DAY3 LAB

1. Write a C program to implement Stack operations using array such as PUSH, POP and PEEK.

#include <stdio.h>

#include <stdlib.h>

#define MAX\_SIZE 100

int stack[MAX\_SIZE];

int top = -1;

void push(int value) {

if (top == MAX\_SIZE - 1) {

printf("Stack Overflow\n");

return;

}

stack[++top] = value;

printf("%d pushed to stack\n", value);

}

void pop() {

if (top == -1) {

printf("Stack Underflow\n");

return;

}

printf("%d popped from stack\n", stack[top--]);

}

int peek() {

if (top == -1) {

printf("Stack is empty\n");

return -1;

}

return stack[top];

}

int main() {

push(10);

push(20);

push(30);

printf("Top element: %d\n", peek());

pop();

pop();

pop();

pop();

return 0;

}

OUTPUT:

10 pushed to stack

20 pushed to stack

30 pushed to stack

Top element: 30

30 popped from stack

20 popped from stack

10 popped from stack

Stack Underflow

1. Write a C program to implement Stack operations using linked list such as PUSH, POP and PEEK.

#include <stdio.h>

#include <stdlib.h>

struct Node {

int data;

struct Node\* next;

};

struct Node\* top = NULL;

void push(int value) {

struct Node\* newNode = (struct Node\*)malloc(sizeof(struct Node));

newNode->data = value;

newNode->next = top;

top = newNode;

printf("%d pushed to the stack.\n", value);

}

void pop() {

if (top == NULL) {

printf("Stack is empty.\n");

return;

}

struct Node\* temp = top;

top = top->next;

printf("%d popped from the stack.\n", temp->data);

free(temp);

}

int peek() {

if (top == NULL) {

printf("Stack is empty.\n");

return -1;

}

return top->data;

}

int main() {

push(10);

push(20);

push(30);

printf("Top element: %d\n", peek());

pop();

pop();

pop();

printf("Top element: %d\n", peek());

return 0;

}

OUTPUT:

10 pushed to the stack.

20 pushed to the stack.

30 pushed to the stack.

Top element: 30

30 popped from the stack.

20 popped from the stack.

10 popped from the stack.

Stack is empty.

Top element: -1

1. Write a C program for Sorting elements using a stack (e.g., sorting a stack using recursion).

#include <stdio.h>

#include <stdlib.h>

#include <limits.h>

struct Stack {

int data;

struct Stack\* next;

};

struct Stack\* createStack() {

return NULL;

}

int isEmpty(struct Stack\* root) {

return !root;

}

void push(struct Stack\*\* root, int data) {

struct Stack\* newNode = (struct Stack\*)malloc(sizeof(struct Stack));

newNode->data = data;

newNode->next = \*root;

\*root = newNode;

}

int pop(struct Stack\*\* root) {

if (isEmpty(\*root))

return INT\_MIN;

struct Stack\* temp = \*root;

\*root = (\*root)->next;

int popped = temp->data;

free(temp);

return popped;

}

void sortedInsert(struct Stack\*\* root, int data) {

if (isEmpty(\*root) || data > (\*root)->data) {

push(root, data);

return;

}

int temp = pop(root);

sortedInsert(root, data);

push(root, temp);

}

void sortStack(struct Stack\*\* root) {

if (!isEmpty(\*root)) {

int temp = pop(root);

sortStack(root);

sortedInsert(root, temp);

}

}

void printStack(struct Stack\* root) {

while (root != NULL) {

printf("%d ", root->data);

root = root->next;

}

}

int main() {

struct Stack\* root = createStack();

push(&root, 30);

push(&root, -5);

push(&root, 18);

push(&root, 14);

push(&root, -3);

printf("Stack elements before sorting: ");

printStack(root);

sortStack(&root);

printf("\nStack elements after sorting: ");

printStack(root);

return 0;

}

OUTPUT:

Stack elements before sorting: -3 14 18 -5 30

Stack elements after sorting: 30 18 14 -3 -5

1. Write a C Program to Simulate Recursive Function Calls Using a Stack

#include <stdio.h>

#define MAX\_SIZE 100

int stack[MAX\_SIZE];

int top = -1;

void push(int item) {

if (top >= MAX\_SIZE - 1) {

printf("Stack Overflow\n");

return;

}

stack[++top] = item;

}

int pop() {

if (top < 0) {

printf("Stack Underflow\n");

return -1;

}

return stack[top--];

}

int isEmpty() {

return top == -1;

}

void simulateRecursive(int n) {

push(n);

while (!isEmpty()) {

int current = pop();

if (current > 0) {

printf("%d ", current);

push(current - 1);

push(current - 1);

}

}

}

int main() {

int n = 3;

simulateRecursive(n);

return 0;

}

OUTPUT:

3 2 1 1 2 1 1

1. Write a C program to Implement undo and redo functionality using two stacks.

#include <stdio.h>

#include <stdlib.h>

#define MAX\_SIZE 100

int undoStack[MAX\_SIZE];

int redoStack[MAX\_SIZE];

int undoTop = -1;

int redoTop = -1;

void pushUndo(int item) {

if (undoTop == MAX\_SIZE - 1) {

printf("Undo Stack Overflow\n");

} else {

undoStack[++undoTop] = item;

}

}

void pushRedo(int item) {

if (redoTop == MAX\_SIZE - 1) {

printf("Redo Stack Overflow\n");

} else {

redoStack[++redoTop] = item;

}

}

int popUndo() {

if (undoTop == -1) {

printf("Undo Stack Underflow\n");

return -1;

} else {

return undoStack[undoTop--];

}

}

int popRedo() {

if (redoTop == -1) {

printf("Redo Stack Underflow\n");

return -1;

} else {

return redoStack[redoTop--];

}

}

void undo() {

int item = popUndo();

if (item != -1) {

pushRedo(item);

printf("Undo: %d\n", item);

}

}

void redo() {

int item = popRedo();

if (item != -1) {

pushUndo(item);

printf("Redo: %d\n", item);

}

}

int main() {

pushUndo(1);

pushUndo(2);

pushUndo(3);

undo();

undo();

redo();

redo();

return 0;

}

OUTPUT:

Undo: 3

Undo: 2

Redo: 2

Redo: 3

1. Write a C program to Check if a string is a palindrome using a stack.

#include <stdio.h>

#include <string.h>

#include <stdlib.h>

#define MAX 100

struct Stack {

int top;

char array[MAX];

};

struct Stack\* createStack() {

struct Stack\* stack = (struct Stack\*)malloc(sizeof(struct Stack));

stack->top = -1;

return stack;

}

int isEmpty(struct Stack\* stack) {

return stack->top == -1;

}

void push(struct Stack\* stack, char item) {

stack->array[++stack->top] = item;

}

char pop(struct Stack\* stack) {

if (!isEmpty(stack))

return stack->array[stack->top--];

return '$';

}

int isPalindrome(char str[]) {

int length = strlen(str);

struct Stack\* stack = createStack();

int i, mid = length / 2;

for (i = 0; i < mid; i++) {

push(stack, str[i]);

}

if (length % 2 != 0) {

i++;

}

while (str[i] != '\0') {

char ele = pop(stack);

if (ele != str[i])

return 0;

i++;

}

return 1;

}

int main() {

char str[MAX];

printf("Enter a string: ");

scanf("%s", str);

if (isPalindrome(str))

printf("%s is a palindrome.\n");

else

printf("%s is not a palindrome.\n");

return 0;

}

OUTPUT:

Enter a string: divya123

Segmentation fault