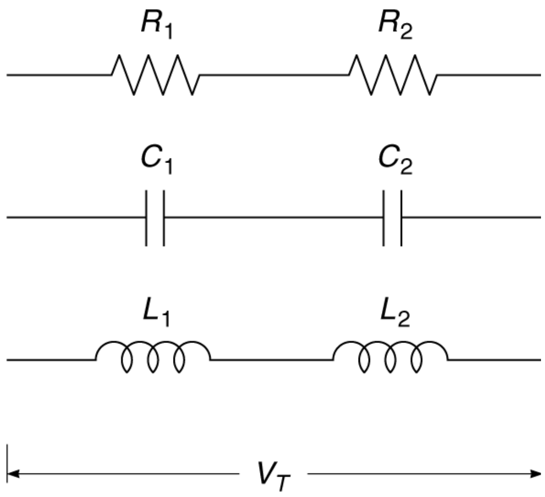
Basic Electronics

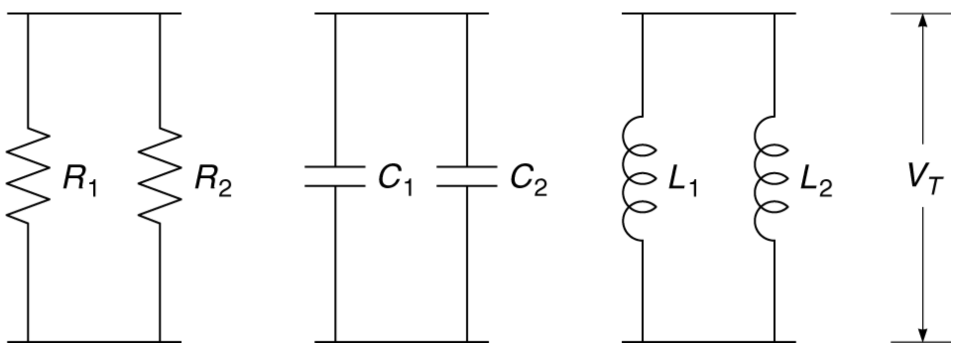
A Sign in Penacook, New Hampshire

I, V Relations for R, L and C
(Table 4.1)

Element	**Unit Symbol**	**I(t)**	**V(t)**	**$V_{I=const}$**
Resistor	R	V(t)/R	RI(t)	RI
Capacitor	C	CdV(t)/dt	$(1/C)\int I(\tau)d\tau$	It/C
Inductor	L	$(1/L)\int V(\tau)d\tau$	LdI(t)/dt	0

R, L and C Combinations

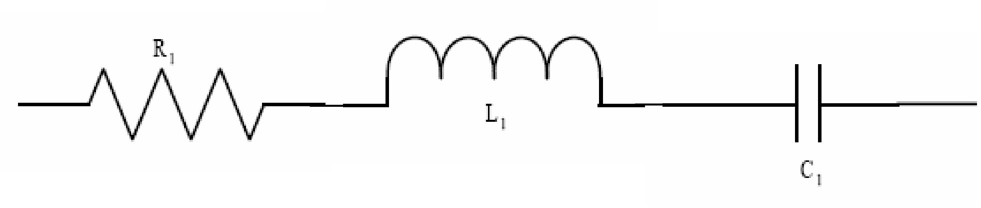




Figures 4.5 and 4.6

Basic Electronics – R, C and L

- For R, C, and L combination in *series*:



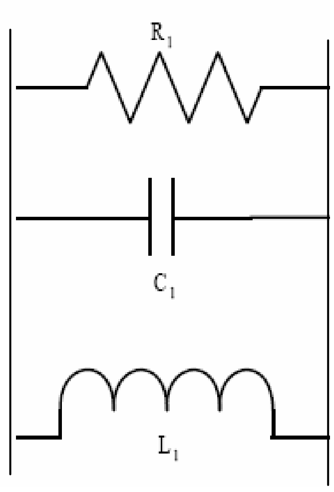
Potential Difference:

Current:

