Engineering 103 –UMass Boston

Homework 4

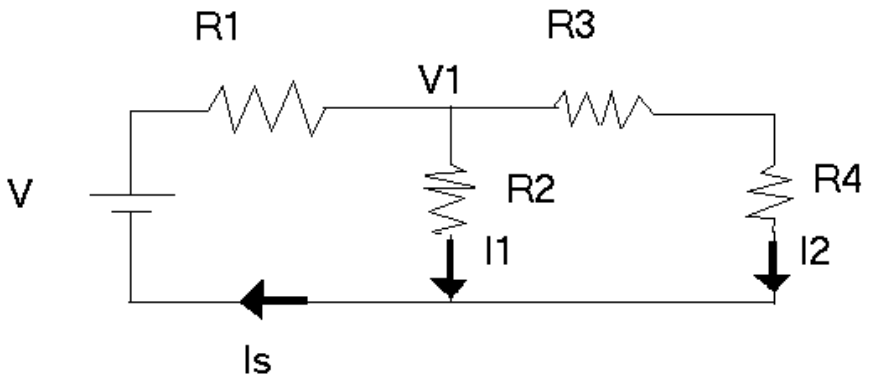
Please type the due date here _____

Please submit an electronically-signed Word file for this homework

This homework is entirely about LabVIEW. There are <u>three</u> problems in this set. To receive credits you should include snapshots of LabVIEW Front Panels and Block Diagrams. In each of these snapshots all the following should be included: (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 take the snapshots</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 include below a snapshot of the front panel and block diagram **<u>with your name inside each (not hand-written),</u>** <u>the snapshots should show the outputs for the following inputs: V=12V; R1=3 Ohm; R2=3 Ohm; R3=3 Ohm; R4=3 Ohm</u>,

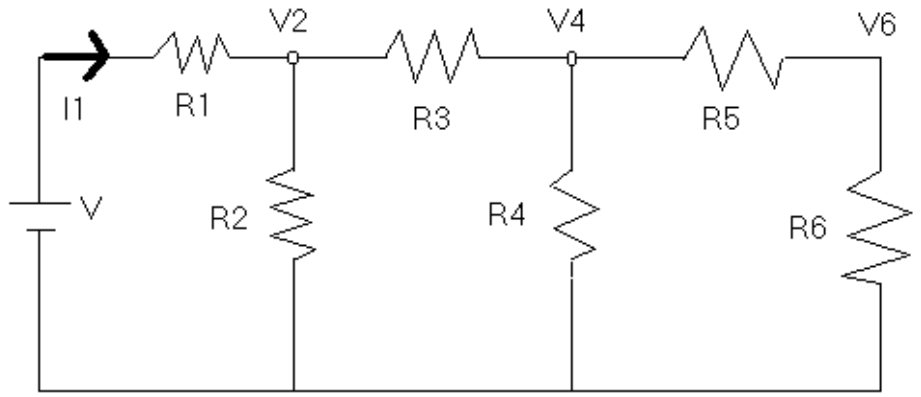


The equations to implement in the Block Diagram are (they are obtained from Circuit Analysis using series and parallel equivalent combinations of resistors):

a) $R_{34}=R3+R4$;
   $R_{234}=R2 \parallel R_{34}=R2*R_{34}/(R2+R_{34})$;
   $R_{1234}=R_{234}+R1$
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. They are not, however, 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 include below a snapshot of the front panel and block diagram **<u>with your name inside each (not hand-written),</u>** <u>the snapshot 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):

$I = \dfrac{V}{R1 + \dfrac{R2 \cdot \left\{ R3 + \dfrac{R4 \cdot (R5 + R6)}{R4 + R5 + R6} \right\}}{R2 + R3 + \dfrac{R4 \cdot (R5 + R6)}{R4 + R5 + R6}}}$	(1)		$V2 = V - I \cdot R1$	(2)
			$V4 = V2 - \left(I - \dfrac{V2}{R2} \right) \cdot R3$	(3)
			$V6 = V4 - \left(I - \dfrac{V2}{R2} - \dfrac{V4}{R4} \right) \cdot R5$	(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 sub-VI from the block diagram by right- clicking, then click on "VI libraries", then browse your library to find the desired subVI. You will include below a snapshot of the front panel and block diagram **with your name inside each (not hand-written),** the snapshot 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 other version shown below that uses a "parallel super-operator" performed by the sub-VI '*parallel.vi*'

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

Also use sub-VI '*Vnext.vi*' to obtain voltages at the next node in equations (2)-(4) and sub-VI '*Iafter.vi*' to obtain the parentheses in equations (3)-(4).

Code of Conduct

You can discuss this homework with your classmates but submissions should be individual.

Students are required to adhere to the University Policy on Academic Standards and Cheating, to the University Statement on Plagiarism and the Documentation of Written Work, and to the Code of Student Conduct as delineated in the catalog of Undergraduate Programs, pp. 44-45, and 48-52. The Code is available online at: http://www.umb.edu/life_on_campus/policies/code/

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Your full name
Engin 103 student