GEORGIA INSTITUTE OF TECHNOLOGY
School of Electrical and Computer Engineering

Course EE 2250

Electric Circuit Analysis

Assigned: January 7, 1999
Due: January 14, 1999

Problem Set #1

Reading: Read the following sections from Dorf and Svoboda:
Chapter 1, Sections 1.3–1.5; (definitions of voltage and current)
Chapter 2, Sections 2.3, 2.5; (resistors and sources)
Chapter 3, Sections 3.3; (Kirchoff's Laws)
Chapter 7, Sections 7.3, 7.6; (definitions of capacitors and inductors)

Problem 1.1: The voltage waveform for the voltage source in Figure 1 is

$$v_s(t) = \begin{cases} \sin 2\pi(100)t, & t \geq 0 \\ 0, & t < 0 \end{cases}$$

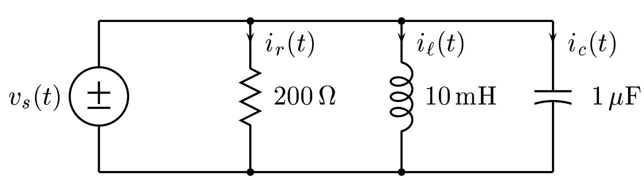


Figure 1:

(a) Determine $i_r(t)$.

(b) Determine $i_\ell(t)$.

(c) Determine $i_c(t)$.

Problem 1.2: Consider the four terminal network N_1 shown in Figure 2.

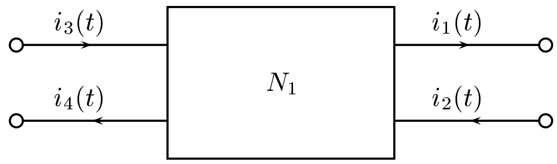


Figure 2:

(a) When network N_1 is connected to the two subnetworks N_2 and N_3 as shown in Figure 3, what is the relation between currents $i_1(t)$ and $i_2(t)$?

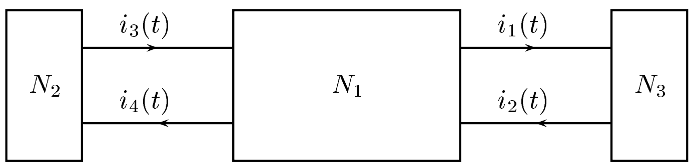


Figure 3:

(b) Does the result that you derived in (a) apply to $i_1(t)$ and $i_2(t)$ when N_1 is embedded in a larger network as shown in Figure 4? Explain.

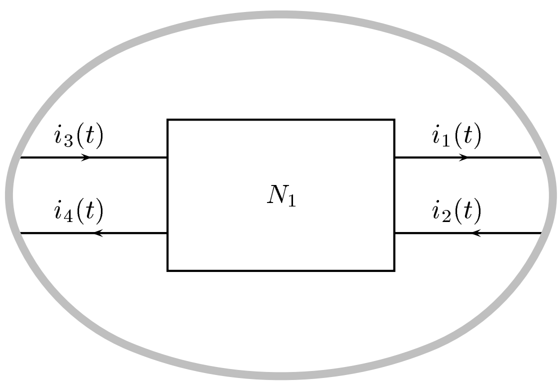


Figure 4:

Problem 1.3: (a) Write the KCL equations that constrain the currents at all of the nodes of the network in Figure 5.

(b) Write the KVL equations that constrain the voltages for all of the meshes in that same figure.

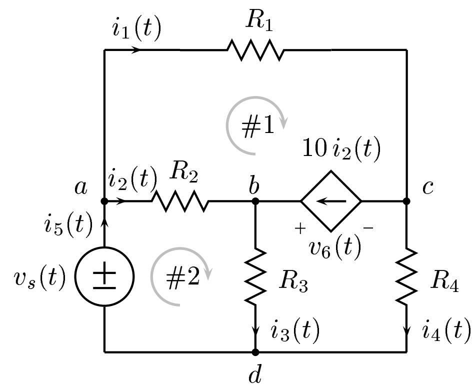


Figure 5:

Problem 1.4: Determine $v(t)$ and $i(t)$ in the network shown in Figure 6

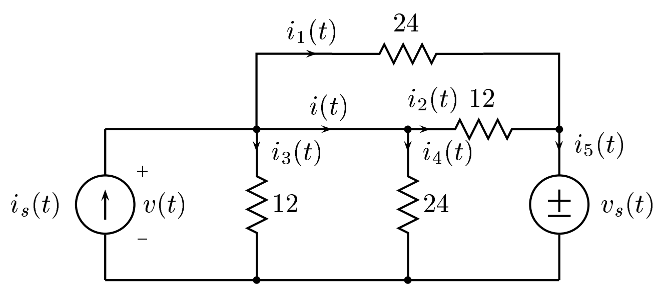
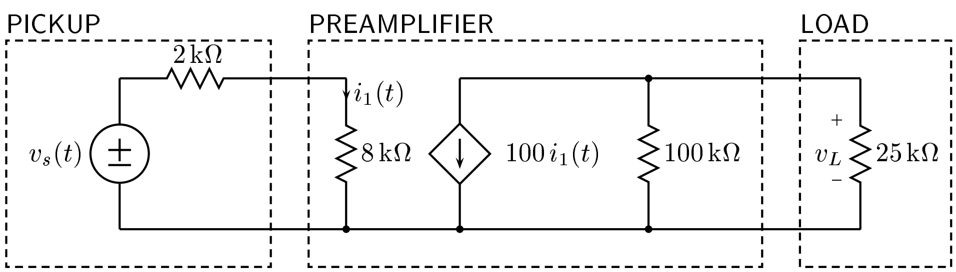


Figure 6:

Problem 1.5: In the center of Figure 7 is a model of a one-transistor preamplifier that is used to amplify the output of a low amplitude magnetic pickup, and drive a 25 kΩ load. Express the voltage $v_L(t)$ measured across the load in terms of $v_s(t)$.



PICKUP
PREAMPLIFIER
LOAD
2 kΩ
$v_s(t)$
$i_1(t)$
8 kΩ
$100\,i_1(t)$
100 kΩ
+
v_L
−
25 kΩ

Figure 7: