Engineering 1D04
Assignment V

The following is due at the **BEGINNING** of the tutorial (JHE/317-319) the week of Feb 24 to 28, 2003

1) The pseudo-code for the given problem. This must be typed, not hand-written. Make sure that you keep a copy of the pseudo-code so that you can use it to develop your C code. You will also need a copy to hand-in as an appendix for the next assignment.
2) Answers to the question(s) provided at the end of this assignment.

NOTE: Please include your tutorial number on every assignment. Also, remember that at the top of the first page of every assignment the following must be included:

"This assignment represents my own work"

followed by your signature, and your e-mail address. You need to include this information, or your assignment mark will be ZERO. Late assignments should be taken to the Drop-In-Centre (ITB/101). Late assignments will not be accepted after 4:30 on the day of your tutorial.

Problem

Write a pseudo-code, which includes data declarations, that can be used for the computation of the following:

(i) the total resistance R of resistors $R_1,\ldots,R_n$ in a parallel combination (Figure 5), and;

(ii) the current I, which is determined by substituting the total resistance R and the source voltage E into Ohm's law:

$$I = \frac{E}{R} \qquad (1)$$

(iii) the maximum value of R_i, for $i = 1,\ldots, n$, where n is the number of resistors.

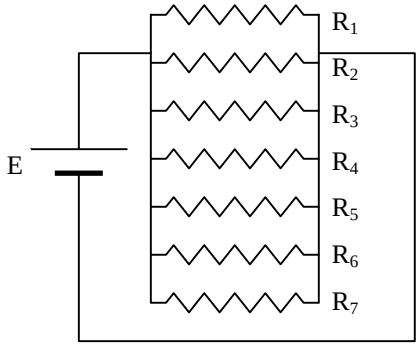

Figure 5

The total resistance of elements connected in parallel can be calculated from

$$\frac{1}{R} = \sum_{i=1}^{n} \frac{1}{R_i} \qquad (2)$$

The pseudo-code should read user input information for the number of resistors n, the resistor values R_1, R_2, etc. and the source voltage E. Furthermore, the pseudo-code should use an array of R_i values.

Your pseudo-code should define a constant, $MAXN \leftarrow 15$, for the maximum number of elements in the array. In addition, your pseudo-code should include subroutines to accomplish the following, without using any global variables:

1. Return the value of the total resistance R of the elements connected in parallel, given an array of values R_i and the number of resistors connected in parallel n
2. Return the current I, given the voltage E and the resistance R
3. Return the maximum value of R_i, given an array of values of R_i and the number of elements in the array.
4. Return a user input value that is greater than zero.

Use the last subroutine (4) to read in and check the validity of the resistance values. These values must be positive for physical reasons, and to avoid a potential division-by-zero error. The pseudo-code for the last subroutine was already implemented in Assignment III. As for the other input values (n and E), you can assume that they will be input correctly. For instance, when reading the number of resistors, you can assume that the user will always correctly enter a positive integer that is less than or equal to $MAXN$.

Questions

1. Explain briefly which of the following problem solving and programming concepts is more general: *algorithm* or *subroutine*? Why?
2. What does the problem decomposition delineate?