1. The current across a capacitor is constant. What is the value of the current?

2. The voltage across a 100-μF capacitor is 200 V. What is the magnitude of the net charge stored on each plate? What is the total of the net charges on both plates?

3. A 1000-μF capacitor, initially charged to 100 V, is discharged by a steady current of 100 μA. How long does it take to discharge the capacitor to 0 V?

4. Find the stored charge and energy for a 5-μF capacitor that is discharged to 0 V in a time interval. If the capacitor is discharged to 0 V in 0.1 s, find the average power delivered by the capacitor during the discharge interval.

5. The voltage across a 10-μF capacitor is given by $v(t) = 100 \sin(1000t)$. Find expressions for the current, power, and stored energy. Sketch the waveforms to scale versus time.

6. The voltage across a 1-μF capacitor is given by $v(t) = 100 \cos(100t)$. Find expressions for the current, power, and stored energy. Sketch the waveforms to scale versus time.

7. Prior to $t = 0$, a 100-μF capacitance is uncharged. Starting at $t = 0$, the voltage across the capacitor is increased linearly with time to 100 V in 2 s. Then, the voltage remains constant at 100 V. Sketch the voltage, current, power, and stored energy to scale versus time.

P3.10. The current through a 0.5-μF capacitor is shown in Figure P3.10. At $t = 0$, the voltage is 10 V. Sketch the voltage, power, and stored energy to scale versus time.

P3.11. The current through a 3-μF capacitor is shown in Figure P3.11. At $t = 0$, the voltage $v(0) = 10$ V. Sketch the voltage, power, and stored energy to scale versus time.

8. Inductances in series or parallel are combined the same manner as resistances.

9. Real inductors have several parasitic effects.

10. Mutual inductance accounts for mutual coupling magnetic fields between coils.

11. It is noted that answers can be found on the OrCAD CD and on the website www.prenhall.com/hambley.
P.3.40. The current flowing through a 2-H inductance is shown in Figure P.3.40. Sketch the voltage, power, and stored energy versus time.

![Figure P.3.40](image1)

P.3.41. The current in a 100-mH inductance is given by \(0.5\sin(1000t)\) A. Find expressions and sketch the waveforms to scale for the voltage, power, and stored energy.

P.3.42. The current in a 2-H inductance is given by \(5e^{-2t}\) A. Find expressions for the voltage, power, and stored energy. Sketch the waveforms to scale for \(0 < t < 0.5\) s.

P.3.43. The voltage across a 2-H inductance is shown in Figure P.3.43. The initial current in the inductance is \(i(0) = 0\). Sketch the current, power, and stored energy to scale versus time.

![Figure P.3.43](image2)

P.3.44. The voltage across a 10-\(\mu\)H inductance is given by \(v(t) = 5\sin(10^6t)\) V. The initial current is \(i(0) = -0.5\) A. Find expressions for the current, power, and stored energy for \(t > 0\). Sketch the waveforms to scale versus time.

P.3.45. A constant voltage of 10 V is applied to a 50-\(\mu\)H inductance as shown in Figure P.3.45. The current in the inductance at \(t = 0\) is \(-100\) mA. At what time \(t\) does the current reach \(+10\) mA?

![Figure P.3.45](image3)

P.3.46. At \(t = 0\), the current flowing in a 0.5-H inductance is 4 A. What constant voltage must be applied to reduce the current to 0 at \(t = 0.2\) s?

P.3.47. Prior to \(t = 0\), the current in a 2-H inductance is zero. Starting at \(t = 0\), the current is increasing linearly with time to 10 A in 5 s. Then, the current remains constant at 10 A. Sketch the voltage, current, power, and stored energy to scale versus time.

P.3.48. At \(t = 0\), a constant 5-V voltage source is applied to a 3-H inductor. Assume an initial current of zero for the inductor. Determine the capacitor current, power, and stored energy at \(t = 2\) s.

P.3.49. At \(t = 5\) s, the energy stored in a 2-H inductor is 200 J and is increasing at 100 J/s. Determine the voltage magnitude and current magnitude at \(t = 5\) s. Does the current enter or leave the positive terminal of the inductor?

P.3.50. What value of inductance (having zero initial current) corresponds to an open circuit? Explain your answer. Repeat for a short circuit.

P.3.51. To what circuit element does a very large (ideally infinite) inductance have an initial current of 10 A correspond? Explain your answer.

Section 3.5: Inductances in Series and Parallel

P.3.52. Discuss how inductances are combined in series and in parallel. Compare with how resistances are combined.