

Rajalakshmi Engineering College

Name: tharunika R
Email: 241801296@rajalakshmi.edu.in
Roll no: 241801296
Phone: 6369646218
Branch: REC
Department: I AI & DS FD
Batch: 2028
Degree: B.E - AI & DS

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NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_Week 3_COD_Question 4

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

You are a software developer tasked with building a module for a scientific calculator application. The primary function of this module is to convert infix mathematical expressions, which are easier for users to read and write, into postfix notation (also known as Reverse Polish Notation). Postfix notation is more straightforward for the application to evaluate because it removes the need for parentheses and operator precedence rules.

The scientific calculator needs to handle various mathematical expressions with different operators and ensure the conversion is correct. Your task is to implement this infix-to-postfix conversion algorithm using a stack-based approach.

Example

Input:

a+b

Output:

ab+

Explanation:

The postfix representation of (a+b) is ab+.

Input Format

The input is a string, representing the infix expression.

Output Format

The output displays the postfix representation of the given infix expression.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: a+(b*e)

Output: abe*+

Answer

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

```
struct Stack {
    int top;
    unsigned capacity;
    char* array;
};
```

```
struct Stack* createStack(unsigned capacity) {
    struct Stack* stack = (struct Stack*)malloc(sizeof(struct Stack));
    if (!stack)
```

```

        return NULL;

    stack->top = -1;
    stack->capacity = capacity;
    stack->array = (char*)malloc(stack->capacity * sizeof(char));

    return stack;
}

```

```

int isEmpty(struct Stack* stack) {
    return stack->top == -1;
}

```

```

char peek(struct Stack* stack) {
    return stack->array[stack->top];
}

```

```

char pop(struct Stack* stack) {
    if (!isEmpty(stack))
        return stack->array[stack->top--];
    return '$';
}

```

```

void push(struct Stack* stack, char op) {
    stack->array[++stack->top] = op;
}

```

You are using Python

Define a function to return precedence of operators

```

def precedence(op):
    if op == '^':
        return 3
    elif op == '*' or op == '/':
        return 2
    elif op == '+' or op == '-':
        return 1
    else:
        return 0

```

Define a function to perform infix to postfix conversion

```

def infix_to_postfix(expression):
    stack = [] # Stack to hold operators
    output = [] # Output list to hold the postfix expression

```

```

# Loop through each character in the input expression
for char in expression:
    if char.isalnum(): # If the character is an operand (a-z, A-Z, 0-9)
        output.append(char)

    elif char == '(': # If the character is a left parenthesis
        stack.append(char)

    elif char == ')': # If the character is a right parenthesis
        # Pop operators from the stack until '(' is found
        while stack and stack[-1] != '(':
            output.append(stack.pop())
        stack.pop() # Pop '(' from the stack

    else: # If the character is an operator (+, -, *, /, ^)
        while (stack and precedence(stack[-1]) >= precedence(char)):
            output.append(stack.pop())
        stack.append(char)

# Pop any remaining operators from the stack
while stack:
    output.append(stack.pop())

return ".join(output)

# Example usage
if __name__ == "__main__":
    expression = input() # Take input from the user
    print(infix_to_postfix(expression)) # Print the postfix expression

int main() {
    char exp[100];
    scanf("%s", exp);

    infixToPostfix(exp);
    return 0;
}

```

Status : Correct

Marks : 10/10