ENGR 200 FALL, 2017

**A7: ELEMENT DATA BASE**

**(using input/output files, for loops, if statements, and an array of structures)**

DUE: November 2, 2017 at 11:59 pm, CDT POINTS: 70

**INTRODUCTION:**

Your company requires you to design a computer based element selection system that will keep track of various elements used for the development of composite materials. The computer based system must be able to extract information from a known reference. The reference is the input file called **elements**. The input file contains the name of the element, the two-letter symbol, the atomic number, the atomic weight, the density in g/cm3, and the crystal structure. The input file is space delimited.

**ASSIGNMENT:**

Write a C program that will read the data from the input file into an array of structures. The program will do the following:

1. Sort the elements by atomic number.
2. Compute the mean atomic weight of the elements in the data base.
3. Compute the median atomic weight of the elements in the data base. See the note below.
4. Determine the element with the maximum atomic weight.
5. Determine the element with the minimum density.

Your program will print to the computer screen and print to an output file called **element\_report**. The output format is given below.

**OUTPUT FORMAT:**

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

ELEMENT DATA TABLE

Element Symbol Atomic Atomic Density Crystal

Number Weight g/cm^3 Structure

-----------------------------------------------------------

sssssssssss sss xx xxx.xx xx.xx sss

. . . . . .

. . . . . .

. . . . . .

sssssssssss sss xx xxx.xx xx.xx sss

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SUMMARY REPORT:

Mean atomic weight = xx.xx

Median atomic weight = xx.xx

The element with the minimum density is sssssssssss

The element with the maximum atomic weight is sssssssssss

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**Note:** Assuming that the values in an array have been sorted, the median is the value in the middle of the group of values. When the number of data values is odd, then the median is the value in the middle of the array and the array subscript is computed by floor(n/2). When the number of data values is even, then the median is the average of the two middle positions of the array and the array subscripts are computed by floor(n/2)-1 and floor(n/2).

After the array has been sorted, to compute the median atomic weight for this problem first compute a new subscript variable k by:

k = floor(n/2)

where n is the number of elements in the array.

Next, compute the median value in the array by applying the following: If the number of elements modulus 2 (n%2) is not equal to 0, assign median the atomic weight at location k, else assign median the average of the two middle atomic weights at location k-1 and location k.