Implement an Undo Mechanism in a Text Editor

Text editors, such as Microsoft Word and Google Docs, provide an "undo" feature that allows

users to reverse their last actions, including typing and deleting text.

Design and implement an undo mechanism using a stack data structure to handle text editing

actions.

Operations:

1. Push Operation:

o Whenever the user performs an action (e.g., typing or deleting text), store the

action on an undo stack.

o Each action should be recorded with enough information to allow it to be

reversed.

2. Pop Operation:

o When the user clicks "undo," remove the most recent action from the stack.

o Reverse this action to restore the text to its previous state.

3. Peek Operation:

o Allow the system to inspect the most recent action on the stack without removing

it.

o This operation can be used to display information about the next action that would

be undone.

Demonstrate the undo functionality by simulating a sequence of user actions and corresponding undo operations, including the ability to peek at the next undo action.

Expected Outcome:

A functional demonstration where a sequence of text editing actions can be undone in reverse order, showcasing the stack-based undo mechanism, with the ability to preview the next action to be undone using the peek operation.

Code:

#*include* <stdio.h>

#*include* <stdlib.h>

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#include <stdbool.h>
#include <limits.h>

#define MAX_SIZE 100

typedef struct {
    int *array;
    int top;
    int capacity;
} Stack;

Stack* createStack(int capacity) {
    Stack* stack = (Stack*)malloc(sizeof(Stack));
    stack->capacity = capacity;
    stack->top = -1;
    stack->array = (int*)malloc(stack->capacity * sizeof(int));
    return stack;
}

