Institute of Computer Technology

B. Tech. Computer Science and Engineering

Sub: DS

Course Code: 2CSE302

Practical – 4

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Sem - 3

Branch: CS

Class: A

Batch: 32

Problem Definition-1: Stack infix to postfix

Parishram is a 7th semester, who is studying at GUNI-ICT. During his "Compiler Design" course, his course faculty explained him that compiler work differently while it does evaluation of an expression due to below reasons:

Infix expressions are readable and solvable by humans because of easily distinguishable order of operators, but compiler doesn't have integrated order of operators. To avoid this traversing, Infix expressions are converted to postfix expression before evaluation.

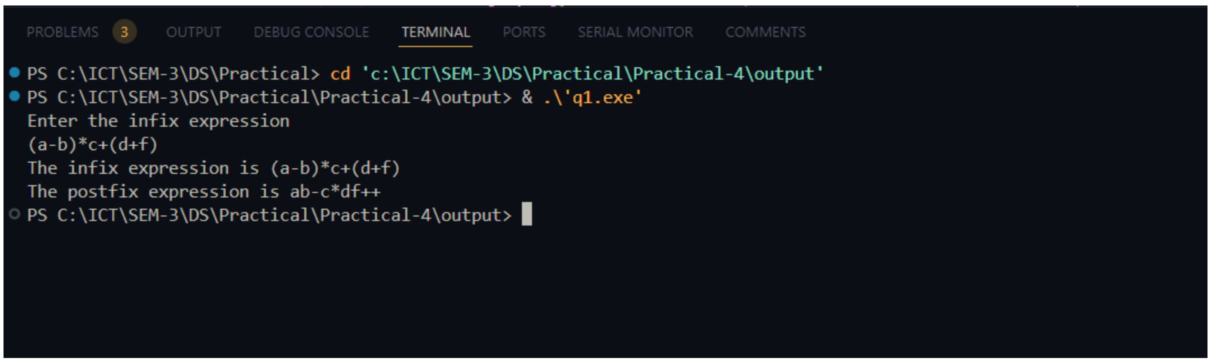
Make a program to convert infix expression into postfix using stack.

Code:

```
#include <stdio.h>
#define max 100

int top = -1, a[max]; // Stack to hold operators with `top` initialized to -1
(indicating an empty stack)

// Function to push an operator onto the stack
void push(char x)
{
    a[++top] = x; // Increment `top` and then store `x` at that position
}
```

```c
// Function to pop an operator from the stack
char pop()
{
    if (top == -1)
        return -1; // Return -1 if the stack is empty
    else
        return a[top--]; // Return the top element and then decrement `top`
}

// Function to define precedence of operators
int prcd(char c)
{
    if (c == '(')
        return 0; // '(' has the lowest precedence
    else if (c == '+' || c == '-')
        return 1; // '+' and '-' have the same precedence
    else if (c == '*' || c == '/')
        return 2; // '*' and '/' have the same precedence, which is higher
than '+' and '-'
}

// Function to convert infix expression to postfix
int infixtopostfix(char infix[max], char postfix[max])
{
    char temp, x;
    int i = 0, j = 0;

    while (infix[i] != '\0') // Loop through the entire infix expression
    {
        temp = infix[i];

        if (isalnum(temp)) // If the character is an operand (number/letter)
        {
            postfix[j++] = temp; // Add it directly to the postfix expression
        }
        else if (temp == '(')
        {
            push(temp); // Push '(' onto the stack
        }
        else if (temp == ')')
        {
            while ((x = pop()) != '(') // Pop from the stack until '(' is
found
            {
                postfix[j++] = x; // Add the popped operators to postfix
            }
        }
        else // If the character is an operator
        {
            while (prcd(a[top]) >= prcd(temp)) // Check precedence and pop operators from stack if needed
            {
                postfix[j++] = pop(); // Add the popped operator to postfix
            }
            push(temp); // Push the current operator onto the stack
        }
        i++;
    }

    while (top != -1) // Pop any remaining operators in the stack
    {
        postfix[j++] = pop();
    }

    postfix[j] = '\0'; // Null-terminate the postfix expression
}

int main()
{
    char infix[max], postfix[max];

    printf("Enter the infix expression\n");
    gets(infix); // Take infix expression input

    printf("The infix expression is %s\n", infix);

    infixtopostfix(infix, postfix); // Convert infix to postfix

    printf("The postfix expression is %s\n", postfix); // Print the resulting postfix expression

    return 0;
}
```

Output:



```
PS C:\ICT\SEM-3\DS\Practical> cd 'c:\ICT\SEM-3\DS\Practical\Practical-4\output'
PS C:\ICT\SEM-3\DS\Practical\Practical-4\output> & .\'q1.exe'
Enter the infix expression
(a-b)*c+(d+f)
The infix expression is (a-b)*c+(d+f)
The postfix expression is ab-c*df++
PS C:\ICT\SEM-3\DS\Practical\Practical-4\output>
```