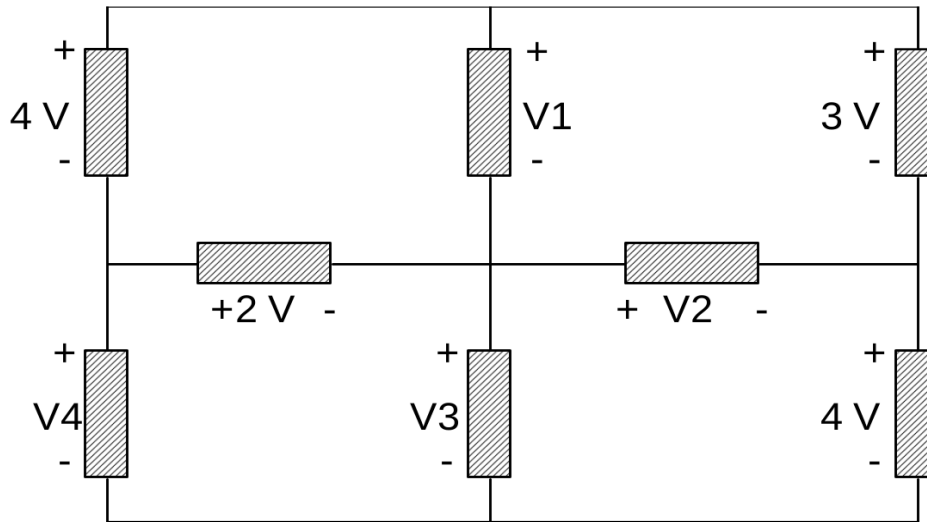




## Assignment 2

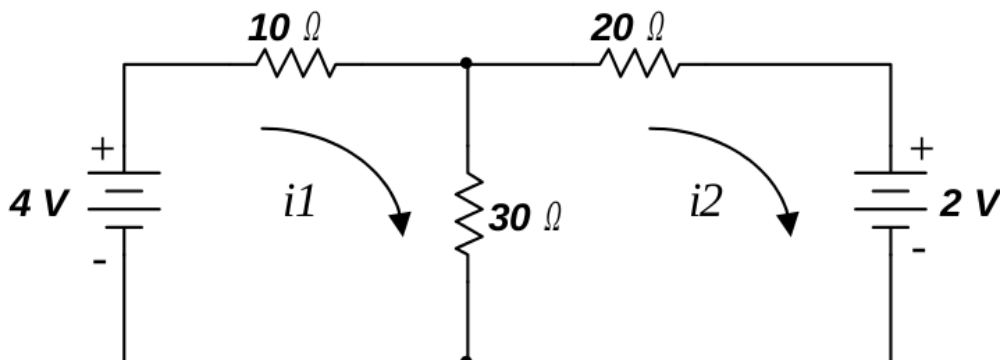
### Problem 1:

The hatched rectangles in the circuit below represent general two terminal elements with the polarity and voltage drop across them as indicated. Use Kirchoff's laws to determine the unknown voltages  $V_1$ ,  $V_2$ ,  $V_3$ ,  $V_4$ .



### Problem 2:

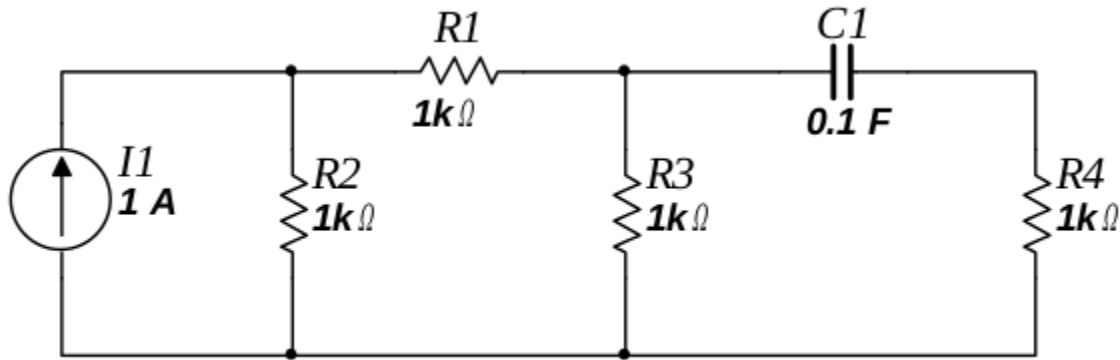
- Find the currents  $i_1$  and  $i_2$  for the following circuit.
- What is the magnitude and direction of the current flowing through the  $30\Omega$  resistor?





