B.M.S. COLLEGE OF ENGINEERING

Bull Temple Road, Basavanagudi, Bengaluru-590019, Karnataka.

LAB REPORT
on

Data Structures using C Lab

(23CS3PCDST)

Submitted by

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in partial fulfillment for the award of the degree of
BACHELOR OF ENGINEERING
in
COMPUTER SCIENCE AND ENGINEERING

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Bull Temple Road, Bangalore 560019
(Affiliated To Visvesvaraya Technological University, Belgaum)
Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled "Data Structures using C Lab (23CS3PCDST) carried out by **Sinchana Hemanth (1BM23CS330),** who is a bonafide student of **B.M.S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum. The Lab report has been approved as it satisfies the academic requirements in respect of Data Structures using C Lab (23CS3PCDST) work prescribed for the said degree.

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Github Link: https://github.com/SinchanaHemanth/1BM23CS330-SinchanaHemanth.git

Program 1

Write a program to simulate the working of stack using an array with the following:

a) Push

b) Pop

c) Display

The program should print appropriate messages for stack overflow, stack underflow.

• Implement stack and ops using arrays

```
#include <stdlib.h>
#include <stdio.h>
int top, size;

void init()
{
    printf("Enter size of stack\n");
    scanf("%d", &size);
    top = -1;
}

bool isEmpty()
{
   return top==-1;
}

bool isFull()
{
   return top==size-1;
}

void push (int arr[], int x)
{
   if (!isFull())
   {
      top++;
      arr [top] = x;
      printf("Pushed %d to stack \n", x);
   }
   else
```

```
        {
          printf("Overflow\n");
        }
}
int pop(int arr[])
{
   if(isEmpty())
   {
      printf("Underflow\n");
      return 0;
   }
   else
   {
      int temp = arr[top];
      top--;
      return temp;
   }
}
int peek(int arr[])
{
   if(isEmpty())
   {
      printf("Stack is empty\n");
      return 0;
   }
   else
   {
      return arr[top];
   }
}
int main()
{
```

```
init();
int arr[size];

for (int i=0; i<size; i++)
{
    int element;
    printf("Enter element %d: ", i+1);
    scanf("%d", &element);
    push(arr, element);
}

for (int i=0; i<size; i++)
{
    printf("Popped : %d\n", pop(arr));
}
return 0;
}
```

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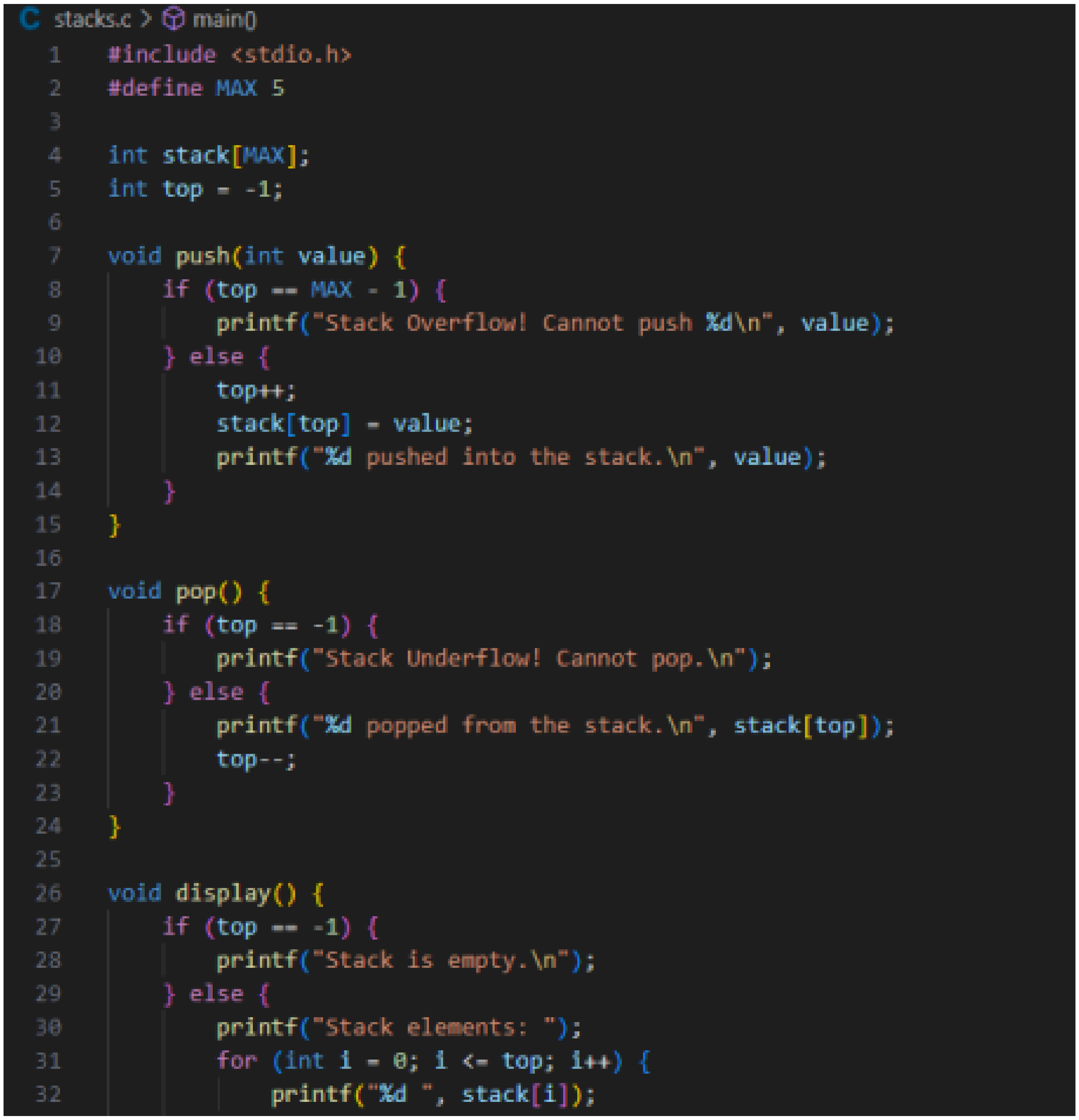
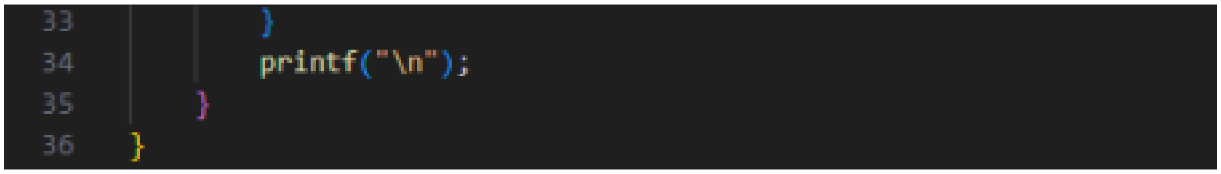
Output

```
Enter size of stack :
5
Enter element 1: 6
Pushed 6 to stack
Enter element 2: 7
Pushed 7 to stack
Enter element 3: 8
Pushed 8 to stack
Enter element 4: 9
Pushed 9 to stack
Enter element 5: 10
Pushed 10 to stack
Popped : 10
Popped : 9
Popped : 8
Popped : 7        Popped : 6
```

