

# Assignment 2

5 – Points

Assigned: 5<sup>th</sup> Feb 2024

Deadline: 12<sup>th</sup> Feb 2024

CS 2124: DATA STRUCTURES  
Spring 2024

# Assignment 2

(Assignment has 3 parts)

- Students should submit a zip file containing all .c and .h (and makefile if there is one) with the PDF file (1 PDF file containing output of all parts of the assignment just like assignment 1's PDF) on the Canvas.
- Assignment must be uploaded to Canvas by the due date to receive credit.
- Kindly **do not email** the assignment as graders can only access your assignment on Canvas.
- Late work will be penalized with point deduction. The only exception will be documented, extenuating circumstances and these must be communicated prior to the due date or submission of the work.
- **Note:** Canvas uses 11:59:00 p.m. as the cutoff time, and not 11:59:59 p.m.
- **Recommendation:** Don't submit work so close to the deadline that you have to worry about bandwidth issues, Canvas issues, or discrepancies in your system clock and the Canvas clock. These will not be considered extenuating circumstances

# Assignment 2 (Part – I)

## (2 – Points)

- C program to Check for balanced Parentheses in an Expression using **Stack**. The program will check if the expression has balanced Parentheses.

- Example:

- $\{2(3+2)\}(1+1)$ 
  - Balanced
- $\{2(3+2)\}[1+1]$ 
  - Balanced
- $\{2(3+2)\}(1+1$ 
  - Unbalanced
- $\{2(3+2)\}1+1$ 
  - Balanced
- $\{2(3+2)(1+1)\}$ 
  - Balanced
- $\{2(3+2)\{1(2+1)\}$ 
  - Unbalanced
- $\{2(3+2)\{1(2+1)\}\}$ 
  - Balanced

```
<Student name> - abc123 - Spring 2024
Enter Expression:(
It's Not Balanced (0_0)
```

```
<Student name> - abc123 - Spring 2024
Enter Expression:3({)()
It's Not Balanced (0_0)
```

```
<Student name> - abc123 - Spring 2024
Enter Expression:1+(0-8)*{[8]6-1}
It's Balanced (^_^)
```

```
<Student name> - abc123 - Spring 2024
Enter Expression:([)]
It's Not Balanced (0_0)
```

```
<Student name> - abc123 - Spring 2024
Enter Expression:52
It's Balanced (^_^)
```

- Number and sequence of opening parenthesis must be same as of closing parenthesis.

# Assignment 2 (Part – II)

(2 – Points)

- Write a program which will take input (Infix expression) from user and converts the expression to Postfix expression (using **stacks**).

```
Name, abc123 <Spring 2023>
Enter the Infix expression :
5+8/2
The Postfix expression:
 5 8 2 / +
End of Program
```

```
Name, abc123 <Spring 2023>
Enter the Infix expression :
5/*+2
The Postfix expression:
 5 / * 2 +
End of Program
```

```
Name, abc123 <Spring 2023>
Enter the Infix expression :
8/2*6
The Postfix expression:
 8 2 / 6 *
End of Program
```

```
Name, abc123 <Spring 2023>
Enter the Infix expression :
52
The Postfix expression:
 5 2
End of Program
```

# Assignment 2 (Part – III)

(1 – Points i.e. 0.5 point for iteration and 0.5 point for recursion program)

- **Binary search** can be performed using iteration and recursive approach.
- Try to implement a code which can tell you the time (CPU cycles) for binary search implemented using iteration and recursion.
- Example output (Your program can have any number of user inputs i.e. 5,8,10 etc. but must have same number of inputs for both iteration and recursion):

```
Student Last name, abc123
Binary Search (Iterative approach)
Enter 5 elements:
5
6
8
9
10
Enter Key elements to search:
5
Element found at index 1
Total time taken by CPU (End Time - Start Time)/clock per_sec: 0.000045
```

```
Student Last name, abc123
Binary Search (Recursive approach)
Enter 5 elements:
5
6
8
9
10
Enter Key elements to search:
8
Element found at index 3
Total time taken by CPU (End Time - Start Time)/clock per_sec: 0.000170
```

- The time is only to be computed for the process of **Binary search** (i.e. user input, display or any other process are not to be included in CPU cycle).
- Optional : User input can be in sorted format just like in example output