ECE 3364, Dr. Hebert, F 2016, Homework 10, due 11/15

Problem 1. Nilsson, Problem 13.38
(same in both 7th edition and 8th edition)

13.38 The magnetically coupled coils in the circuit seen in Fig. P13.38 carry initial currents of 3 and 2 A, as shown.

a) Find the initial energy stored in the circuit.

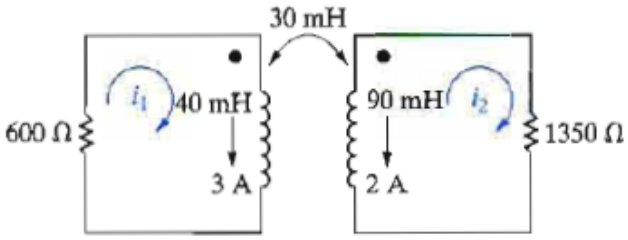
b) Find I_1 and I_2.

c) Find i_1 and i_2.

d) Find the total energy dissipated in the 600 and 1350 Ω resistors.

e) Repeat (a)–(d), with the dot on the 90 mH inductor at the lower terminal.

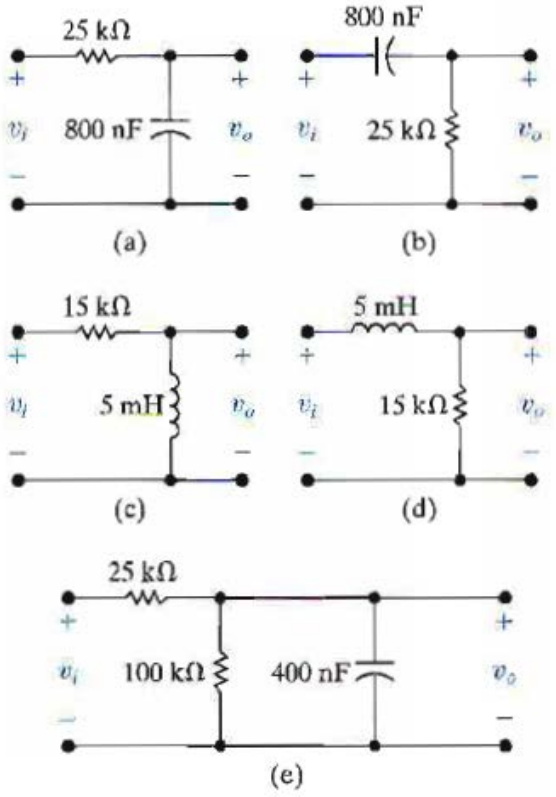
Figure P13.38



Problem 2.
Nilsson, 8th edition
Problem 13.49

13.49 Find the numerical expression for the transfer function (V_o/V_i) of each circuit in Fig. P13.49 and give the numerical value of the poles and zeros of each transfer function.

Figure P13.49



Problem 3.
Nilsson, 8th edition Problem 13.69

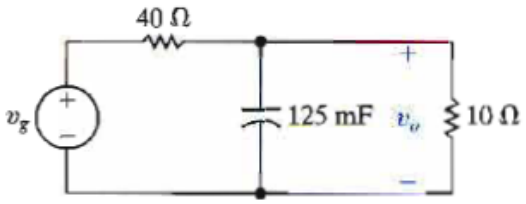
13.69 a) Find the impulse response of the circuit seen in Fig. P13.69 if v_g is the input signal and v_o is the output signal.

b) Assume that the voltage source has the waveform shown in Fig. P13.68(b). Use the convolution integral to find v_o.

c) Sketch v_o for $0 \le t \le 1.5$ s.

d) Does v_o have the same waveform as v_g? Why?

Figure P13.69



Problem 4.
Nilsson, 8th edition
Problem 13.74

13.74 The transfer function for a linear time-invariant circuit is

$$H(s) = \frac{V_o}{V_g} = \frac{10^4(s + 6000)}{s^2 + 875s + 88 \times 10^6}.$$

If $v_g = 12.5 \cos 8000t$ V, what is the steady-state expression for v_o?

Problem 5.
Nilsson, 8th edition
Problem 13.77

13.77 When an input voltage of $240u(t)$ V is applied to a circuit, the response is known to be

$$v_o = (75 - 100e^{-800t} + 25e^{-3200t})u(t) \text{ V}.$$

What will the steady-state response be if $v_g = 40 \cos 16{,}000$ V?

Problem 6. Nilsson, 8th edition Problem 13.87

13.87 There is no energy stored in the circuit in Fig. P13.87 at the time the impulse voltage is applied.

a) Find i_1 for $t \ge 0^+$.

b) Find i_2 for $t \ge 0^+$.

c) Find v_o for $t \ge 0^+$.

d) Do your solutions for i_1, i_2, and v_o make sense in terms of known circuit behavior? Explain.

Figure P13.87