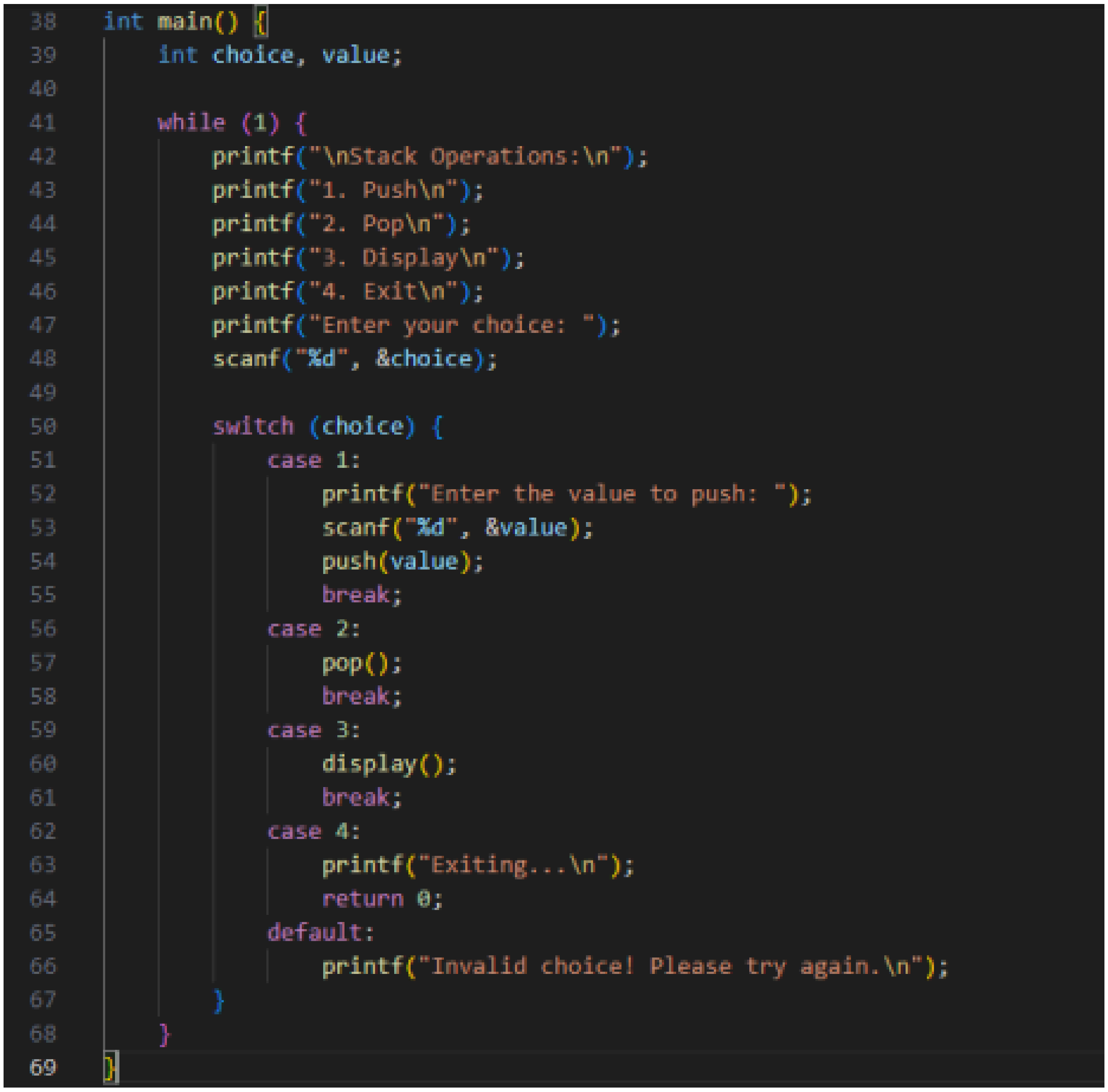


stacks.c > main()

```c
#include <stdio.h>
#define MAX 5

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

void push(int value) {
    if (top == MAX - 1) {
        printf("Stack Overflow! Cannot push %d\n", value);
    } else {
        top++;
        stack[top] = value;
        printf("%d pushed into the stack.\n", value);
    }
}

void pop() {
    if (top == -1) {
        printf("Stack Underflow! Cannot pop.\n");
    } else {
        printf("%d popped from the stack.\n", stack[top]);
        top--;
    }
}

void display() {
    if (top == -1) {
        printf("Stack is empty.\n");
    } else {
        printf("Stack elements: ");
        for (int i = 0; i <= top; i++) {
            printf("%d ", stack[i]);
```

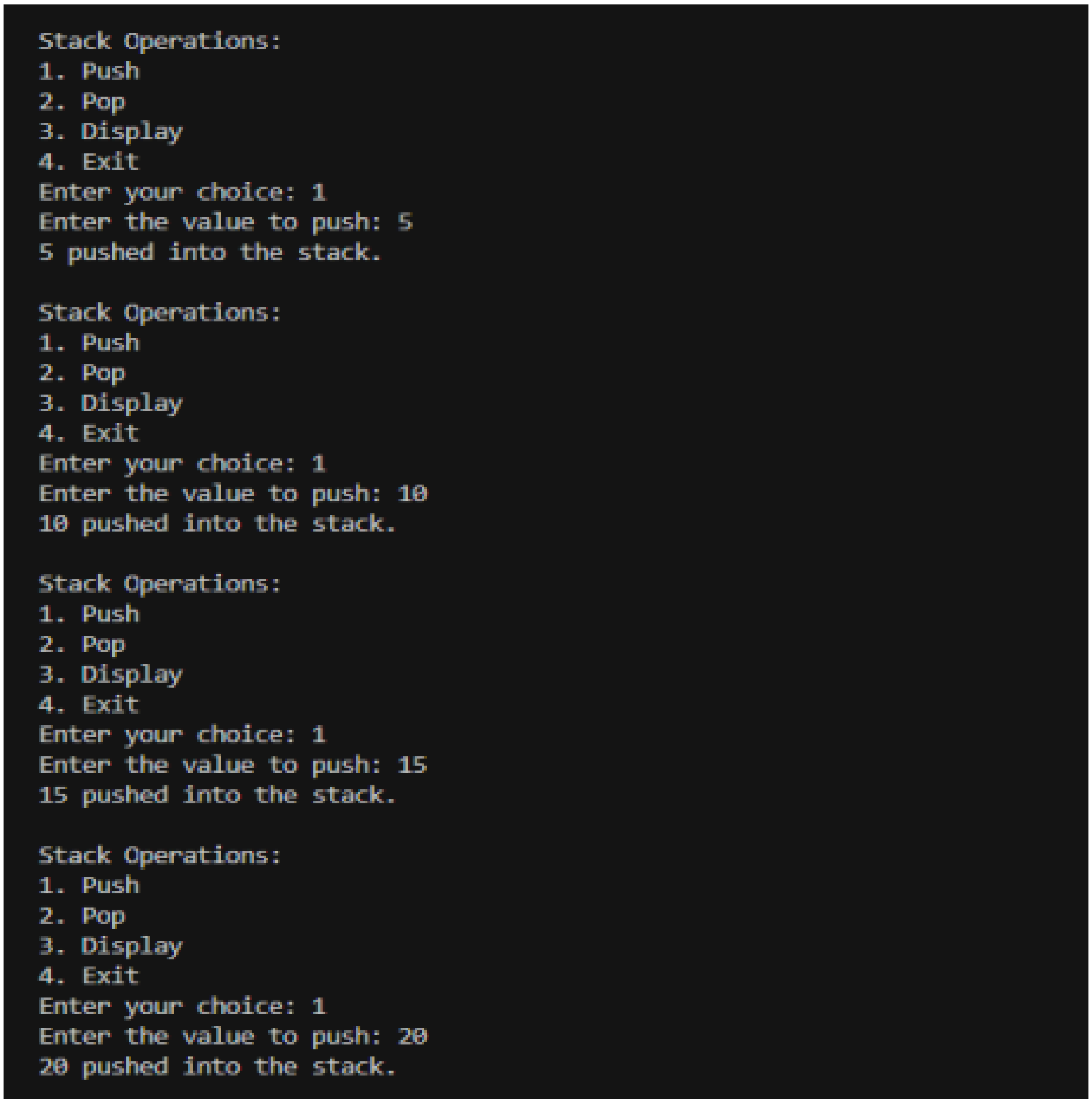


```c
        }
        printf("\n");
    }
}
```

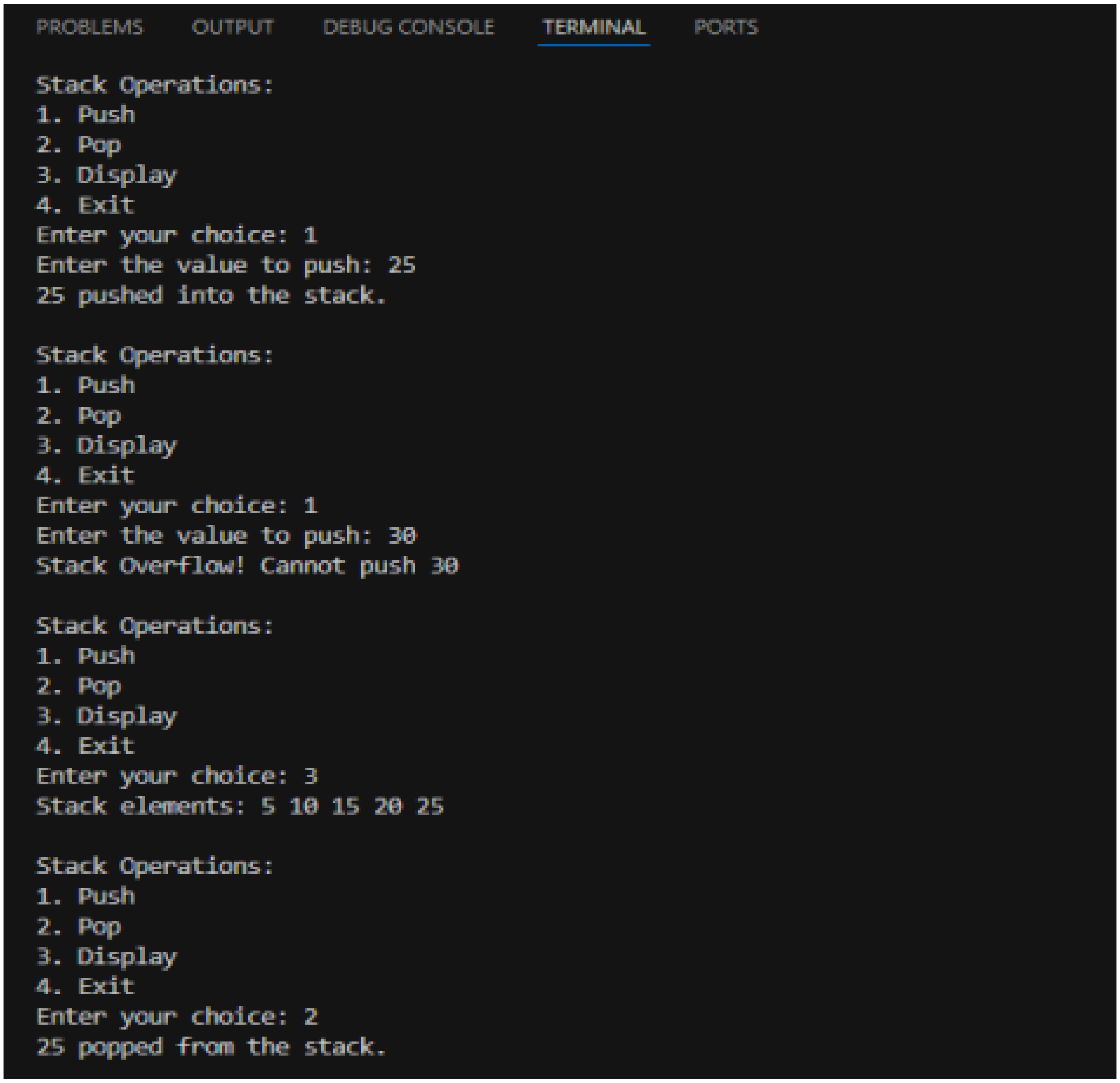


```c
int main() {
    int choice, value;

    while (1) {
        printf("\nStack Operations:\n");
        printf("1. Push\n");
        printf("2. Pop\n");
        printf("3. Display\n");
        printf("4. Exit\n");
        printf("Enter your choice: ");
        scanf("%d", &choice);

        switch (choice) {
            case 1:
                printf("Enter the value to push: ");
                scanf("%d", &value);
                push(value);
                break;
            case 2:
                pop();
                break;
            case 3:
                display();
                break;
            case 4:
                printf("Exiting...\n");
                return 0;
            default:
                printf("Invalid choice! Please try again.\n");
        }
    }
}
```

