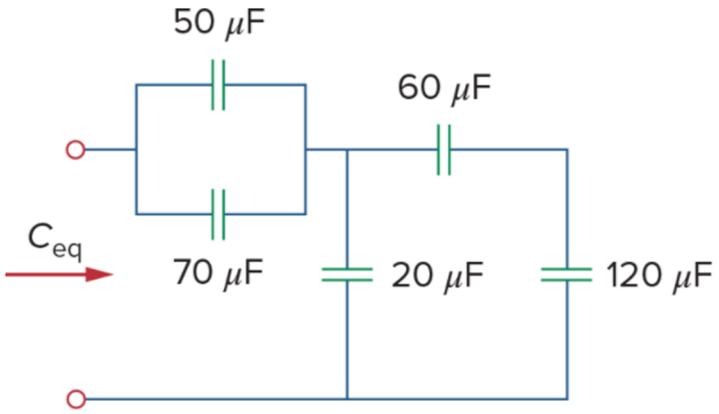

Figure 6.17
For Practice Prob. 6.6.

Practice Problem 6.7

Find the voltage across each of the capacitors in Fig. 6.20.

Answer: $v_1 = 45$ V, $v_2 = 45$ V, $v_3 = 15$ V, $v_4 = 30$ V.

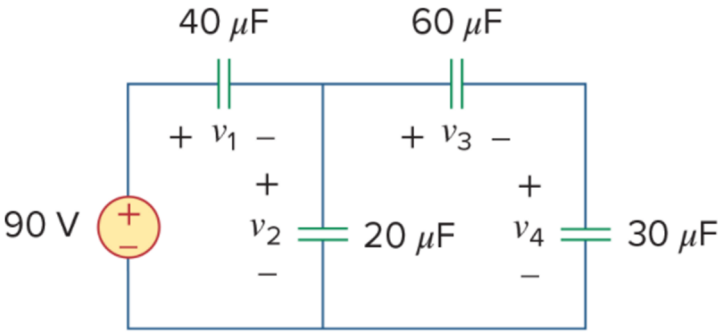

Figure 6.20
For Practice Prob. 6.7.

Practice Problem 6.8

If the current through a 1-mH inductor is $i(t) = 60\cos(100t)$ mA, find the terminal voltage and the energy stored.

Answer: $-6\sin(100t)$ mV, $1.8\cos^2(100t)$ μJ.

Practice Problem 6.9

The terminal voltage of a 2-H inductor is $v = 10(1 - t)$ V. Find the current flowing through it at $t = 4$ s and the energy stored in it at $t = 4$ s. Assume $i(0) = 2$ A.

Answer: −18 A, 324 J.

Practice Problem 6.10

Determine v_C, i_L, and the energy stored in the capacitor and inductor in the circuit of Fig. 6.28 under dc conditions.

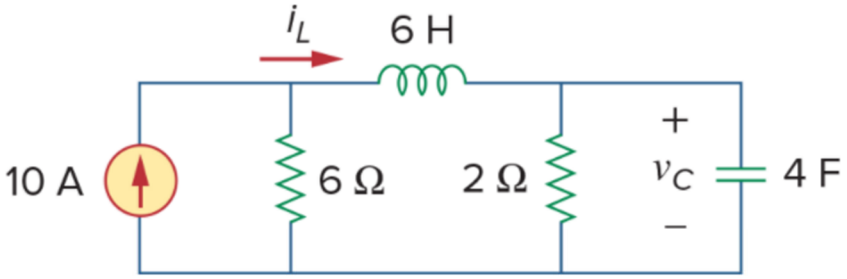

Figure 6.28
For Practice Prob. 6.10.

Answer: 15 V, 7.5 A, 450 J, 168.75 J.

Practice Problem 6.11

Calculate the equivalent inductance for the inductive ladder network in Fig. 6.32.

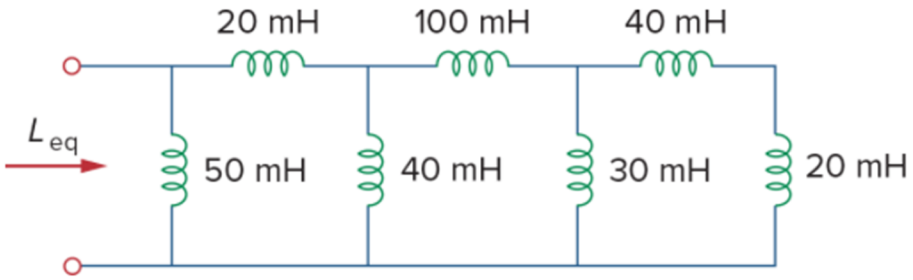

Figure 6.32
For Practice Prob. 6.11.

Answer: 25 mH.

Practice Problem 6.12

In the circuit of Fig. 6.34, $i_1\,(t) = 600e^{-2t}$ mA. If $i\,(0) = 1.4$ A, find: (a) $i_2\,(0)$; (b) $i_2\,(t)$ and $i\,(t)$; (c) $v_1\,(t)$, $v_2\,(t)$, and $v\,(t)$.

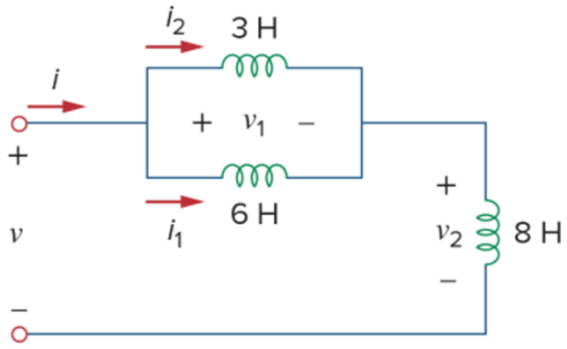

Figure 6.34
For Practice Prob. 6.12.

Answer: (a) 800 mA, (b) $\left(-0.4 + 1.2e^{-2t}\right)$ A, $\left(-0.4 + 1.8e^{-2t}\right)$ A, (c) $-36e^{-2t}$ V, $-7.2e^{-2t}$ V, $-28.8e^{-2t}$ V.