- For R, C, and L combination in *parallel*:

Potential Difference:

Current:



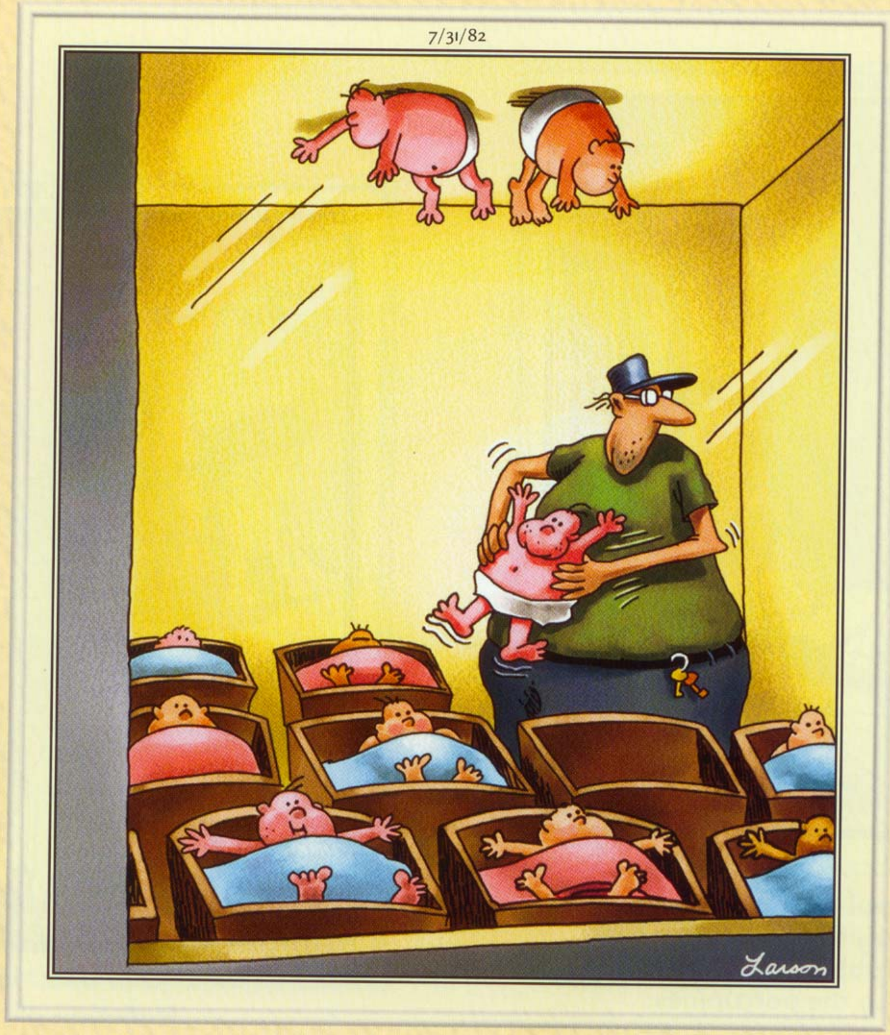
Basic Electronics – R, C and L

Current related to charge

DC: direct current →

DC: alternating current →

Determine the DC potential difference across
2 inductors in parallel:



Late at night, and without permission, Reuben would often enter the nursery and conduct experiments in static electricity.