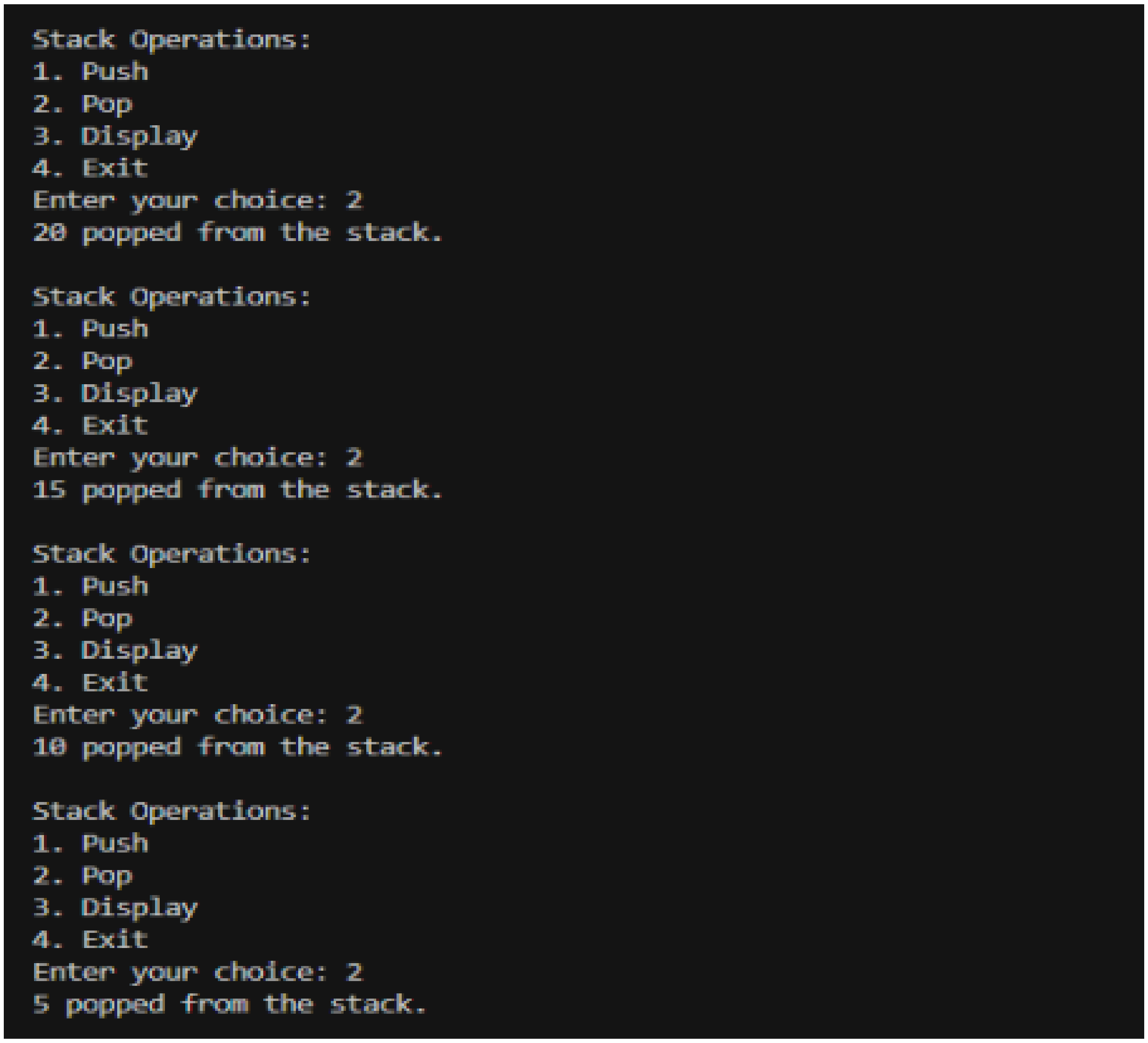
OUTPUT:



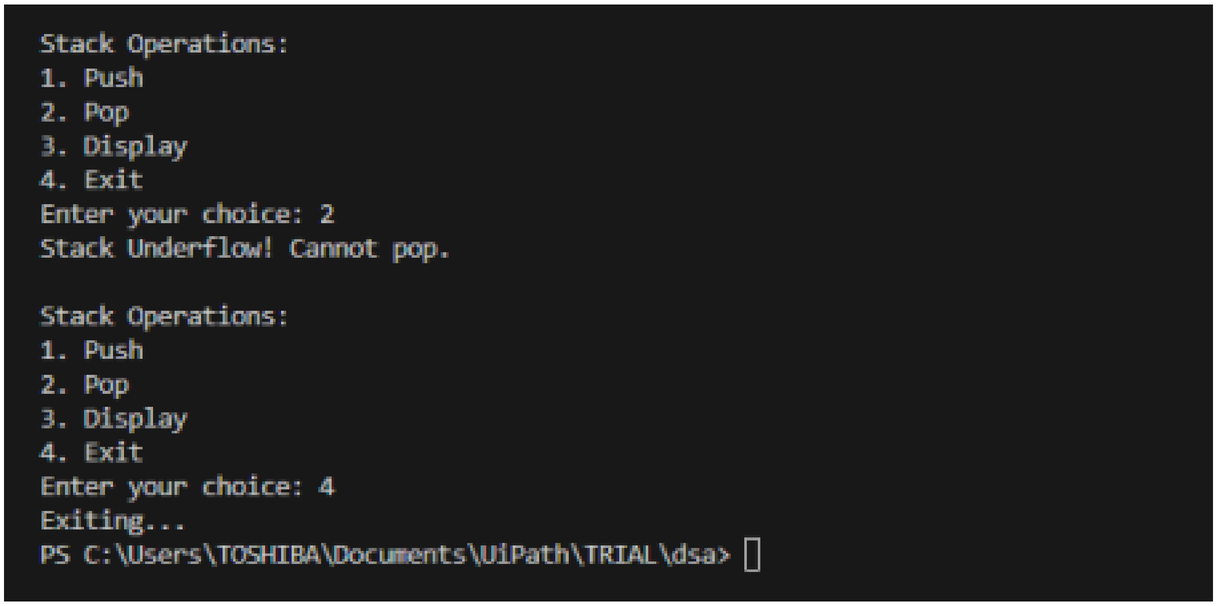
```
Stack Operations:
1. Push
2. Pop
3. Display
4. Exit
Enter your choice: 1
Enter the value to push: 5
5 pushed into the stack.

Stack Operations:
1. Push
2. Pop
3. Display
4. Exit
Enter your choice: 1
Enter the value to push: 10
10 pushed into the stack.

Stack Operations:
1. Push
2. Pop
3. Display
4. Exit
Enter your choice: 1
Enter the value to push: 15
15 pushed into the stack.

Stack Operations:
1. Push
2. Pop
3. Display
4. Exit
Enter your choice: 1
Enter the value to push: 20
20 pushed into the stack.
```



```
Stack Operations:
1. Push
2. Pop
3. Display
4. Exit
Enter your choice: 1
Enter the value to push: 25
25 pushed into the stack.

Stack Operations:
1. Push
2. Pop
3. Display
4. Exit
Enter your choice: 1
Enter the value to push: 30
Stack Overflow! Cannot push 30

Stack Operations:
1. Push
2. Pop
3. Display
4. Exit
Enter your choice: 3
Stack elements: 5 10 15 20 25

Stack Operations:
1. Push
2. Pop
3. Display
4. Exit
Enter your choice: 2
25 popped from the stack.
```



