

# Rajalakshmi Engineering College

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## NeoColab\_REC\_CS23231\_DATA STRUCTURES

### REC\_DS using C\_Week 3\_CY

Attempt : 1  
Total Mark : 30  
Marks Obtained : 30

#### Section 1 : Coding

##### 1. Problem Statement

Raj is a software developer, and his team is building an application that processes user inputs in the form of strings containing brackets. One of the essential features of the application is to validate whether the input string meets specific criteria.

During testing, Raj inputs the string "([()]){}". The application correctly returns "Valid string" because the input satisfies the criteria: every opening bracket (, [, and { has a corresponding closing bracket ), ], and }, arranged in the correct order.

Next, Raj tests the application with the string "([])". This time, the application correctly returns "Invalid string" because the opening bracket [ is incorrectly closed by the bracket ), which violates the validation rules.

Finally, Raj enters the string "{[()]}" . The application correctly identifies it as a "Valid string" since all opening brackets are matched with the corresponding closing brackets in the correct order.

As a software developer, Raj's responsibility is to ensure that the application works reliably and produces accurate results for all input strings, following the validation rules. He accomplishes this by using a method for solving such problems.

### ***Input Format***

The input comprises a string representing a sequence of brackets that need to be validated.

### ***Output Format***

The output prints "Valid string" if the string is valid. Otherwise, it prints "Invalid string".

Refer to the sample output for formatting specifications.

### ***Sample Test Case***

Input: (([])){}

Output: Valid string

### ***Answer***

```
#include <stdio.h>
#include <string.h>

#define MAX 100
char stack[MAX];
int top = -1;
void push(char c) {
    if (top < MAX - 1) {
        stack[++top] = c;
    }
}
char pop() {
    if (top >= 0) {
```

```

        return stack[top--];
    }
    return '\0';
}
int isMatchingPair(char open, char close) {
    return (open == '(' && close == ')') ||
           (open == '[' && close == ']') ||
           (open == '{' && close == '}');
}
const char* isValidString(const char *str) {
    for (int i = 0; str[i] != '\0'; i++) {
        char current = str[i];

        if (current == '(' || current == '[' || current == '{') {
            push(current);
        } else if (current == ')' || current == ']' || current == '}') {
            char popped = pop();
            if (!isMatchingPair(popped, current)) {
                return "Invalid string";
            }
        } else {
            return "Invalid string";
        }
    }
    return (top == -1) ? "Valid string" : "Invalid string";
}
int main() {
    char input[MAX];
    scanf("%s", input);

    printf("%s\n", isValidString(input));
    return 0;
}

```

**Status :** Correct

**Marks :** 10/10

## 2. Problem Statement

In an educational setting, Professor Smith tasks Computer Science students with designing an algorithm to evaluate postfix expressions efficiently, fostering problem-solving skills and understanding of stack-

based computations.

The program prompts users to input a postfix expression, evaluates it, and displays the result, aiding students in honing their coding abilities.

### ***Input Format***

The input consists of the postfix mathematical expression.

The expression will contain real numbers and mathematical operators ( +, -, \*, / ), without any space.

### ***Output Format***

The output prints the result of evaluating the given postfix expression.

Refer to the sample output for formatting specifications.

### ***Sample Test Case***

Input: 82/

Output: 4

### ***Answer***

```
#include <stdio.h>
#include <stdlib.h>
#include <ctype.h>
#include <math.h>

#define MAX 100

double stack[MAX];
int top = -1;
void push(double value)
{
    if (top < MAX - 1)
    {
        stack[++top] = value;
    }
}
double pop()
```

```

{
    if (top >= 0)
    {
        return stack[top--];
    }
    return 0;
}
int isOperator(char c)
{
    return c == '+' || c == '-' || c == '*' || c == '/';
}
double evaluatePostfix(const char *expr)
{
    for (int i = 0; expr[i] != '\0'; i++)
    {
        char ch = expr[i];
        if (isdigit(ch))
        {
            push(ch - '0');
        } else if (isOperator(ch))
        {
            double b = pop();
            double a = pop();
            double result;

            switch (ch)
            {
                case '+': result = a + b; break;
                case '-': result = a - b; break;
                case '*': result = a * b; break;
                case '/': result = a / b; break;
            }
            push(result);
        }
    }
    return pop();
}

int main()
{
    char expression[MAX];
    scanf("%s", expression);

