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NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_Week 3_COD_Question 1

Attempt : 2 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: 13
    14
    3
    2
Output: Pushed element: 3
    Pushed element: 4
    Stack elements (top to bottom): 43
    Popped element: 4
    Stack elements (top to bottom): 3
    Exiting program
    Answer
    #include <stdio.h>
    #include <stdlib.h>
int data;
    struct Node {
      struct Node* next;
    struct Node* top = NULL;
    // You are using GCC
    void push(int value) {
      struct Node* newNode=(struct Node*)malloc(sizeof(struct Node));
      newNode->data=value;
      newNode->next=top;
      top=newNode;
      printf("Pushed element: %d\n",value);
```

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```
241901002
if(top==NULL){
    printf("S+^ '
         printf("Stack is empty.Cannot pop.\n");
       else{
         struct Node* temp=top;
         printf("Popped element:%d\n",temp->data);
         top=top->next;
         free(temp);
      }
     }
    void displayStack() {
       if(top==NULL){
         printf("Stack is empty\n");
       else{
         struct Node* temp=top;
         printf("Stack elements(top to bottom): ");
         while(temp!=NULL){
           printf("%d\n",temp->data);
           temp=temp->next;
         }
      }
     }
    int main() {
odo {
      int choice, value;
         scanf("%d", &choice);
         switch (choice) {
           case 1:
             scanf("%d", &value);
             push(value);
              break;
           case 2:
              pop();
              break;
           case 3:
                                                      241901002
             displayStack();
              break;
           case 4:
              printf("Exiting program\n");
```

24,190,1002

241901002

```
24,190,1002
                                                                                 241901002
                                                      24,190,1002
              return 0;
efault:
printf("Invalid choice\n");
           return 0;
default:
       } while (choice != 4);
       return 0;
     }
     Status: Correct
                                                                          Marks: 10/10
                                                                                 241901002
241901002
                           24,190,1002
                                                      241901002
241901002
                           241901002
                                                      241901002
                                                                                 24,190,1002
```

241901002

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24,190,1002

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NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_Week 3_COD_Question 2

Attempt : 1 Total Mark : 10 Marks Obtained : 10

Section 1: Coding

1. Problem Statement

Sanjeev is in charge of managing a library's book storage, and he wants to create a program that simplifies this task. His goal is to implement a program that simulates a stack using an array.

Help him in writing a program that provides the following functionality:

Add Book ID to the Stack (Push): You can add a book ID to the top of the book stack. Remove Book ID from the Stack (Pop): You can remove the top book ID from the stack and display its details. If the stack is empty, you cannot remove any more book IDs.Display Books ID in the Stack (Display): You can view the books ID currently on the stack. Exit the Library: You can choose to exit the program.

Input Format

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

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

Choice 2: Pop the book ID from the stack.

Choice 3: Display the book ID in the stack.

Choice 4: Exit the program.

Output Format

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

- 1. If the choice is 1, push the given book ID to the stack and display the corresponding message.
- 2. If the choice is 2, pop the book ID from the stack and display the corresponding message.
- 3. If the choice is 2, and if the stack is empty without any book ID, print "Stack Underflow"
- 4. If the choice is 3, print the book IDs in the stack.
- 5. If the choice is 3, and there are book IDs in the stack, print "Stack is empty"
- 6. If the choice is 4, exit the program and display the corresponding message.
- 7. If any other choice is entered, print "Invalid choice"

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

Sample Test Case

Input: 1 19 1 28 2 3

2

Output: Book ID 19 is pushed onto the stack

Book ID 28 is pushed onto the stack

```
Book ID 28 is popped from the stack
     Book ID in the stack: 19
 Book ID 19 is popped from the stack
     Exiting the program
     Answer
     // You are using GCC
     #include<stdio.h>
     #define MAX 100
     int stack[MAX];
     int top=-1;
رب-=MAX-1){
printf("Stack Overflow\n");
}
else{
          stack[++top]=value;
         printf("Book ID %d is pushed onto the stack\n",value);
       }
     }
     void pop(){
       if(top==-1){
         printf("Stack Underflow\n");
       }
       else{
         printf("Book ID %d is popped from the stack\n",stack[top--]);
   void display(){
       if(top==-1){
         printf("Stack is empty\n");
       }
       else{
          printf("Book ID in the stack:");
         for(int i=top;i>=0;i-){
            printf("%d\n",stack[i]);
       }
                                                                                   241901002
     int main(){
       int choice, value;
```

```
241901002
  scanf("%d",&choice);
switch(choice){
while(1){
     case 1:
        scanf("%d",&value);
        push(value);
        break;
     case 2:
        pop();
        break;
     case 3:
        display();
        break;
                                                                              24,190,1002
     case 4:
        printf("Exiting the program");
        return 0;
     default:
        printf("Invalid choice\n");
   }
}
return 0;
```