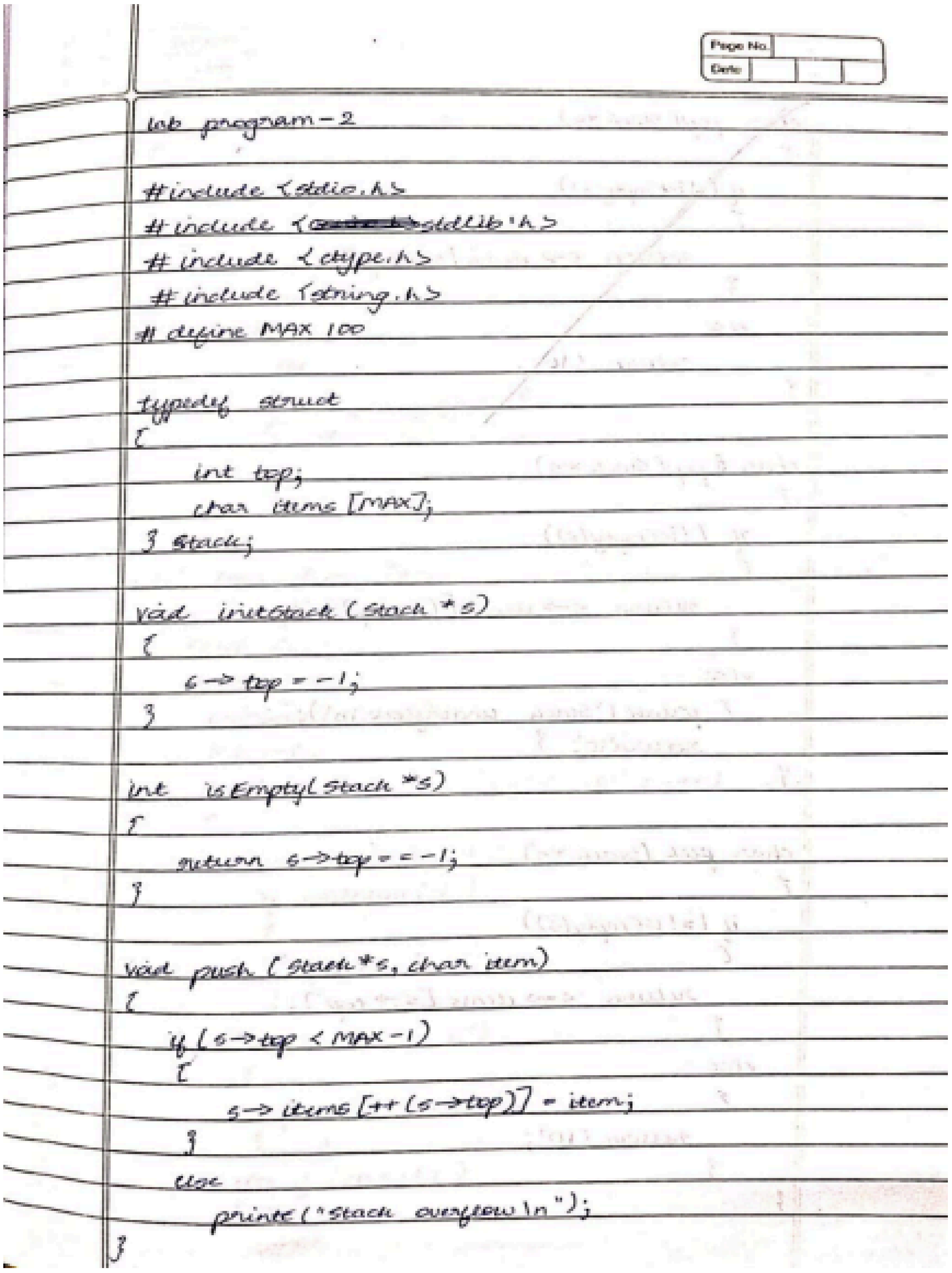
```
Stack Operations:
1. Push
2. Pop
3. Display
4. Exit
Enter your choice: 2
20 popped from the stack.

Stack Operations:
1. Push
2. Pop
3. Display
4. Exit
Enter your choice: 2
15 popped from the stack.

Stack Operations:
1. Push
2. Pop
3. Display
4. Exit
Enter your choice: 2
10 popped from the stack.

Stack Operations:
1. Push
2. Pop
3. Display
4. Exit
Enter your choice: 2
5 popped from the stack.
```



```
Stack Operations:
1. Push
2. Pop
3. Display
4. Exit
Enter your choice: 2
Stack Underflow! Cannot pop.

Stack Operations:
1. Push
2. Pop
3. Display
4. Exit
Enter your choice: 4
Exiting...
PS C:\Users\TOSHIBA\Documents\UiPath\TRIAL\dsa>
```

Program 2

Write a program to convert given valid parenthesized infix arithmetic expressions to postfix expressions. The expression consists of single character operands and the binary operators are + (plus), - (minus), * (multiply), / (divide) and ^ (exponential).



```
lab program-2

#include <stdio.h>
#include <stdlib.h>
#include <ctype.h>
#include <string.h>
#define MAX 100

typedef struct
{
    int top;
    char items [MAX];
} stack;

void initStack (stack *s)
{
    s->top = -1;
}

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

void push (stack *s, char item)
{
    if (s->top < MAX -1)
    {
        s-> items [++ (s->top)] = item;
    }
    else
        printf ("stack overflow\n");
}
```

```
char pop(Stack *s)
{
    if (!isEmpty(s))
    {
        return s->items[(s->top)--];
    }
    else
     { printf("Stack underflow \n");
        return '\0'; }
}

char peek (Stack *s)
{
    if (!isEmpty(s))
     {
        return s->items[s->top];
     }
   else
     {
        return '\0';
     }
}
```

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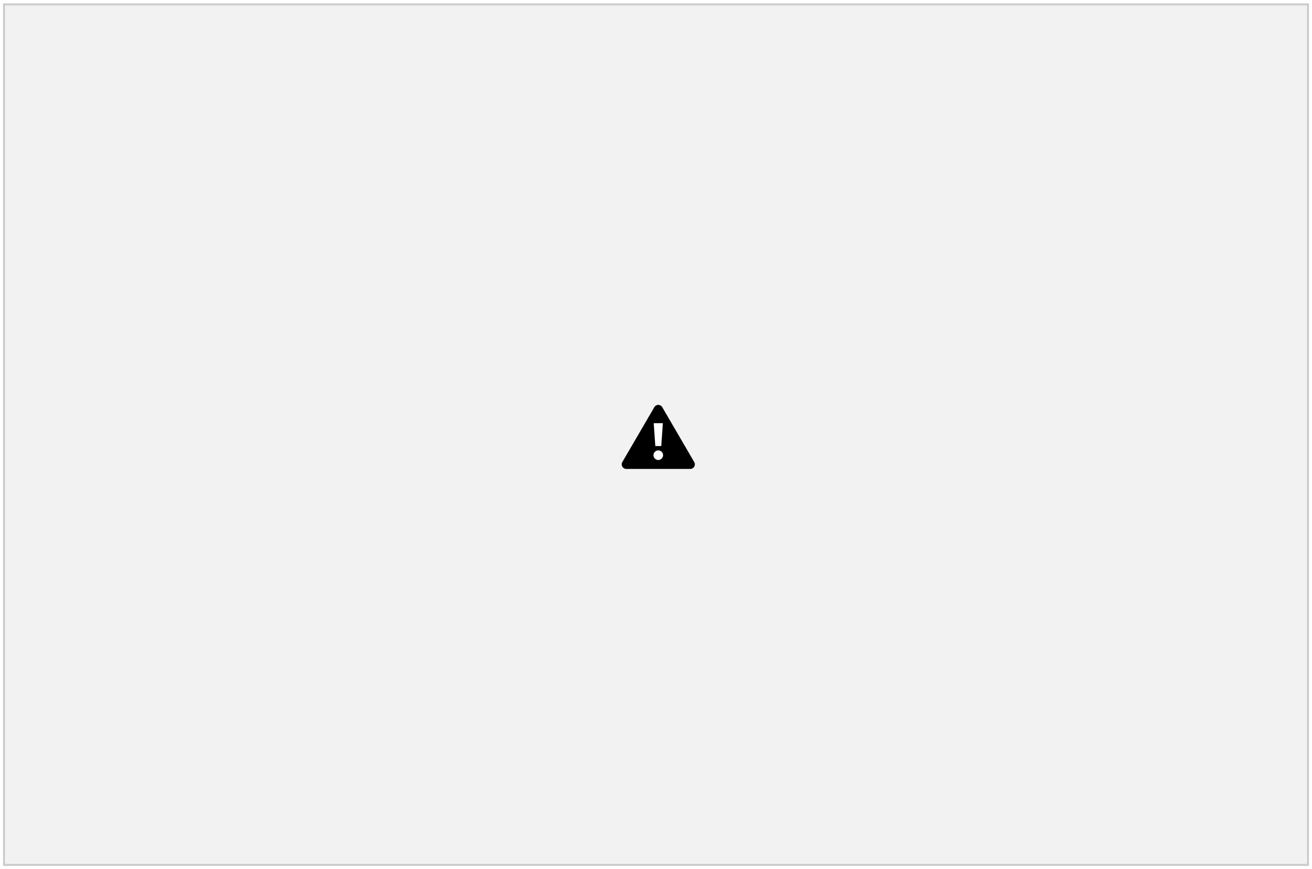
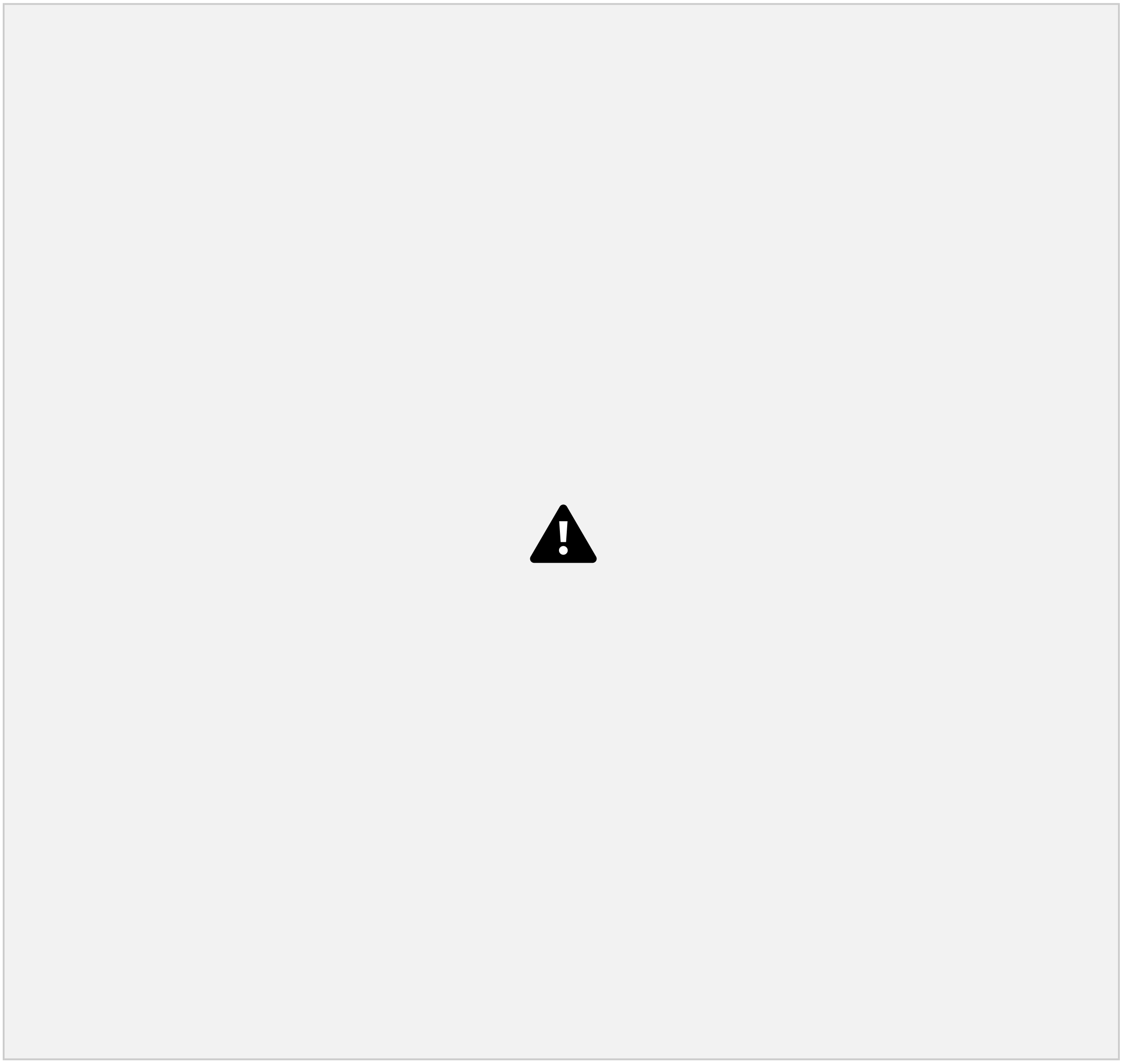


OUTPUT:

<u>Program 3</u>

(a) Write a C program to simulate the working of a queue of integers using an array. Provide the following operations: insert, delete,display. The program should print appropriate messages for queue empty and queue overflow conditions.