bool isFull(Stack* stack) {
    return stack->top == stack->capacity - 1;
}

bool isEmpty(Stack* stack) {
    return stack->top == -1;
}

void push(Stack* stack, int item) {
    if (isFull(stack)) {
        printf("Stack Overflow! Cannot push %d\n", item);
        return;
```

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    }
    stack->array[++stack->top] = item;
    printf("%d pushed to stack\n", item);
}

int pop(Stack* stack) {
    if (isEmpty(stack)) {
        printf("Stack Underflow! Cannot pop from an empty stack\n");
        return INT_MIN;
    }
    return stack->array[stack->top--];
}

int redo(Stack* stack) {
    if (isEmpty(stack)) {
        printf("Stack Underflow! Cannot pop from an empty stack\n");
        return INT_MIN;
    }
    return stack->array[stack->top++];
}

int peek(Stack* stack) {
    if (isEmpty(stack)) {
        printf("Stack is empty\n");
        return INT_MIN;
    }
    return stack->array[stack->top];
}

void display(Stack* stack) {
    if (isEmpty(stack)) {
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        printf("Stack is empty\n");
        return;
    }
    printf("Stack elements: ");
    for (int i = stack->top; i >= 0; i--) {
        printf("%d ", stack->array[i]);
    }
    printf("\n");
}

int size(Stack* stack) {
    return stack->top + 1;
}

void clear(Stack* stack) {
    stack->top = -1;
    printf("Stack cleared\n");
}

void freeStack(Stack* stack) {
    free(stack->array);
    free(stack);
}

int main() {
    Stack* stack = createStack(MAX_SIZE);
    int choice, item;

    while (1) {
        printf("\nStack Operations:\n");
        printf("1. Push\n2. Pop\n3. Peek\n4. Display\n5. Size\n");
```

```
printf("6. Is Empty\n7. Is Full\n8. Redo\n9. Clear\n10. Exit\n");
printf("Enter your choice: ");
scanf("%d", &choice);

switch (choice) {
   case 1:
      printf("Enter the item to push: ");
      scanf("%d", &item);
      push(stack, item);
      break;
   case 2:
      item = pop(stack);
      if (item != INT_MIN)
         printf("Popped item: %d\n", item);
      break;
   case 3:
      item = peek(stack);
      if (item != INT_MIN)
         printf("Top item: %d\n", item);
      break;
   case 4:
      display(stack);
      break;
   case 5:
      printf("Stack size: %d\n", size(stack));
      break;
   case 6:
      printf("Is stack empty? %s\n", isEmpty(stack) ? "Yes" : "No");
      break;
   case 7:
      printf("Is stack full? %s\n", isFull(stack) ? "Yes" : "No");
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            break;
        case 8:
            item = redo(stack);
            printf("Redo item: %d\n", item);
            break;
        case 9:
            clear(stack);
            break;
        case 10:
            freeStack(stack);
            printf("Exiting the program. Goodbye!\n");
            exit(0);
        default:
            printf("Invalid choice. Please try again.\n");
      }
   }

   return 0;
}
```
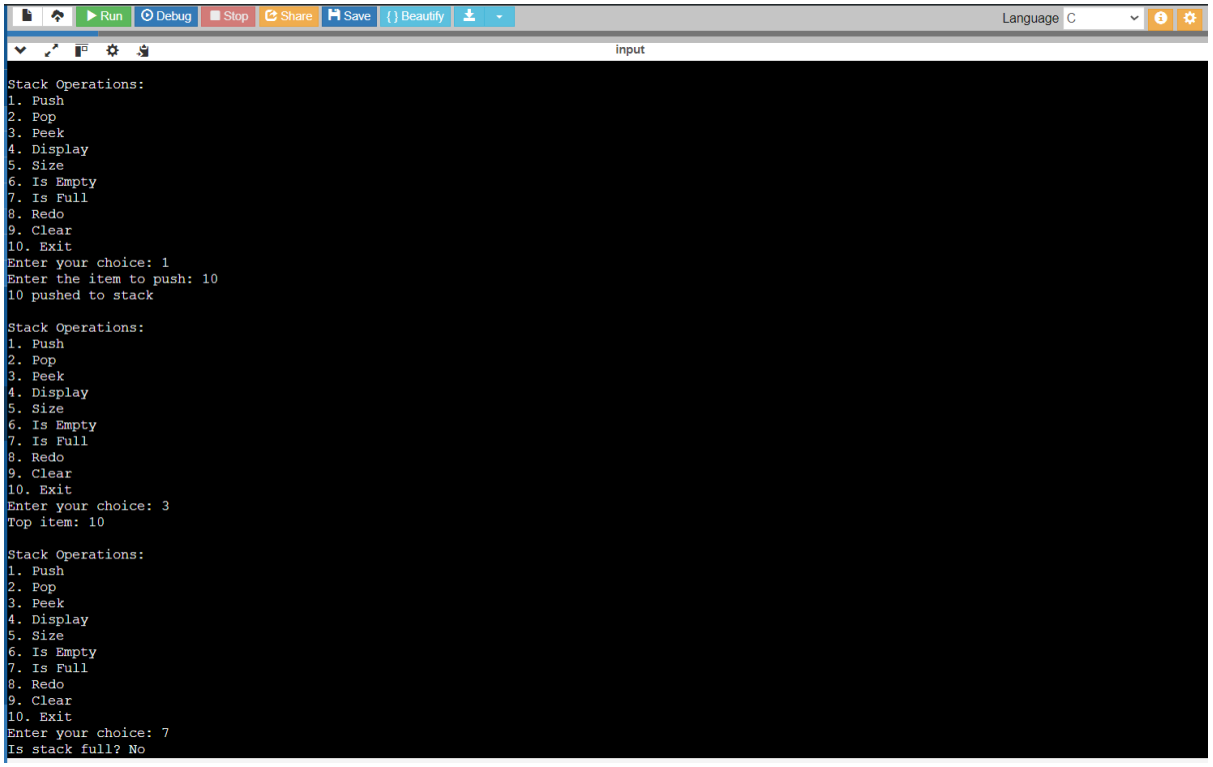

Output:


Run
Debug
Stop
Share
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{ } Beautify
Language C
input
Stack Operations:
1. Push
2. Pop
3. Peek
4. Display
5. Size
6. Is Empty
7. Is Full
8. Redo
9. Clear
10. Exit
Enter your choice: 1
Enter the item to push: 10
10 pushed to stack
Stack Operations:
1. Push
2. Pop
3. Peek
4. Display
5. Size
6. Is Empty
7. Is Full
8. Redo
9. Clear
10. Exit
Enter your choice: 3
Top item: 10
Stack Operations:
1. Push
2. Pop
3. Peek
4. Display
5. Size
6. Is Empty
7. Is Full
8. Redo
9. Clear
10. Exit
Enter your choice: 7
Is stack full? No