Rajalakshmi Engineering College

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NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_Week 3_COD_Question 1

Attempt : 1
Total Mark : 10
Marks Obtained : 10

Section 1 : Coding

1. Problem Statement

In a coding competition, you are assigned a task to create a program that simulates a stack using a linked list.

The program should feature a menu-driven interface for pushing an integer to stack, popping, and displaying stack elements, with robust error handling for stack underflow situations. This challenge tests your data structure skills.

Input Format

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

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

Choice 2: Pop the integer from the stack.

Choice 3: Display the elements in the stack.

Choice 4: Exit the program.

Output Format

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

If the choice is 1, push the given integer to the stack and display the following: "Pushed element: " followed by the value pushed.

If the choice is 2, pop the integer from the stack and display the following: "Popped element: " followed by the value popped.

If the choice is 2, and if the stack is empty without any elements, print "Stack is empty. Cannot pop."

If the choice is 3, print the elements in the stack: "Stack elements (top to bottom): " followed by the space-separated values.

If the choice is 3, and there are no elements in the stack, print "Stack is empty".

If the choice is 4, exit the program and display the following: "Exiting program".

If any other choice is entered, print "Invalid choice".

Refer to the sample input and output for the exact format.

Sample Test Case

```
Input: 1 3
1 4
3
2
3
4
Output: Pushed element: 3
Pushed element: 4
Stack elements (top to bottom): 4 3
Popped element: 4
Stack elements (top to bottom): 3
Exiting program
```

Answer

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

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

struct Node* top = NULL;

// You are using GCC
// Function to push an element onto the stack
void push(int value) {
   // Create a new node
   struct Node* newNode = (struct Node*)malloc(sizeof(struct Node));
   if (newNode == NULL) {
      printf("Memory allocation failed. Cannot push element.\n");
      return;
   }
```

```
    // Assign data to the new node
    newNode->data = value;

    // Link the new node to the current top
    newNode->next = top;

    // Update the top of the stack
    top = newNode;

    // Print the push confirmation message
    printf("Pushed element: %d\n", value);
}

// Function to pop an element from the stack
void pop() {
    // Check if the stack is empty (underflow condition)
    if (top == NULL) {
        printf("Stack is Empty. Cannot pop.\n");
        return;
    }

    // Store the top node to free it later
    struct Node* temp = top;

    // Get the data before popping
    int poppedValue = temp->data;

    // Update the top to the next node
    top = top->next;

    // Free the memory of the popped node
    free(temp);

    // Print the pop confirmation message
    printf("Popped element: %d\n", poppedValue);
}

// Function to display the elements of the stack
void displayStack() {
    // Check if the stack is empty
    if (top == NULL) {
        printf("Stack is empty\n");
        return;
    }

    // Traverse the stack from top to bottom and print elements
    struct Node* current = top;
    printf("Stack elements (top to bottom): ");
    while (current != NULL) {
        printf("%d ", current->data);
        current = current->next;
    }
   printf("\n");
}

int main() {
    int choice, value;
    do {
        scanf("%d", &choice);
        switch (choice) {
            case 1:
                scanf("%d", &value);
                push(value);
                break;
            case 2:
                pop();
                break;
            case 3:
                displayStack();
                break;
            case 4:
                printf("Exiting program\n");
                return 0;
            default:
                printf("Invalid choice\n");
        }
    } while (choice != 4);

    return 0;
}
```

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