C6 problems

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.

Answer: 100 mV, 400 mV.

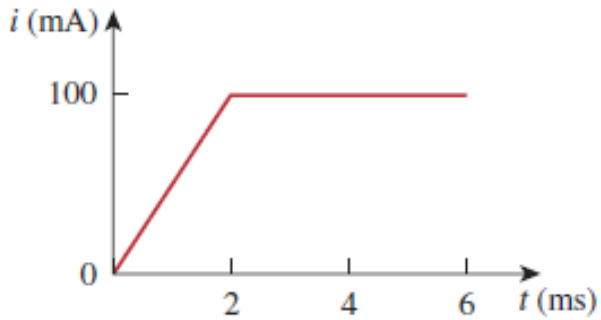

Figure 6.11
For Practice Prob. 6.4.

Practice Problem 6.5

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

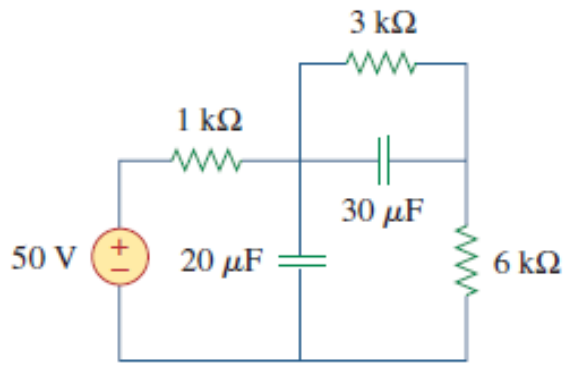

Figure 6.13
For Practice Prob. 6.5.

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.

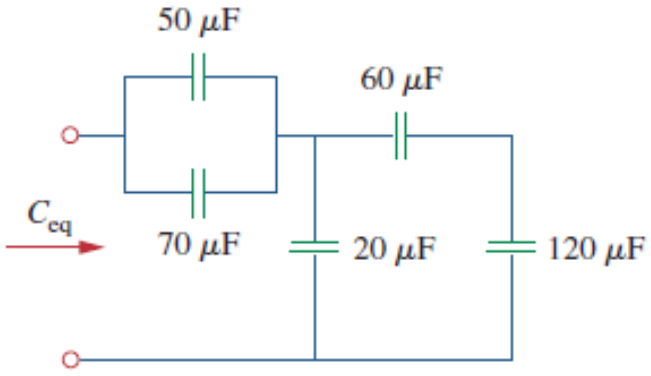

Figure 6.17
For Practice Prob. 6.6.

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.

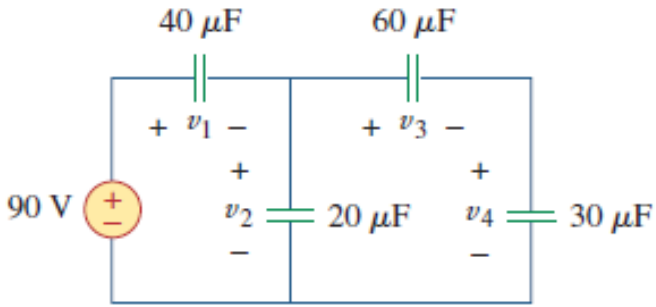

Figure 6.20
For Practice Prob. 6.7.

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, 320 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.

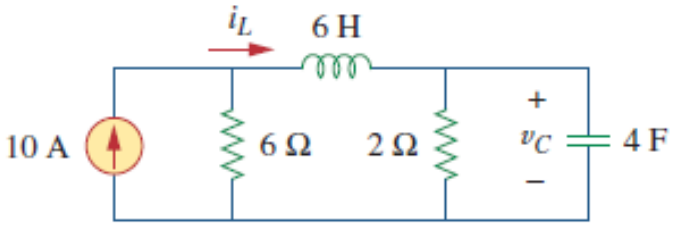

Figure 6.28
For Practice Prob. 6.10.

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

Practice Problem 6.12

In the circuit of Fig. 6.34, $i_1(t) = 0.6e^{-2t}$ A. 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 $v(t)$.

Answer: (a) 0.8 A, (b) $(-0.4 + 1.2e^{-2t})$ A, $(-0.4 + 1.8e^{-2t})$ A, (c) $-36e^{-2t}$ V, $-7.2e^{-2t}$ V, $-28.8e^{-2t}$ V.

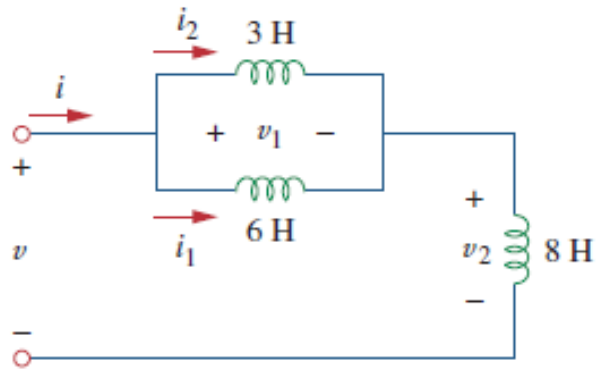

Figure 6.34
For Practice Prob. 6.12.

Practice Problem 6.13

The integrator in Fig. 6.35(b) has $R = 100\ \text{k}\Omega$, $C = 20\ \mu\text{F}$. Determine the output voltage when a dc voltage of 2.5 mV is applied at $t = 0$. Assume that the op amp is initially nulled.

Answer: $-1.25t$ mV.

Practice Problem 6.14

The differentiator in Fig. 6.37 has $R = 100\ \text{k}\Omega$ and $C = 0.1\ \mu\text{F}$. Given that $v_i = 1.25t$ V, determine the output v_o.

Answer: -12.5 mV.

notes

- 6.4 (S6.2)
- 6.5 (S6.2)
- 6.6 (S6.3)
- 6.7 (S6.3)
- 6.8 (S6.4)
- 6.9 (S6.4)
- 6.10 (S6.4)
- 6.12 (S6.5)
- 6.13 (S6.6)
- 6.14 (S6.6)