Kirchhoff’s Laws

Node: a point in a circuit where any two of more elements meet

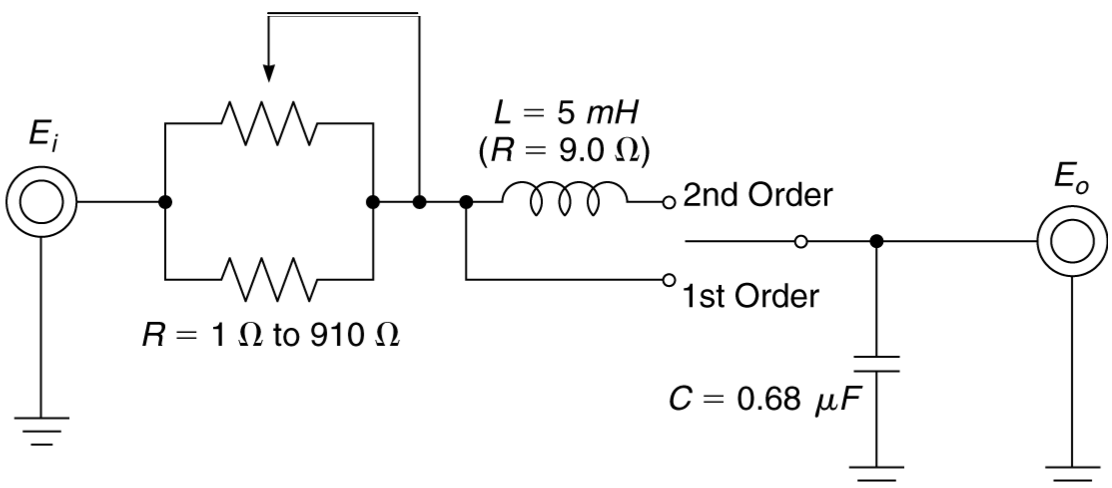
Loop: a closed path going from one circuit node back to itself without passing through any intermediate node more than once

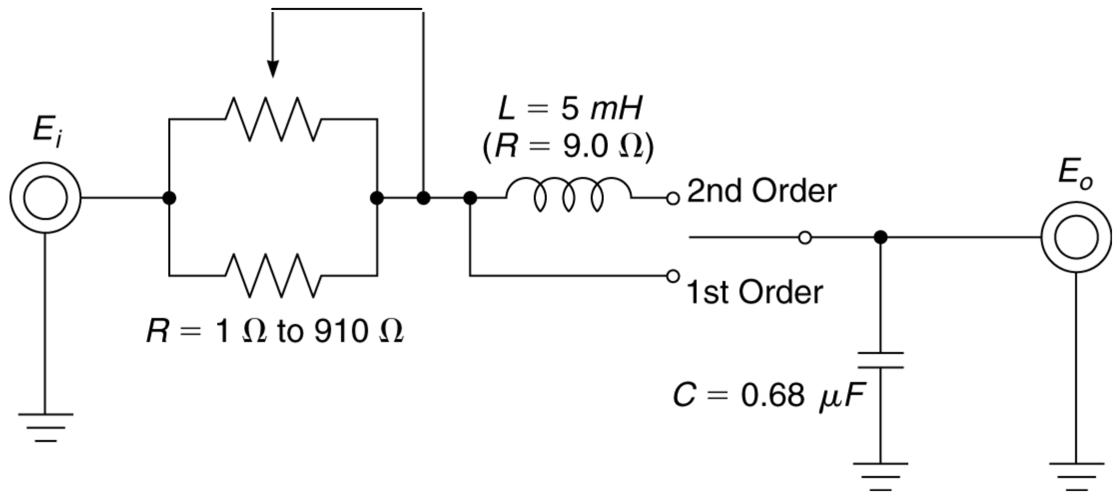
Kirchhoff’s first (or current) law: at a circuit node, the current flowing into the node equals the current flowing out (charge is conserved)

Kirchhoff’s second (or voltage) law: around a circuit loop, the sum of the voltages equal zero (energy is conserved)

