GEORGIA INSTITUTE OF TECHNOLOGY
School of Electrical and Computer Engineering

Course ECE 2040

Circuit Analysis

Assigned: March 16, 2001
Due: March 23, 2001

Problem Set #9

Reading: Read the following sections from the class notes:
Chapter 6, Sections 6.3–6.5

Reading: Some of same topics are discussed in Dorf and Svoboda:
Chapter 8, Sections 8.3,8.6 (inspection methods)
Chapter 14, Sections 14.8, 14.9 (impedances and admittances)

Announcement: Quiz #3 will be held during the class hour on Monday, March 23, 2000. It will be a closed book test, although calculators are permitted. You may also bring one 8.5 by 11.0 inch sheet of *handwritten* notes. It will cover problem sets 6–8.

Problem 9.1: In the circuit below, $v_c(0) = 8$V and $i_\ell(0) = 4$A. Find $i_\ell(t)$ for $t > 0$.

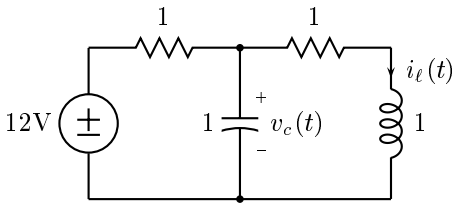

Figure 1: Circuit for Problem 9.1.

Problem 9.2: The first-order circuit in Figure 2 has a constant input for $t > 0$.

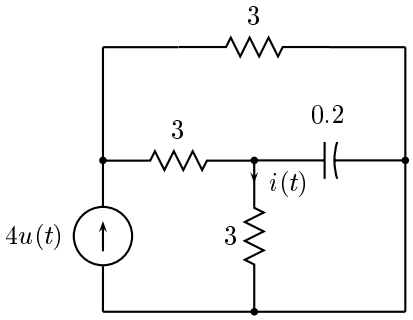

Figure 2: First-order circuit for Problem 9.2.

(a) Find $i(0)$.

(b) Find $i(\infty)$.

(c) Find $i(t)$ for $t > 0$.

Problem 9.3: Two capacitors with capacitance C_1 and C_2, respectively, are connected in parallel. Show that the parallel connection behaves like a single capacitor and determine the impedance of the parallel connection in terms of C_1 and C_2.

Problem 9.4: For each of the networks in Figure 3, determine the equivalent impedance. Express your answers as ratios of polynomials in s.

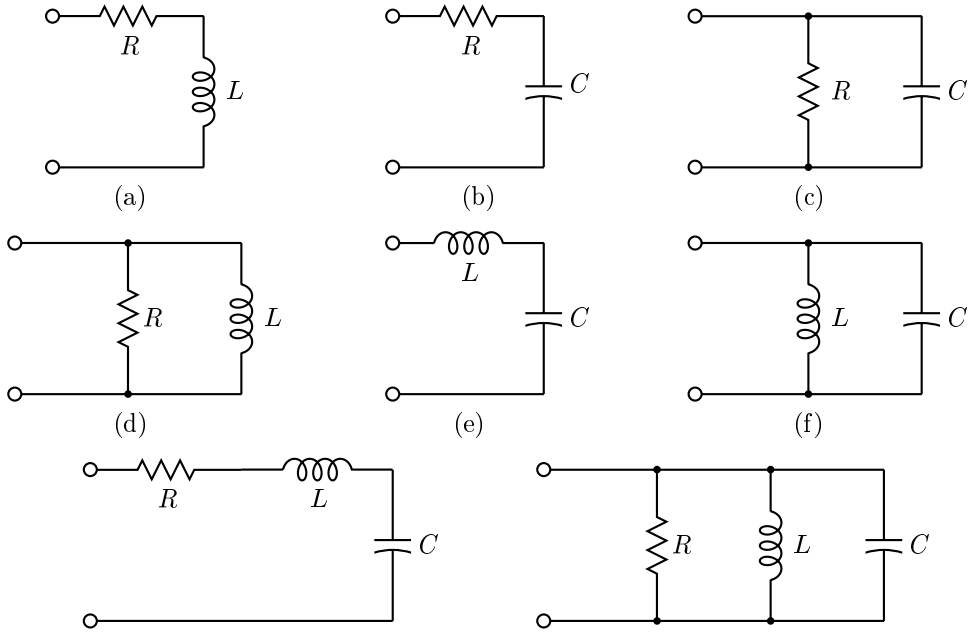

Figure 3: Circuits for Problem 9.4.