OUTPUT:



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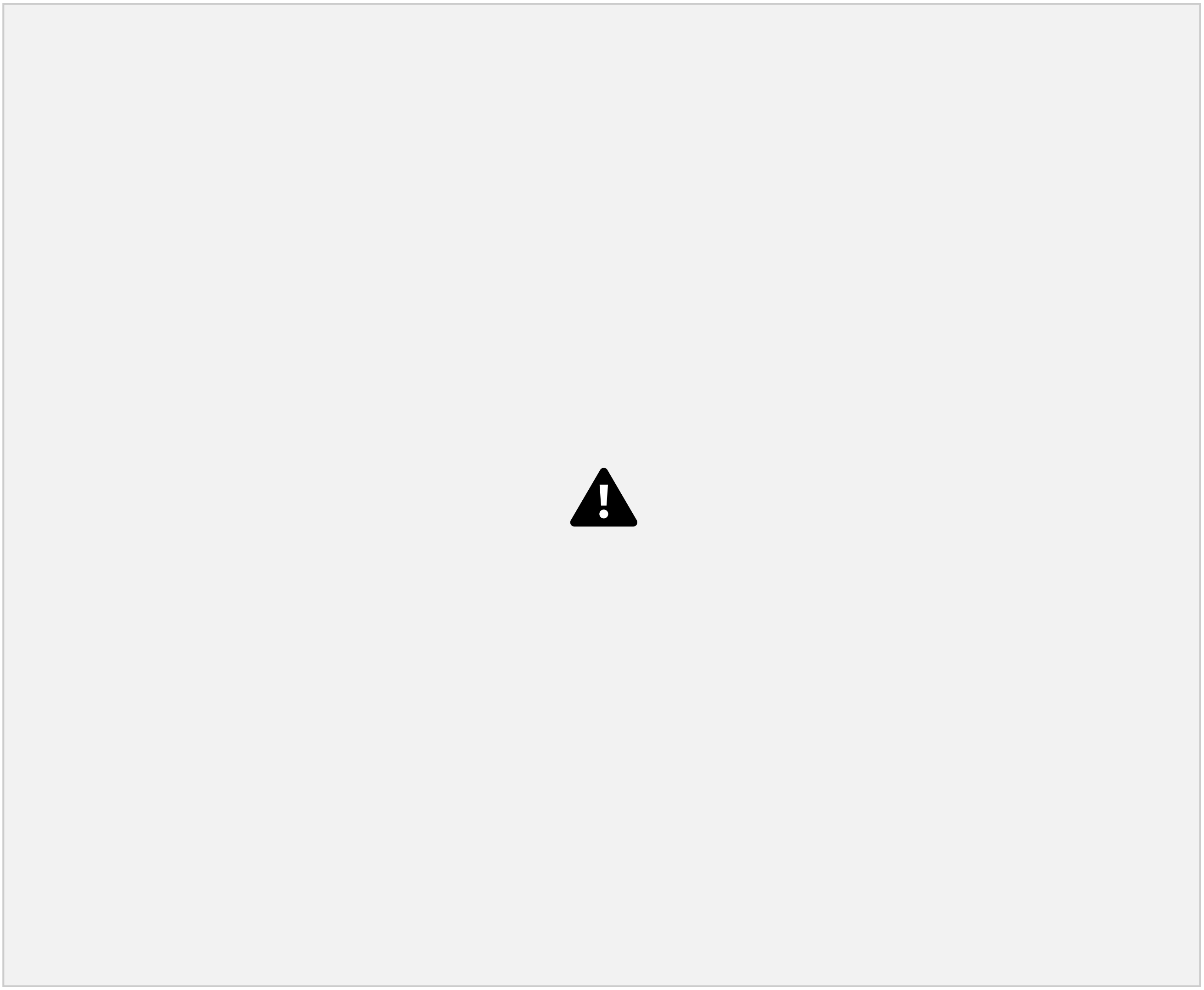

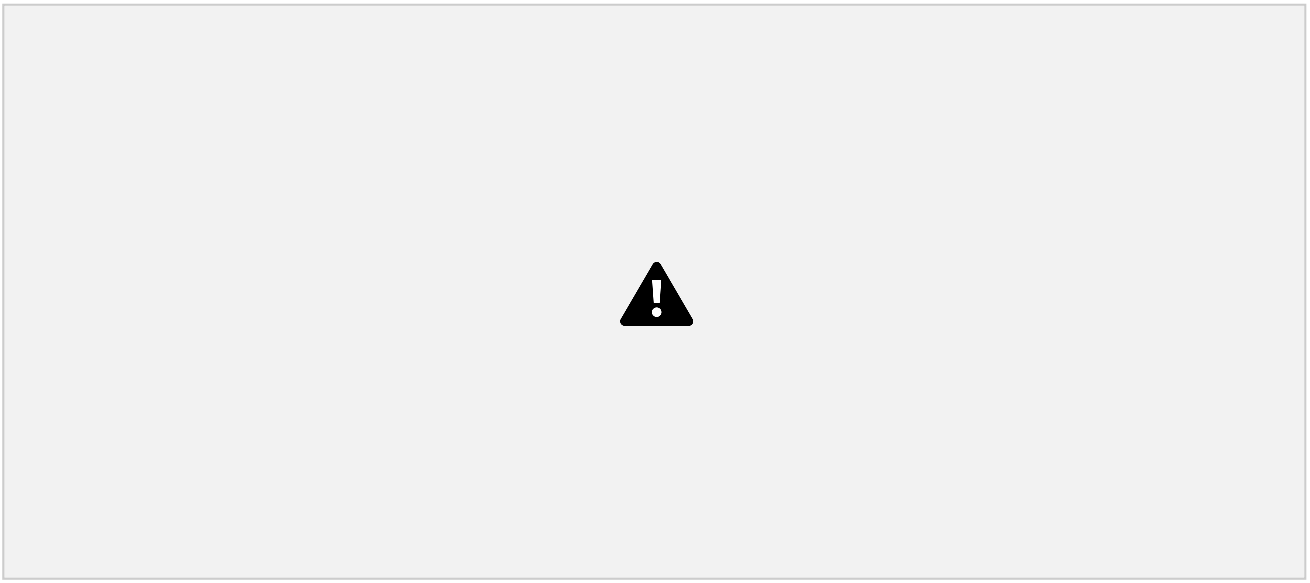

Program 3

(b) Write a program in c to simulate the working of a circular queue of integers using an array.

Provide the following operations: insert, delete & display. The program should print appropriate messages for queue empty and queue overflow conditions**.**

OUTPUT:

41

Program 4

WAP in c to Implement Singly Linked List with following operations:

(a) Create a linked list
(b) Insertion of a node at first position and at end of list
(c) Display the contents of the linked list.