```

```
double result = evaluatePostfix(expression);
if (floor(result) == result)
{
    printf("%.0f\n", result);
} else
{
    printf("%.2f\n", result);
}

return 0;
}
```

**Status :** Correct

**Marks :** 10/10

### 3. Problem Statement

Rithi is building a simple text editor that allows users to type characters, undo their typing, and view the current text. She has implemented this text editor using an array-based stack data structure.

She has to develop a basic text editor with the following features:

Type a Character (Push): Users can type a character and add it to the text editor. Undo Typing (Pop): Users can undo their typing by removing the last character they entered from the editor. View Current Text (Display): Users can view the current text in the editor, which is the sequence of characters in the buffer. Exit: Users can exit the text editor application.

Write a program that simulates this text editor's undo feature using a character stack and implements the push, pop and display operations accordingly.

#### ***Input Format***

The input consists of integers corresponding to the operation that needs to be performed:

Choice 1: Push the character onto the stack. If the choice is 1, the following input is a space-separated character, representing the character to be pushed onto the stack.

Choice 2: Pop the character from the stack.

Choice 3: Display the characters in the stack.

Choice 4: Exit the program.

### ***Output Format***

The output displays messages according to the choice and the status of the stack:

1. If the choice is 1, print: "Typed character: <character>" where <character> is the character that was pushed to the stack.
2. If the choice is 2, print: "Undo: Removed character <character>" where <character> is the character that was removed from the stack.
3. If the choice is 2, and if the stack is empty without any characters, print "Text editor buffer is empty. Nothing to undo."
4. If the choice is 3, print: "Current text: <character1> <character2> ... <characterN>" where <character1>, <character2>, ... are the characters in the stack, starting from the last pushed character.
5. If the choice is 3, and there are no characters in the stack, print "Text editor buffer is empty."
6. If the choice is 4, exit the program.
7. If any other choice is entered, print "Invalid choice"

Refer to the sample output for formatting specifications.

### ***Sample Test Case***

Input: 1 H

1 A

3

4

Output: Typed character: H

Typed character: A

Current text: A H

### ***Answer***

```
#include <stdio.h>
```

```
#include <stdlib.h>
```

```

#define MAX 100

char stack[MAX];
int top = -1;
void push(char c)
{
    if (top < MAX - 1)
    {
        stack[++top] = c;
        printf("Typed character: %c\n", c);
    }
}
void pop()
{
    if (top >= 0)
    {
        char removed = stack[top--];
        printf("Undo: Removed character %c\n", removed);
    }
    else
    {
        printf("Text editor buffer is empty. Nothing to undo.\n");
    }
}
void display()
{
    if (top == -1)
    {
        printf("Text editor buffer is empty.\n");
    } else
    {
        printf("Current text: ");
        for (int i = top; i >= 0; i--)
        {
            printf("%c ", stack[i]);
        }
        printf("\n");
    }
}
int main()
{
    int choice;

```



```
char ch;

while (1)
{
    if (scanf("%d", &choice) != 1)
    {
        while (getchar() != '\n');
        printf("Invalid choice\n");
        continue;
    }

    switch (choice)
    {
        case 1:
            scanf(" %c", &ch);
            push(ch);
            break;
        case 2:
            pop();
            break;
        case 3:
            display();
            break;
        case 4:
            return 0;
        default:
            printf("Invalid choice\n");
            break;
    }
}
}
```

**Status :** Correct

**Marks :** 10/10