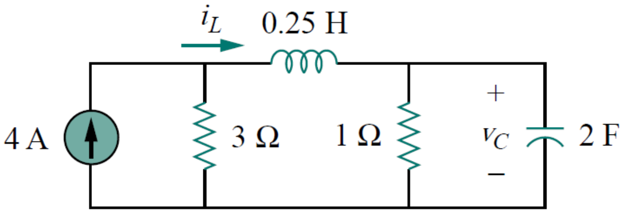
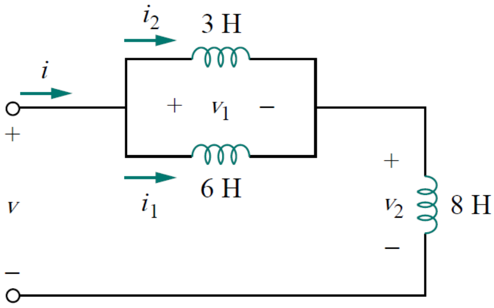
باسمه تعالی

تمرین های سری پنجم درس مدارهای الکتریکی ۱،   نام استاد: حسن خانی

1- What is the voltage across a 3-μF capacitor if the charge on one plate is 0.12mC? How much energy is stored? **Answer:** 40 V, 2.4 mJ.
2- If a 10-μF capacitor is connected to a voltage source with $v(t)$ = 50 sin 2000t V determine the current through the capacitor. **Answer:** cos 2000t A.
3- The current through a 100-µF capacitor is i(t) = 50 sin 120πt mA. Calculate the voltage across it at t = 1 ms and t = 5 ms. Take v(0) = 0. **Answer**: −93.137 V, −1.736 V.
4- 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 within 0 < t < 4 s. Assume i(0) = 2 A. **Answer**: −18 A, 320 J.
5- Determine v_C, i_L, and the energy stored in the capacitor and inductor in the circuit of the following figure under dc conditions. **Answer**: 3 V, 3 A, 9 J, 1.125 J.



6- In the circuit of the figure given below, $i_1(t) = 0.6e^{-2t}$ A. If i(0) = 1.4 A, find: (a) $i_2(0)$; (b) $i_2(t)$ and i(t); (c) v(t), $v_1(t)$, and $v_2(t)$. Answer: (a) 0.8 A, (b) $(-0.4 + 1.2e^{-2t})$ A, $(-0.4 + 1.8e^{-2t})$ A, (c) $-7.2e^{-2t}$ V, $-28.8e^{-2t}$ V, $-36e^{-2t}$ V.



6.25 Obtain the equivalent capacitance of the network shown in Fig. 6.58.

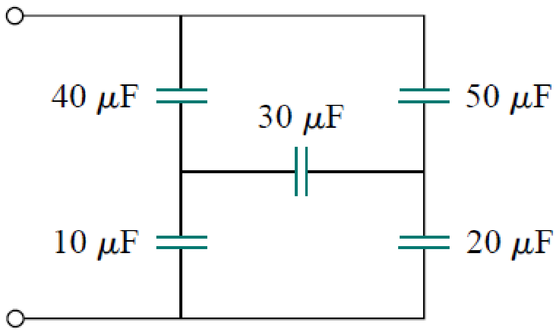


Figure 6.58 For Prob. 6.25.

6.22 (a) Show that the voltage-division rule for two capacitors in series as in Fig. 6.57(a) is

$$v_1 = \frac{C_2}{C_1 + C_2} v_s, \qquad v_2 = \frac{C_1}{C_1 + C_2} v_s$$

assuming that the initial conditions are zero.

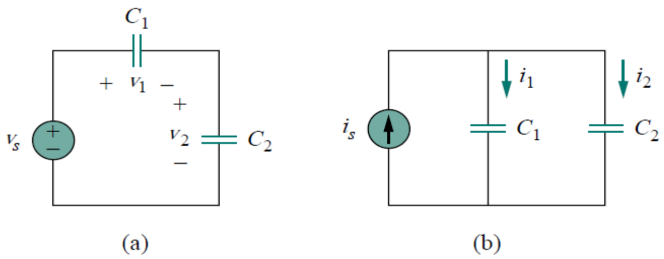


Figure 6.57 For Prob. 6.22.