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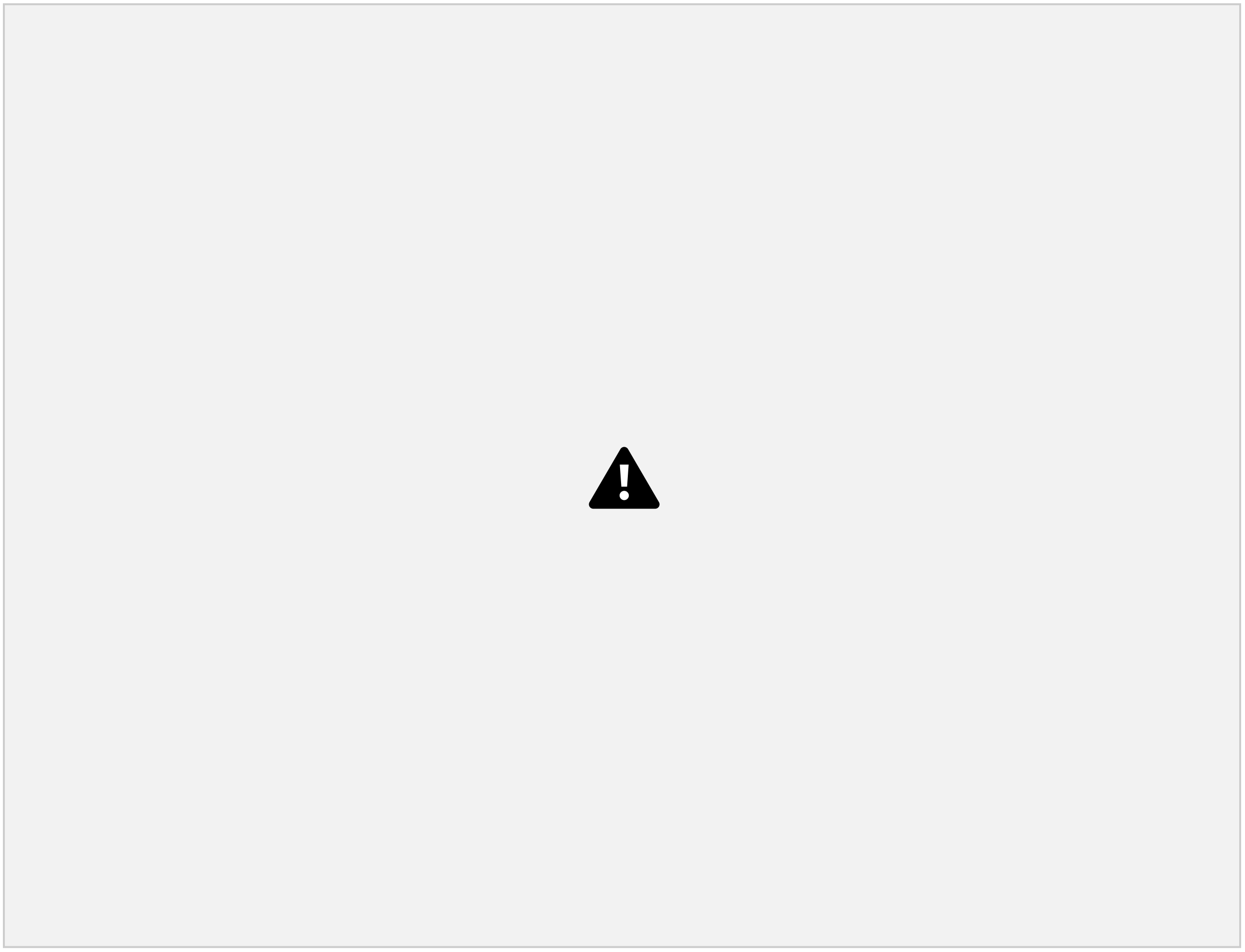

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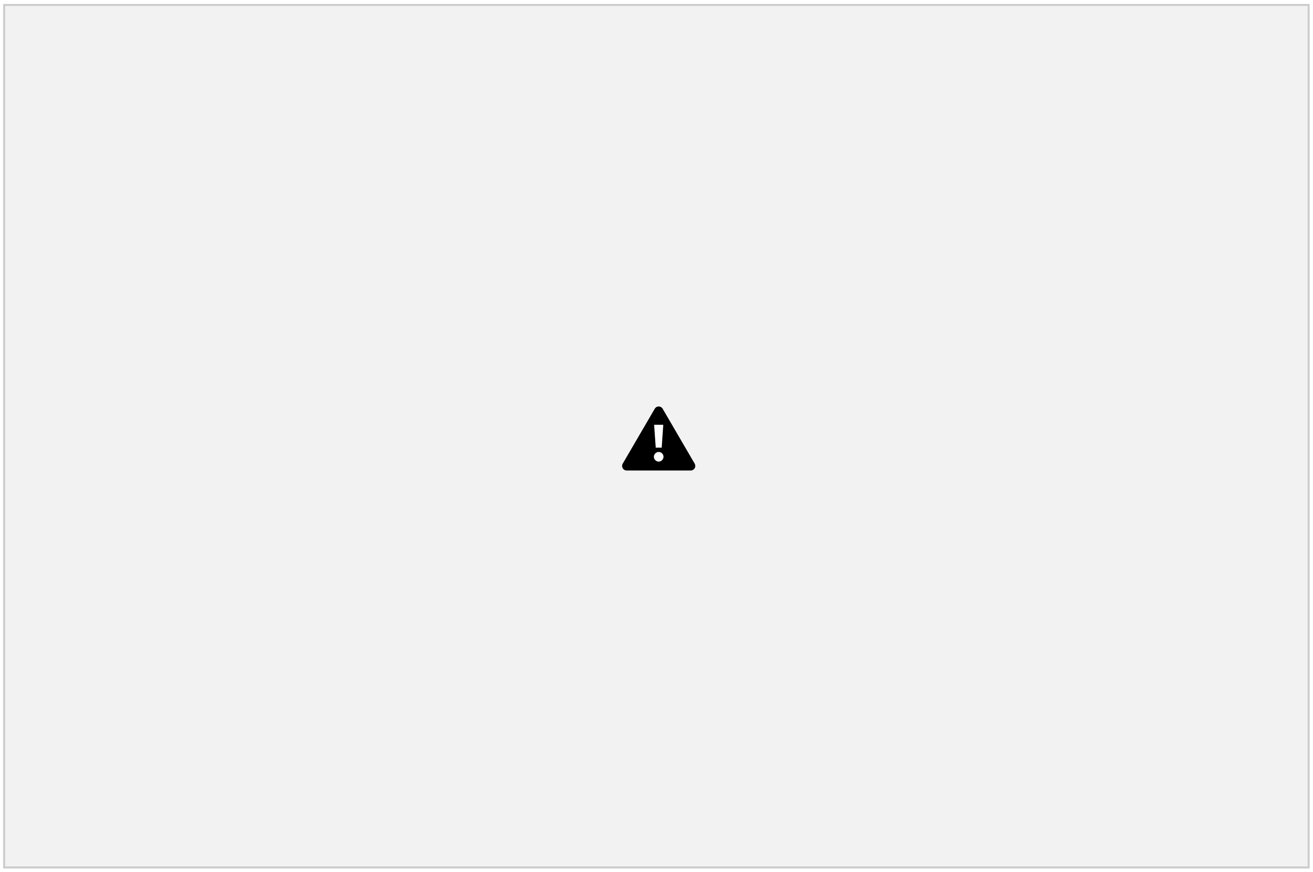
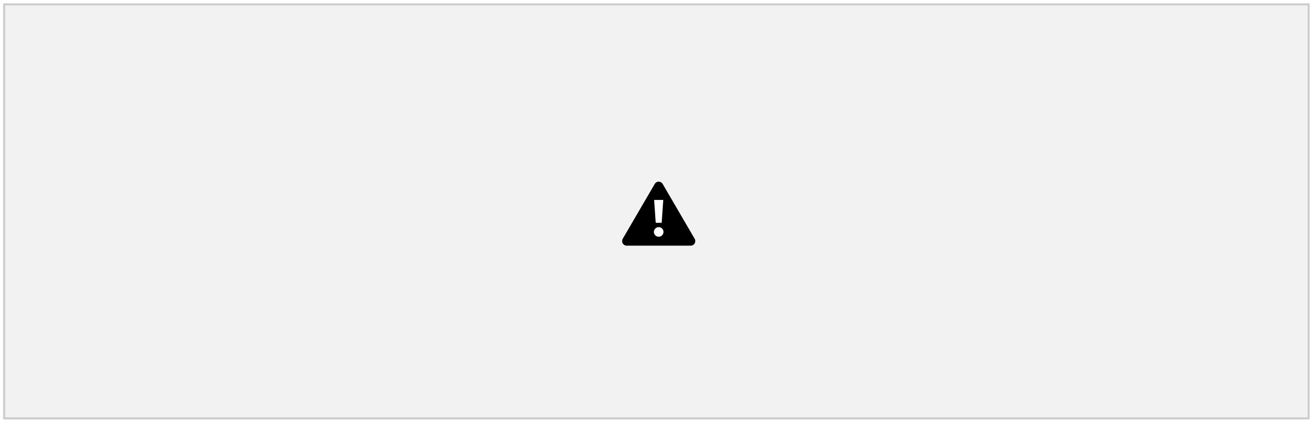
OUTPUT:



