Rajalakshmi Engineering College

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NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_Week 3_CY

Attempt : 2
Total Mark : 30
Marks Obtained : 30

Section 1 : Coding

1. Problem Statement

You are required to implement a stack data structure using a singly linked list that follows the Last In, First Out (LIFO) principle.

The stack should support the following operations: push, pop, display, and peek.

Input Format

The input consists of four space-separated integers N, representing the elements to be pushed onto the stack.

Output Format

The first line of output displays all four elements in a single line separated by a space.

The second line of output is left blank to indicate the pop operation without displaying anything.

The third line of output displays the space separated stack elements in the same line after the pop operation.

The fourth line of output displays the top element of the stack using the peek operation.

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 11 22 33 44
Output: 44 33 22 11

33 22 11
33

Answer

```
// You are using GCC
#include <stdio.h>
#include <stdlib.h>

struct Node {
    int data;
    struct Node* next;
};

struct Node* top = NULL;

void push(int val) {
    struct Node* newNode = (struct Node*)malloc(sizeof(struct Node));
    newNode->data = val;
    newNode->next = top;
    top = newNode;
}

void pop() {
    if (top != NULL) {
```

```
        struct Node* temp = top;
        top = top->next;
        free(temp);
    }
}

void display() {
    struct Node* temp = top;
    while (temp != NULL) {
        printf("%d ", temp->data);
        temp = temp->next;
    }
}

void peek() {
    if (top != NULL) {
        printf("%d", top->data);
    }
}

int main() {
    int a, b, c, d;
    scanf("%d %d %d %d", &a, &b, &c, &d);

    push(a);
    push(b);
    push(c);
    push(d);

    display();
    printf("\n");

    pop();

    display();
    printf("\n");

    peek();
    return 0;
}
```

Status : Correct *Marks : 10/10*

2. Problem Statement

Siri is a computer science student who loves solving mathematical problems. She recently learned about infix and postfix expressions and was fascinated by how they can be used to evaluate mathematical expressions.

She decided to write a program to convert an infix expression with operators to its postfix form. Help Siri in writing the program.

Input Format

The input consists of a single line containing an infix expression.

Output Format

The output prints a single line containing the postfix expression equivalent to the given infix expression.

Refer to the sample output for the formatting specifications.

Sample Test Case

Input: (2 + 3) * 4

Output: 23+4*

Answer

```
// You are using GCC
#include <stdio.h>
#include <stdlib.h>
#include <string.h>
#include <ctype.h>

#define MAX 100

char stack[MAX];
int top = -1;

void push(char ch) {
    stack[++top] = ch;
```

```
}

char pop() {
    return stack[top--];
}

char peek() {
    return stack[top];
}

int precedence(char op) {
    if (op == '+' || op == '-') return 1;
    if (op == '*' || op == '/') return 2;
    return 0;
}

int isOperator(char ch) {
    return ch == '+' || ch == '-' || ch == '*' || ch == '/';
}

int main() {
    char infix[100], postfix[100];
    fgets(infix, sizeof(infix), stdin);
    int i = 0, j = 0;
    while (infix[i]) {
        if (isdigit(infix[i])) {
            postfix[j++] = infix[i];
        } else if (infix[i] == '(') {
            push(infix[i]);
        } else if (infix[i] == ')') {
            while (top != -1 && peek() != '(') {
                postfix[j++] = pop();
            }
            pop();
        } else if (isOperator(infix[i])) {
            while (top != -1 && precedence(peek()) >= precedence(infix[i])) {
                postfix[j++] = pop();
            }
            push(infix[i]);
        }
        i++;
    }
```

```
    while (top != -1) {
        postfix[j++] = pop();
    }
    postfix[j] = '\0';
    printf("%s", postfix);
    return 0;
}
```

Status : Correct **Marks : 10/10**

3. 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

```c
// You are using GCC
#include <stdio.h>
#include <stdlib.h>
#include <ctype.h>
#include <math.h>

#define MAX 100

float stack[MAX];
int top = -1;

void push(float num) {
    stack[++top] = num;
}

float pop() {
    return stack[top--];
}

int main() {
    char expr[100];
    fgets(expr, sizeof(expr), stdin);
    int i = 0;
    while (expr[i] && expr[i] != '\n') {
        if (isdigit(expr[i])) {
            push(expr[i] - '0');
        } else {
            float b = pop();
            float a = pop();
            switch (expr[i]) {
                case '+': push(a + b); break;
                case '-': push(a - b); break;
                case '*': push(a * b); break;
                case '/': push(a / b); break;
            }
        }
        i++;
    }
    printf("%.0f", pop());
    return 0;
}
```

Status : Correct *Marks : 10/10*