Engineering 103 –UMass Boston

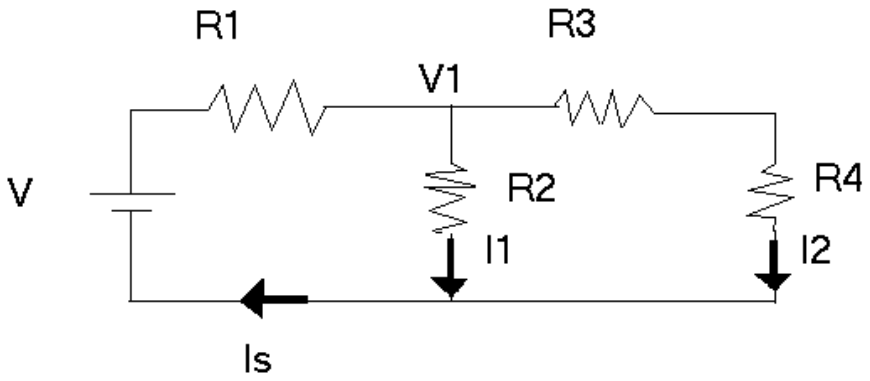
Home work 4

Please write the due date here _____

This homework is entirely about LabVIEW. There are <u>three</u> problems in this set. To receive credits you should submit the printouts of LabVIEW Front Panels and Block Diagrams. In each of these files, (i) <u>your name AND date should be shown as LabVIEW text boxes</u>; (ii) Data entered into the "numeric control" inputs AND results shown in the "numeric indicator" outputs. (iii) <u>choose 'Operate/Save current values as default' before you save your files and make the printouts</u>.

1) Build a VI that outputs Is (A), V1 (V), I1 (A), and I2 (A), as shown in the figure below. The inputs are V (V), and R1 to R4 (Ohm).

You will turn in a file and a print-out of the front panel and block diagram **<u>with your name inside each (not hand-written),</u>** <u>the print-out should show the outputs for the following inputs: V=12V; R1=3 Ohm; R2=3 Ohm; R3=3 Ohm; R4=3 Ohm</u>,

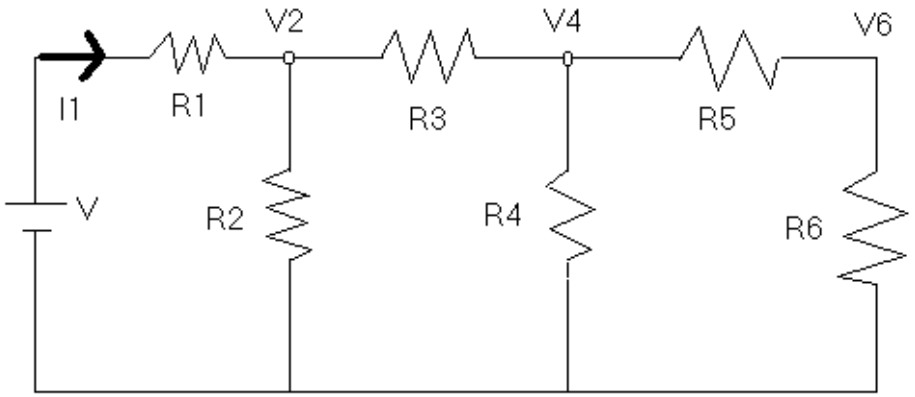


The equations to implement in the Block Diagram are (they are obtained from Circuit Analysis using series and parallel equivalent combinations of resistors):

a) R_{34}=R3+R4;
   R_{234}=R2 || R_{34}=R2*R_{34}/(R2+R_{34});
   R_{1234}=R_{234}+R1
b) Is=V/R_{1234}
c) V1=V-R1*Is
   I1=V1/R2
   I2=V1/R_{34}

Please note that R_{34}, R_{234}, and R_{1234} are just intermediate variables, which can be labeled in the Block Diagram for easy reading. However they are not output variables.

2) Make a VI that outputs I1 (A), V2 (V), V4 (V), and V6 (V) as shown in the figure below. The inputs are V (V), and R1 through R6 (Ohm). You will turn in a print-out of the front panel and block diagram **<u>with your name inside each (not hand-written),</u>** <u>the print-out should show the outputs for the following inputs: V=12V; R1 through R6 = 4 (Ohm) each.</u>



The equations to use are (they are obtained from Circuit Analysis using series and parallel equivalent combinations of resistors):

$$I = \frac{V}{R1 + \dfrac{R2 \cdot \left\{ R3 + \dfrac{R4 \cdot (R5 + R6)}{R4 + R5 + R6} \right\}}{R2 + R3 + \dfrac{R4 \cdot (R5 + R6)}{R4 + R5 + R6}}} \qquad (1)$$

$$V2 = V - I \cdot R1 \qquad (2)$$

$$V4 = V2 - \left(I - \frac{V2}{R2} \right) \cdot R3 \qquad (3)$$

$$V6 = V4 - \left(I - \frac{V2}{R2} - \frac{V4}{R4} \right) \cdot R5 \qquad (4)$$

3) Create three sub VI's: one called *parallel.vi* , one called *Vnext.vi*, and the *Iafter.vi* (see class notes and link to Circuit Analysis w/ LabVIEW IV from the course e-syllabus), then save them in a LLB library. In the same library you will rewrite the VI made in problem 2 but now using the newly created sub VI. You can call your subVI from the block diagram by right click, then click on "VI libraries", then browse your library to find the desired subVI. You will turn in a print-out of the front panel and block diagram **with your name inside each (not hand-written),** the print-out should show the outputs for the following inputs: V=12V; R1 through R6 = 4 (Ohm) each. The equations are the same as with the previous problem, since it is the same circuit, however instead of equation (1) that involves only arithmetic operations, use this version shown below that uses a "super-operator" performed by *parallel.vi*

$$I = \frac{V}{R1 + R2 \parallel \left\{ R3 + \left[R4 \parallel (R5 + R6) \right] \right\}}$$