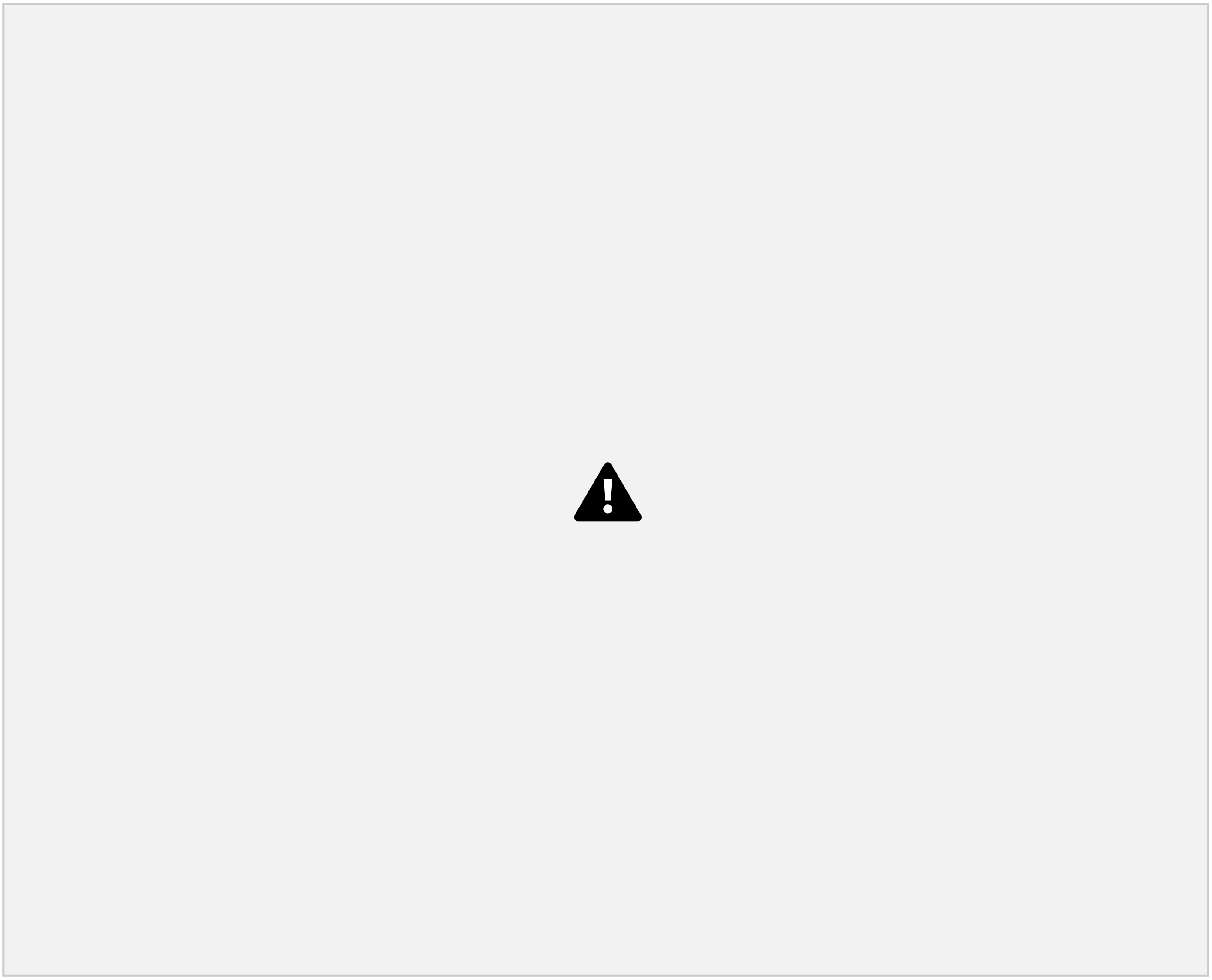


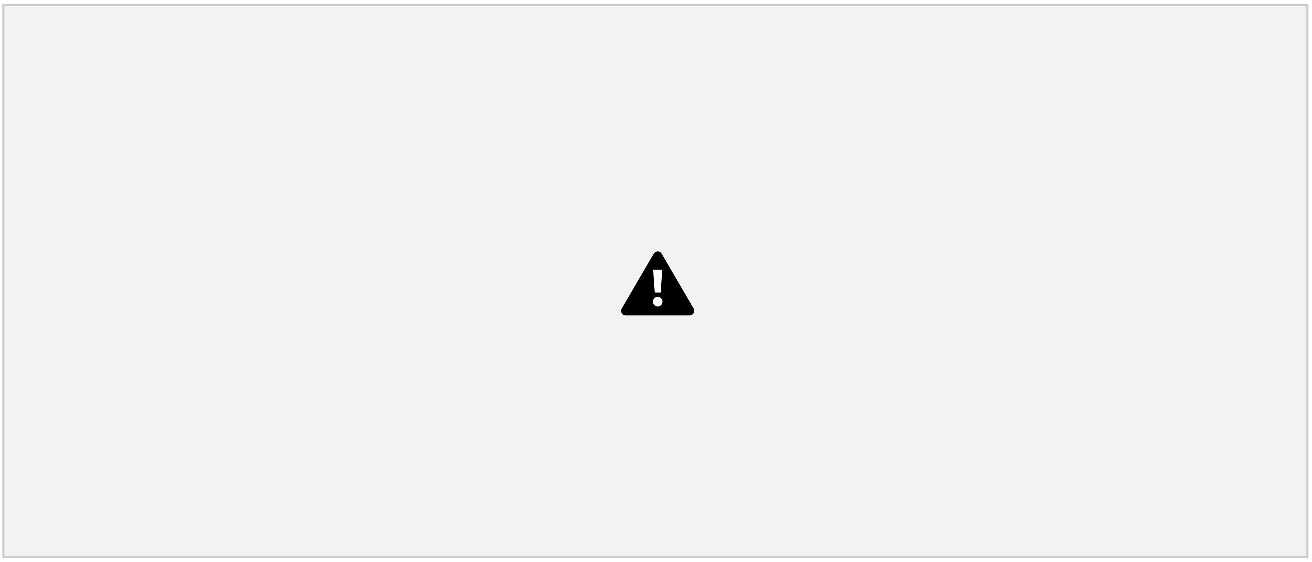
Program 5

WAP in C to Implement Singly Linked List with following operations:

(a) Create a linked list.
(b) Deletion of the first element, specified element and last element in the list.
(c) Display the contents of the linked list.

OUTPUT:





OUTPUT:

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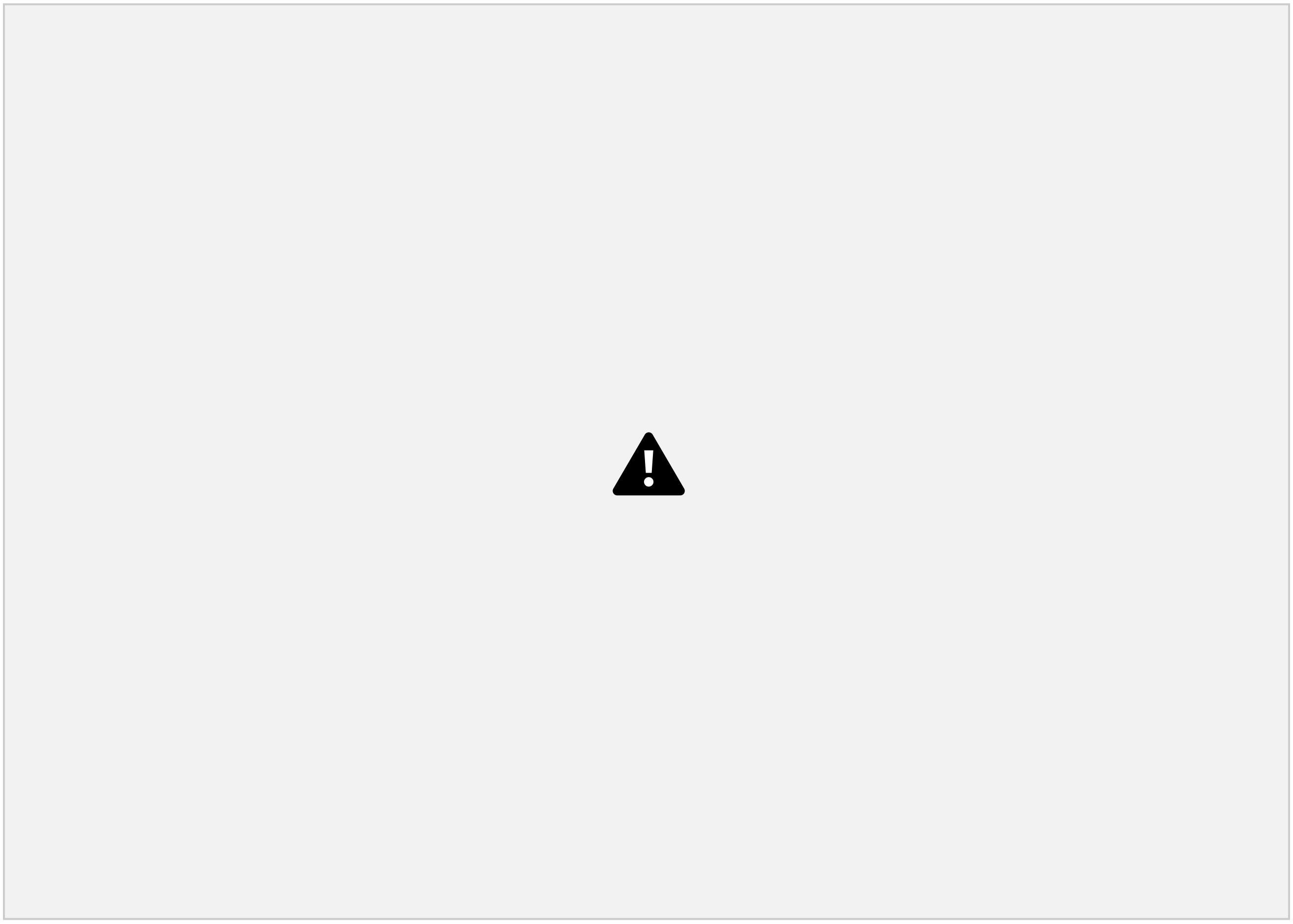
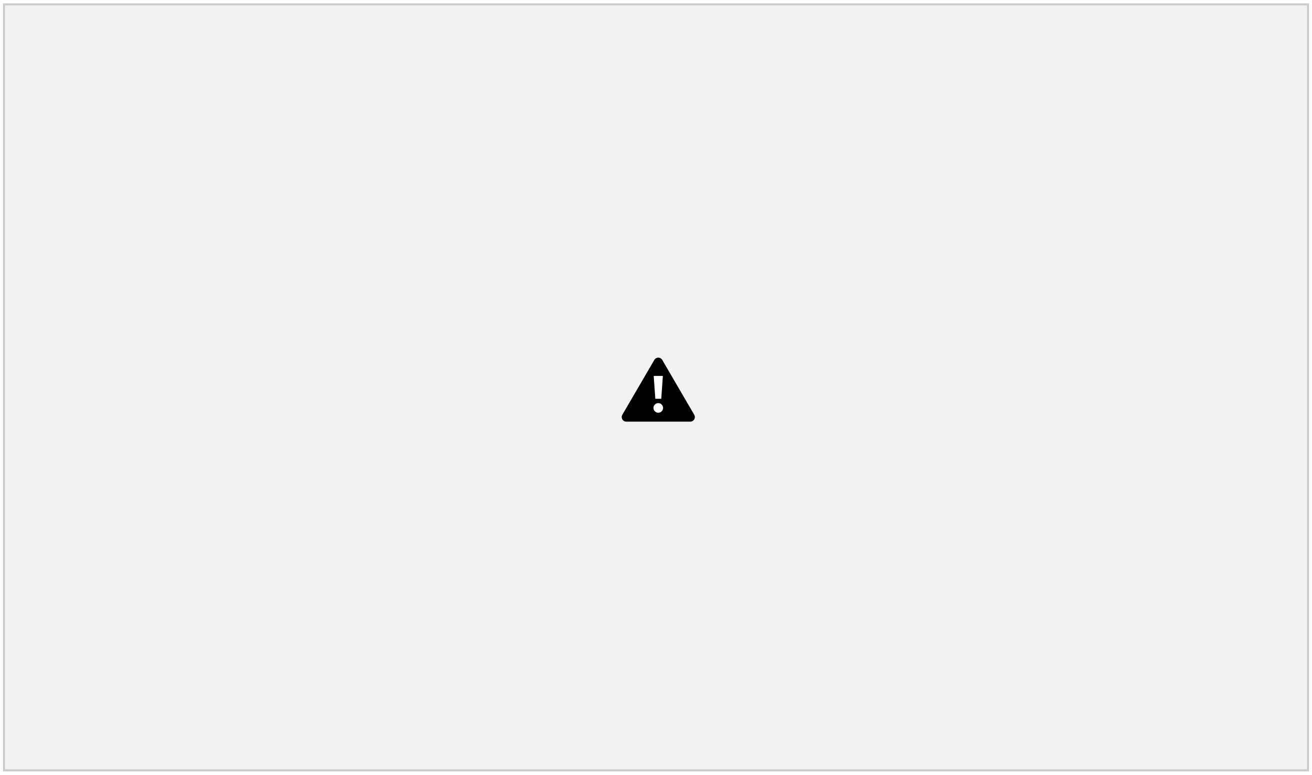
Program 6