Example RLC Circuit

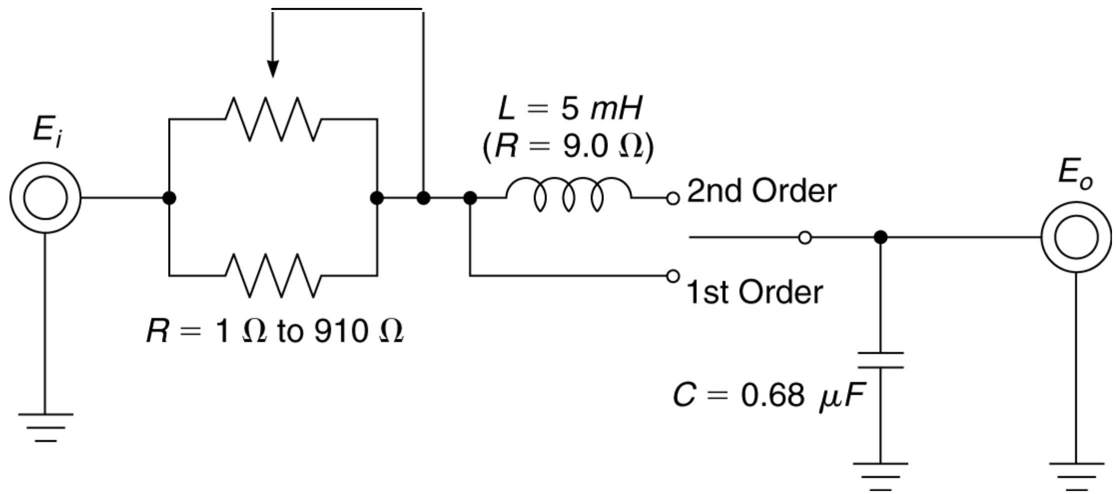
- Consider a RLC circuit used in your 'Dynamic System Response' laboratory exercise.





- E_i, R, L and C are in series →

- Recall that I=dQ/dt →



- Now examine another loop and apply Kirchoff's Voltage Law again.