(b) For two capacitors in parallel as in Fig. 6.57(b), show that the current-division rule is

$$i_1 = \frac{C_1}{C_1 + C_2} i_s, \qquad i_2 = \frac{C_2}{C_1 + C_2} i_s$$

assuming that the initial conditions are zero.

6.50 Determine L_{eq} that may be used to represent the inductive network of Fig. 6.75 at the terminals.

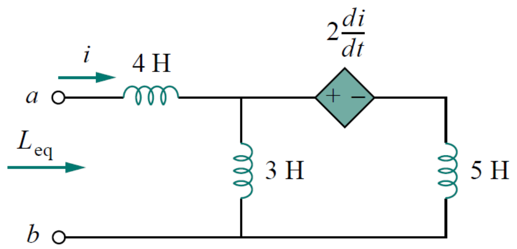


Figure 6.75 For Prob. 6.50.

6.55 Find i and v in the circuit of Fig. 6.80 assuming that $i(0) = 0 = v(0)$.

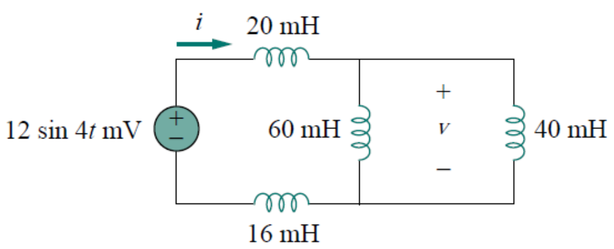


Figure 6.80 For Prob. 6.55.

6.52 (a) For two inductors in series as in Fig. 6.77(b), show that the current-division principle is

$$v_1 = \frac{L_1}{L_1 + L_2} v_s, \qquad v_2 = \frac{L_2}{L_1 + L_2} v_s$$

assuming that the initial conditions are zero.

(b) For two inductors in parallel as in Fig. 6.77(b), show that the current-division principle is

$$i_1 = \frac{L_2}{L_1 + L_2} i_s, \qquad i_2 = \frac{L_1}{L_1 + L_2} i_s$$

assuming that the initial conditions are zero.

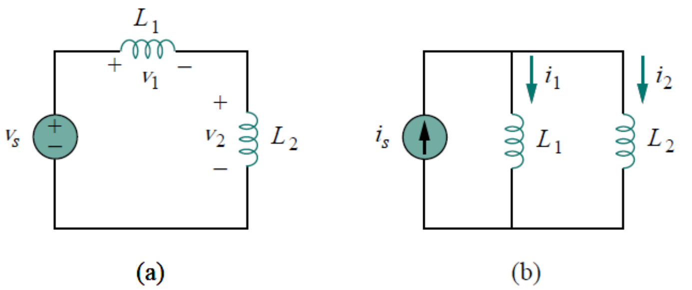


Figure 6.77 For Prob. 6.52.

6.47 Find the equivalent inductance looking into the terminals of the circuit in Fig. 6.72.

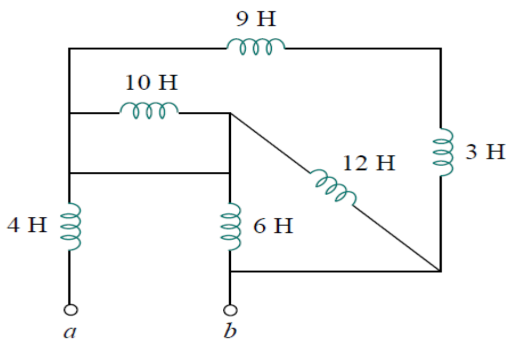


Figure 6.72 For Prob. 6.47.