Status: Correct Marks: 10/10

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NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_Week 3_COD_Question 3

Attempt : 2 Total Mark : 10 Marks Obtained : 10

Section 1: Coding

1. Problem Statement

Sharon is developing a programming challenge for a coding competition.

The challenge revolves around implementing a character-based stack data structure using an array.

Sharon's project involves a stack that can perform the following operations:

Push a Character: Users can push a character onto the stack.Pop a Character: Users can pop a character from the stack, removing and displaying the top character.Display Stack: Users can view the current elements in the stack.Exit: Users can exit the stack operations application.

Write a program to help Sharon to implement a program that performs the given operations.

Input Format

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

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

Choice 2: Pop the character from the stack.

Choice 3: Display the characters in the stack.

Choice 4: Exit the program.

Output Format

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

- 1. If the choice is 1, push the given character to the stack and display the pushed character having the prefix "Pushed: ".
- 2. If the choice is 2, undo the character from the stack and display the character that is popped having the prefix "Popped: ".
- 3. If the choice is 2, and if the stack is empty without any characters, print "Stack is empty. Nothing to pop."
- 4. If the choice is 3, print the elements in the stack having the prefix "Stack elements: ".
- 5. If the choice is 3, and there are no characters in the stack, print "Stack is empty."
- 6. If the choice is 4, exit the program.
- 7. If any other choice is entered, print "Invalid choice"

Refer to the sample output for formatting specifications.

Sample Test Case

Input: 2

4

Output: Stack is empty. Nothing to pop.

Answer

#include <stdio.h>

```
24,190,1002
    #include <stdbool.h>
#define MAX_SIZE 100
    char items[MAX_SIZE];
    int top = -1;
    void initialize() {
      top = -1;
    bool isFull() {
      return top == MAX_SIZE - 1;
    }
                                                                                241901002
    bool isEmpty() {
      return top == -1;
    // You are using GCC
    void push(char value) {
      if(isFull()){
         printf("Stack is full.Cannot push.\n");
         return;
      }
      items[++top]=value;
      printf("Pushed: %c\n",value);
                                                     241901002
char pop() {
      if(isEmpty()){
         printf("Stack is empty. Nothing to pop.\n");
         return '\0';
      }
      char popped=items[top--];
      printf("Popped: %c\n",popped);
      return popped;
printf("Stack is empty.\n"),
return;
}
                                                                                241901002
                                                     241901002
```

```
for(int i=top;i>=0;i-){
    printf("%c " itom
       printf("Stack elements: ");
          printf("%c ",items[i]);
       printf("\n");
     int main() {
       initialize();
       int choice;
       char value;
       while (true) {
switch (choice) {
    case 1:
          scanf("%d", &choice);
               scanf(" %c", &value);
               push(value);
               break;
             case 2:
               pop();
               break;
             case 3:
               display();
               break;
             case 4:
               return 0;
            default:
               printf("Invalid choice\n");
       }
       return 0;
     }
```

Status: Correct Marks: 10/10

241901002

241901002

24,190,1002

24,190,1002

241901002

24,190,1002

24,190,1002

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NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_Week 3_COD_Question 4

Attempt : 1 Total Mark : 10 Marks Obtained : 10

Section 1: Coding

1. Problem Statement

You are a software developer tasked with building a module for a scientific calculator application. The primary function of this module is to convert infix mathematical expressions, which are easier for users to read and write, into postfix notation (also known as Reverse Polish Notation). Postfix notation is more straightforward for the application to evaluate because it removes the need for parentheses and operator precedence rules.

The scientific calculator needs to handle various mathematical expressions with different operators and ensure the conversion is correct. Your task is to implement this infix-to-postfix conversion algorithm using a stack-based approach.

Example

```
Input:
a+b
   Output:
   ab+
   Explanation:
   The postfix representation of (a+b) is ab+.
   Input Format
```

The input is a string, representing the infix expression.

Output Format

The output displays the postfix representation of the given infix expression.