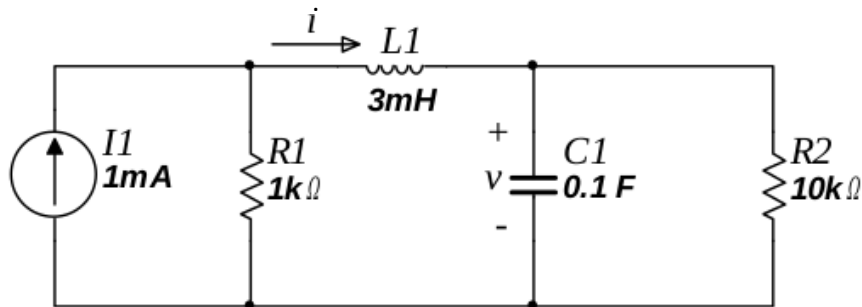
**Problem 3:**

For dc operation determine the energy stored in the 0.1F capacitor



**Problem 4:**

Under dc conditions calculate the current  $i$  and the voltage  $v$  for the following circuit.

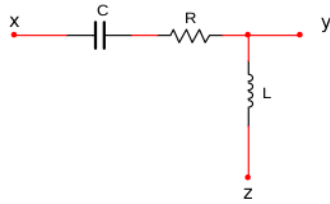


**Problem 5:**

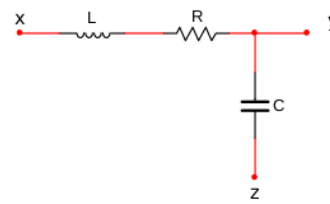
John finds a black box with 3 terminals labeled X, Y, Z. John decides to make resistance measurements across the terminals at DC ( $\omega=0$  Hz) and at high frequency ( $\omega$  large). He observes the following results:

Measured resistance across	Resistance ( $\Omega$ ) at	
	DC	High-freq
X-Y	∞	40
Y-Z	0	∞
X-Z	∞	∞

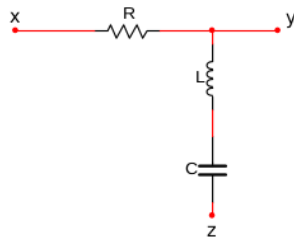
Which of the following equivalent circuits is inside John's black box?



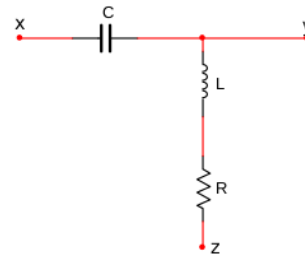
Circuit A



Circuit B



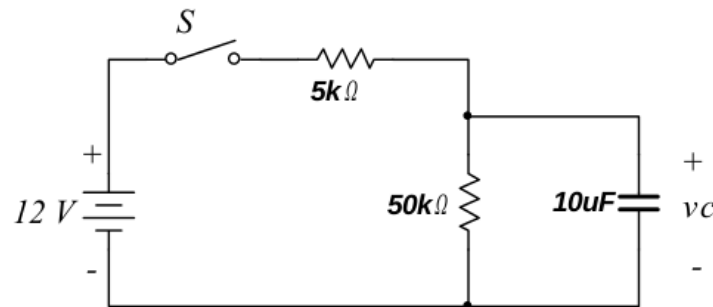
Circuit C



Circuit D

**Problem 6:**

For the following circuit the switch  $S$  has been opened for a long time. At time  $t=0$  the switch is closed and it is opened again at time  $t=1$  sec. Sketch  $v_c(t)$  for all  $t$ . Indicate all relevant values in your sketch





**Problem 7:**

A Resistive temperature detector (RTD) is used to monitor the temperature inside a room to turn on AC if it's necessary (if temperature is above 27 °C). The RTD was put in simple circuit shown in the below figure. The RTD resistance is 200Ω at 20°C. What's the AC state (On or Off) if you know that the  $V_{ref}$  is 12v,  $R_1$  is 250Ω, the RTD sensitivity is 0.5Ω/°C and the  $V_{Meas}$  is 5.4V.

