

# Data Structure

## Homework 1

**Deadline: 2021/10/25 Mon. 23:55**

### Task 1: (I/O: 35 points, coding style: 5 points)

Please write a program to represent the input sparse matrix by using triplet form as mentioned in class. Then, transpose the matrix and print out the result as shown below. It should be noted that the input data will be integers. Therefore, you only need to check the input matrix is consistent with the input size.(size for input array will not bigger than 100x100.)

| Input   | Output  |
|---|---|
| 5 5<br>15 0 0 22 0<br>0 0 3 0 0<br>0 0 0 -6 0<br>0 0 0 0 7<br>9 1 0 0 0 0   | Sparse matrix by triplet form:<br>5 5 6<br>0 0 15<br>0 3 22<br>1 2 3<br>2 3 -6<br>3 4 7<br>4 0 91<br>Transpose of the sparse matrix:<br>5 5 6<br>0 0 15<br>0 4 91<br>2 1 3<br>3 0 22<br>3 2 -6<br>4 3 7 |
| 6 6<br>15 0 0 22 0 -15 100<br>0 11 3 0 0 0<br>0 0 0 -6 0 0<br>0 0 0 0 0 0<br>9 1 0 0 0 0 0<br>0 0 28 0 0 0<br>1 0 0 0 0 0 | Input matrix has wrong size. Please input again.  |

**Task 2: (I/O: 35 points, coding style: 5 points)**

Please write a program to convert infix expressions to postfix expressions, and calculate the values by the postfix expressions. All of the input data will be fully parenthesized infix expressions, integers are between 0 and 9, and all of the operators include “+”, “-”, “\*”, “/”, “(”, and “)”. Round the results to the nearest integer in the end. The program must be implemented **by stack**, or you will get zero points. [In our rule,  $-0.5 \approx -1$ ]

Example:

| Input                       | Output   |
|-----------------------------|--|
| $((8*6)+(9/(7+2)))$         | $> 8\ 6\ *\ 9\ 7\ 2\ +\ /\ +$<br>$> 49$              |
| $((4+(((9+5)-4)*3))-(8/2))$ | $> 4\ 9\ 5\ +\ 4\ -\ 3\ *\ +\ 6\ 3\ /\ -$<br>$> 30$  |
| $((3-(8*7))-((6+3)*(8/2)))$ | $> 3\ 8\ 7\ *\ -\ 6\ 3\ +\ 8\ 2\ /\ *\ -$<br>$> -89$ |

Note: In addition to the note stated above, you should add the functions: “toPostfix()”, “calPostfix()”.

Put the files below in the folder (folder name: studentID), and compress this folder as **“studentID.zip”**.

1. Two source code files (filename: studentID\_1.c, studentID\_2.c)
2. One report with your coding environment (OS, IDE, ...), problems you encountered, and references. (filename: studentID.pdf) (10 points)

All the file names are correct, or you’ll get zero points. (10 points)

**You must hand in the assignment on time, or you will get zero points.**

**Warning:** We encourage you to discuss assignments with each other. However, you have the responsibility to finish the assignments individually. **Do not copy others’ assignment, or you will get zero points.**