Problem 9.5: For each of the networks in Figure 4 determine the Laplace domain formula that relates the indicated output variable to the source variable. Your answers should be expressed in terms of the Laplace transforms of the source variables and the Laplace domain variable s.

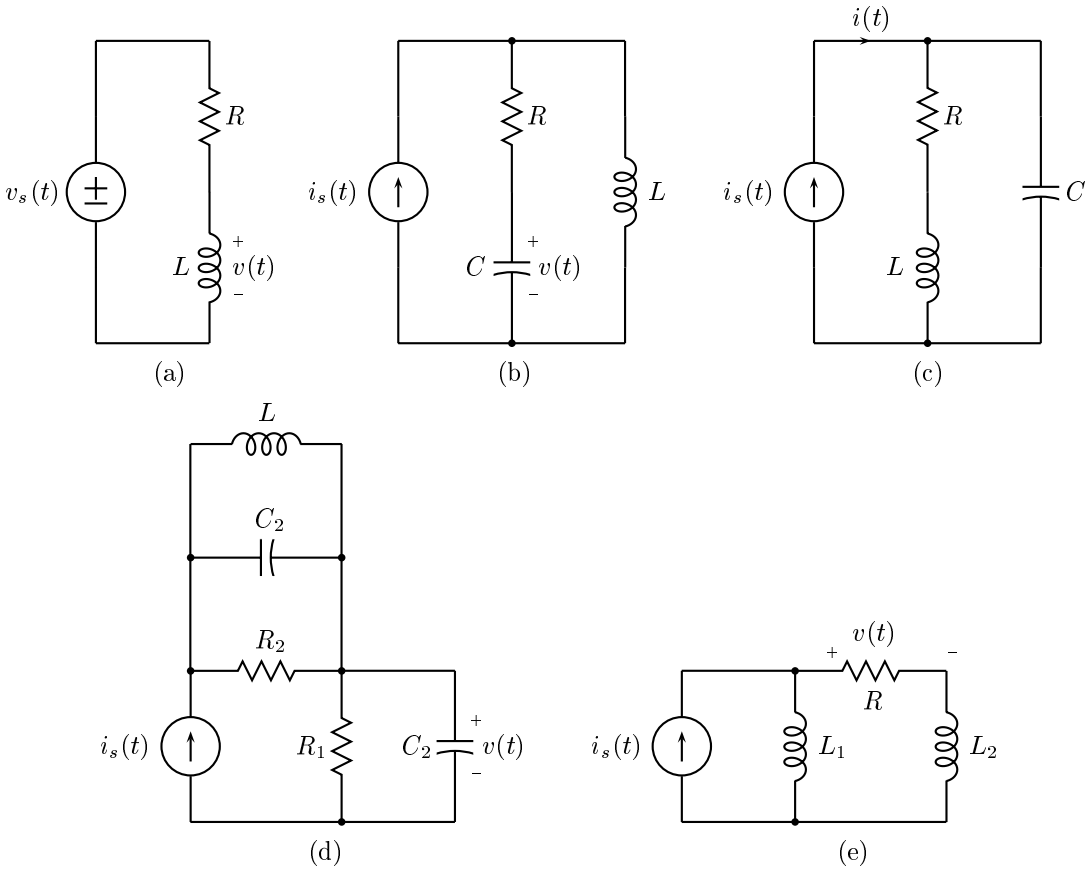

Figure 4: Networks for Problem 9.5.