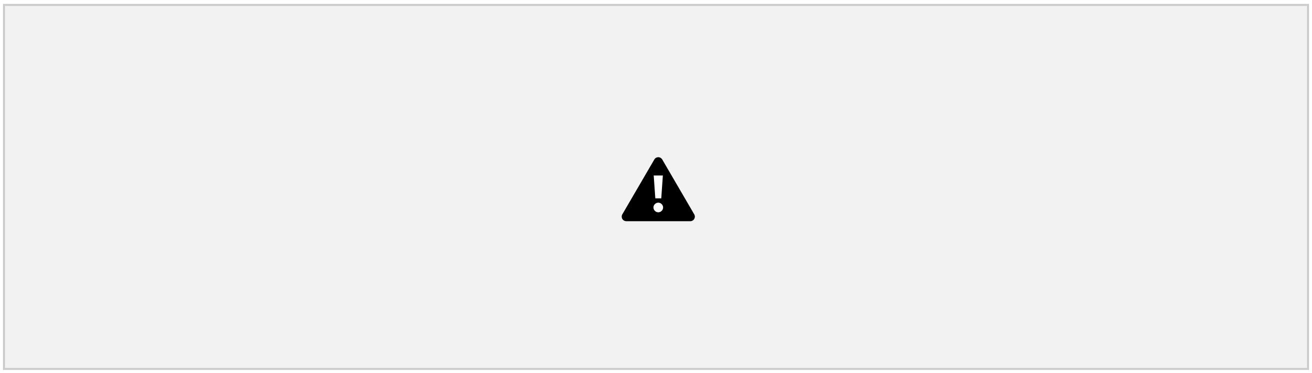
(a) WAP to Implement Single Link List with following operations:

- -Sort the linked list,
- -Reverse the linked list,
- -Concatenation of two linked lists.



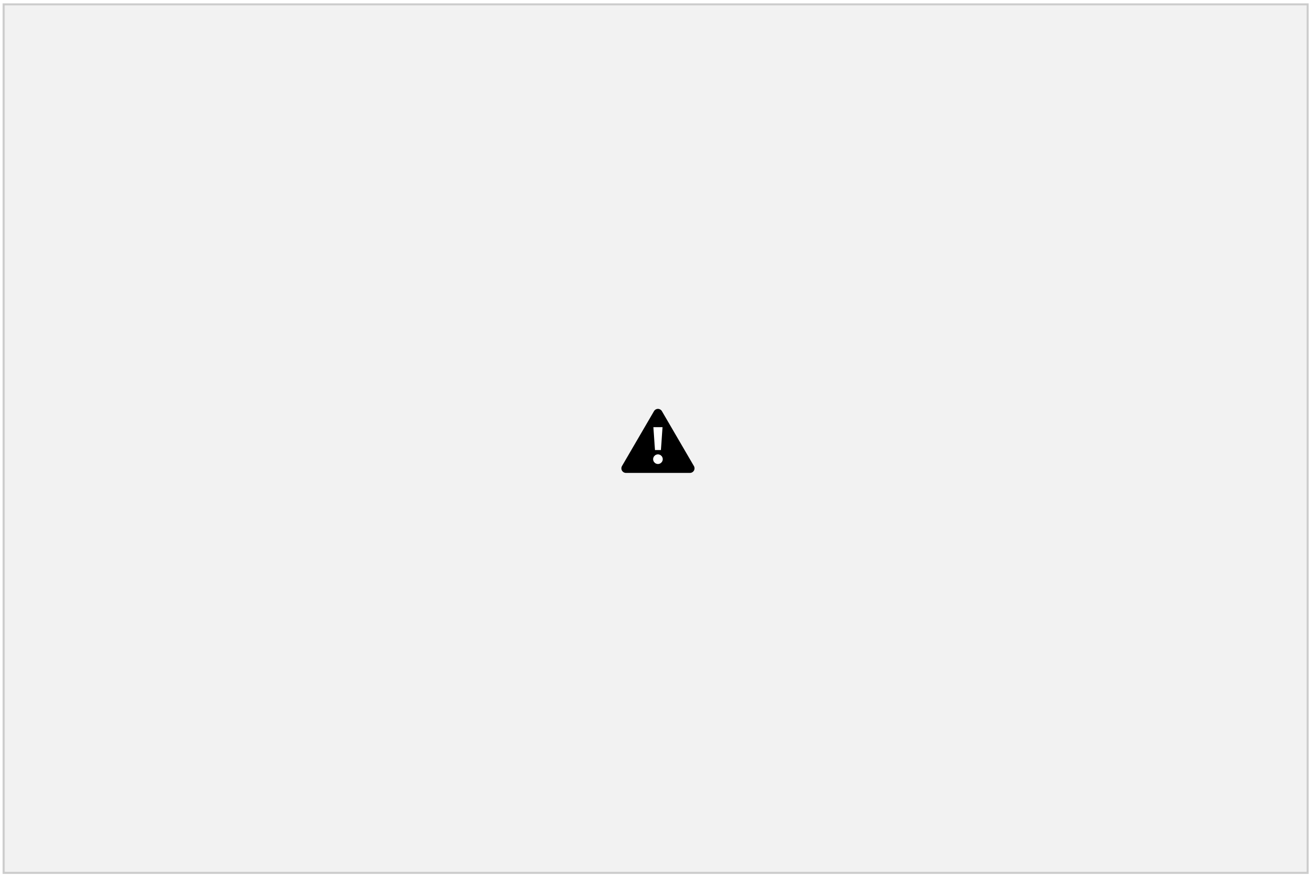


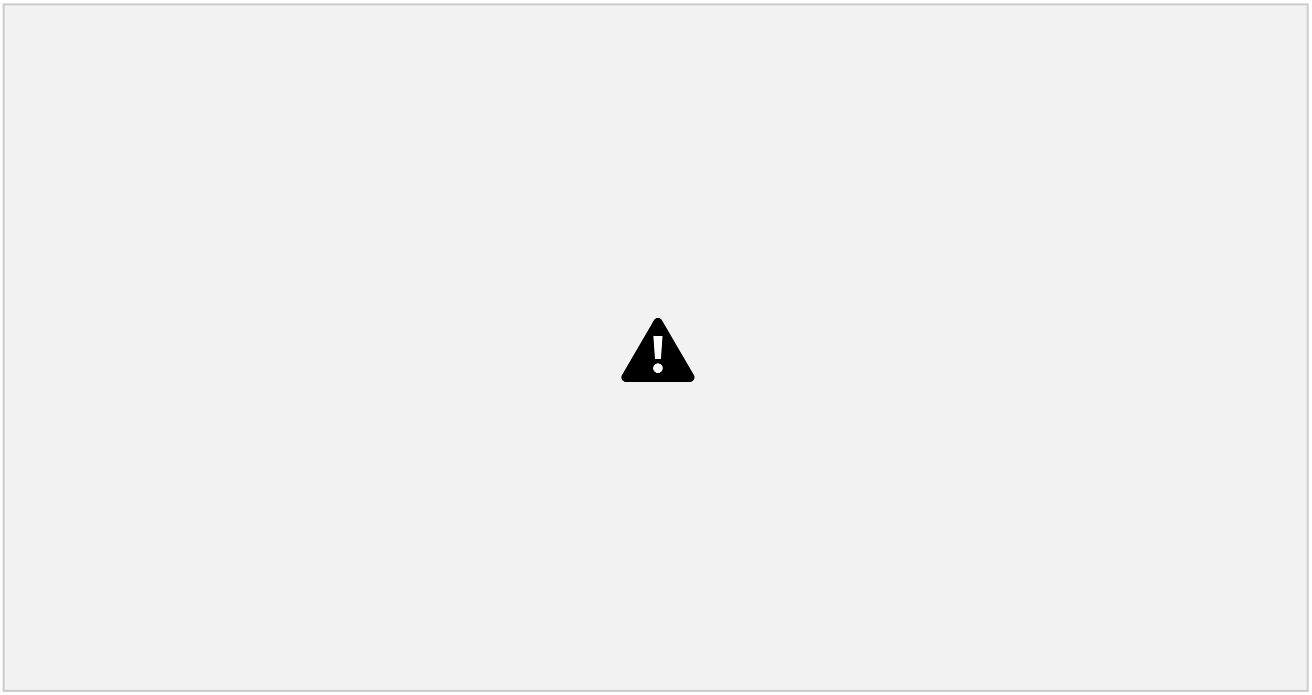
OUTPUT:



(b) WAP to Implement Single Link List to stimulate Stack and Queue operations.

OUTPUT:





Program 7

WAP to implement doubly linked list with operations:

(a) Create a doubly linked list

(b) Insert a new node to the left of the node

(c) Delete a node based on a specific value
(d) Display the contents of a list