The Wheatstone Bridge

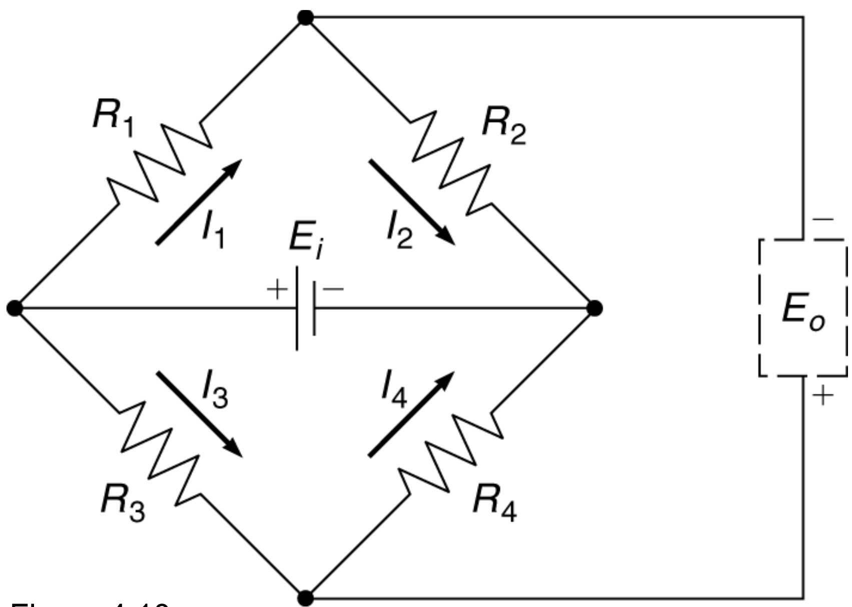
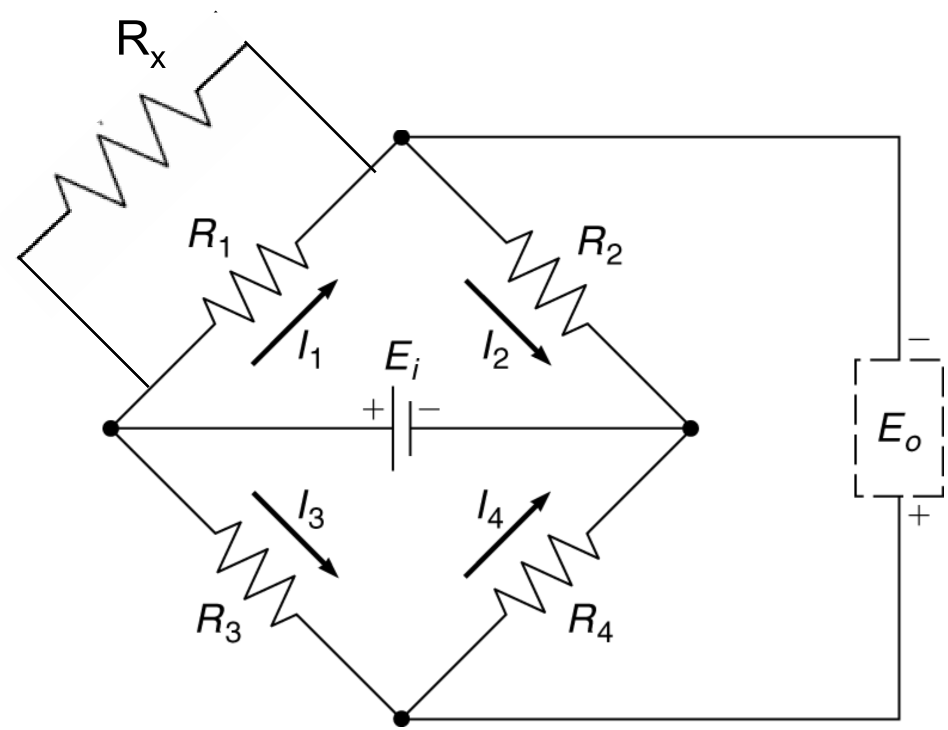
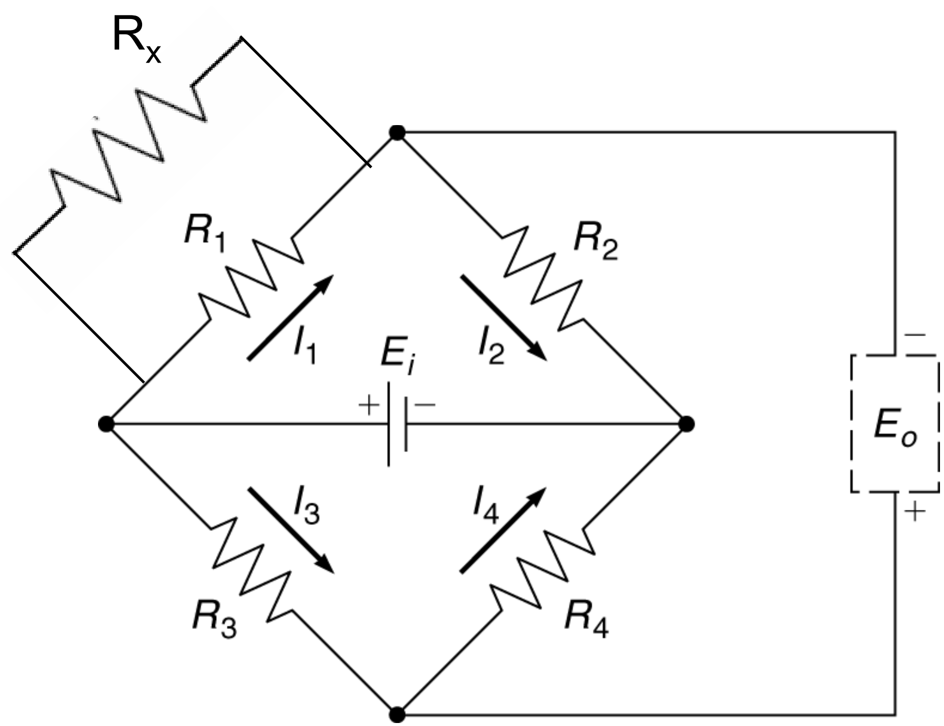


Figure 4.10

Use Kirchhoff's Voltage Law:

- What is the Wheatstone bridge equation if another resistor, R_x, is added in *parallel* with R_1 ?





R_x
R_1
R_2
I_1
E_i
I_2
+
−
E_o
−
+
I_3
I_4
R_3
R_4