Refer to the sample output for formatting specifications.

```
Sample Test Case
```

```
Input: a+(b*e)
    Output: abe*+
    Answer
   #include <stdio.h>
#include <stdlib.h>
    #include <string.h>
    struct Stack {
      int top;
      unsigned capacity;
      char* array;
    };
    struct Stack* createStack(unsigned capacity) {
      struct Stack* stack = (struct Stack*)malloc(sizeof(struct Stack));
if (!stack)
```

```
return NULL;
                                                                                241901002
       stack->capacity = capacity;
       stack->array = (char*)malloc(stack->capacity * sizeof(char));
       return stack:
    }
    int isEmpty(struct Stack* stack) {
       return stack->top == -1;
    }
                                                                                241901002
return stack->array[stack->top];
    char pop(struct Stack* stack) {
       if (!isEmpty(stack))
         return stack->array[stack->top--];
       return '$';
    }
    void push(struct Stack* stack, char op) {
       stack->array[++stack->top] = op;
    // You are using GCC
    #include<ctype.h>
int isOperand(char ch) {
       return isalnum(ch);
    }
    int Prec(char ch) {
       switch(ch){
         case '+':
         case '-':return 1;
         case '*':
case '/':return 2;
case '^':return 3;
                                                                                241901002
                                                     241901002
```

```
24,190,1002
       return -1;
24.1301
     void infixToPostfix(char* exp) {
       int i,k;
       struct Stack* stack=createStack(strlen(exp));
       for(i=0,k=-1;exp[i];++i){}
         if(isOperand(exp[i])){
            exp[++k]=exp[i];
         else if(exp[i]=='('){
            push(stack,exp[i]);
                                                                                     241901002
         else if(exp[i]==')'){
            while(stack->top!=-1&&peek(stack)!='('){
              exp[++k]=pop(stack);
            }
            pop(stack);
         }
         else{
            while(stack->top!=-1 && Prec(exp[i])<=Prec(peek(stack))){
              exp[++k]=pop(stack);
            push(stack,exp[i]);
while(stack->top!=-1){
    exp[++k]=non/c²
         exp[++k]=pop(stack);
       \exp[++k]='\setminus 0';
       printf("%s\n",exp);
       free(stack->array);
       free(stack);
     }
     int main() {
       char exp[100];
                                                                                     241901002
       scanf("%s", exp);
   infixToPostfix(exp);
       return 0;
```

Status : Correct

Marks : 10/10

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NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_Week 3_COD_Question 5

Attempt : 1 Total Mark : 10 Marks Obtained : 10

Section 1: Coding

1. Problem Statement

Milton is a diligent clerk at a school who has been assigned the task of managing class schedules. The school has various sections, and Milton needs to keep track of the class schedules for each section using a stackbased system.

He uses a program that allows him to push, pop, and display class schedules for each section. Milton's program uses a stack data structure, and each class schedule is represented as a character. Help him write a program using a linked list.

Input Format

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

Choice 1: Push the character onto the stack. If the choice is 1, the following input is a space-separated character, representing the class schedule to be pushed onto the stack.

Choice 2: Pop class schedule from the stack

Choice 3: Display the class schedules 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 class schedule to the stack and display the following: "Adding Section: [class schedule]"
- If the choice is 2, pop the class schedule from the stack and display the following: "Removing Section: [class schedule]"
- If the choice is 2, and if the stack is empty without any class schedules, print "Stack is empty. Cannot pop."
- If the choice is 3, print the class schedules in the stack in the following:
- "Enrolled Sections: " followed by the class schedules separated by space.
- If the choice is 3, and there are no class schedules in the stack, print "Stack is empty"
- If the choice is 4, exit the program and display the following: "Exiting the program"
 - If any other choice is entered, print "Invalid choice"

Refer to the sample output for the exact format.

Sample Test Case

Input: 1 d

3

```
Output: Adding Section: d
Adding Section: h
Enrolle
    Removing Section: h
    Enrolled Sections: d
    Exiting program
    Answer
    #include <stdio.h>
    #include <stdlib.h>
                                                                              241901002
    struct Node {
   char data;
      struct Node* next;
    struct Node* top = NULL;
    // You are using GCC
    void push(char value) {
      struct Node* newNode=(struct Node*)malloc(sizeof(struct Node));
      if(newNode==NULL){
        printf("Stack overflow\n");
        return;
      newNode->data=value;
      newNode->next=top;
      top=newNode;
      printf("Adding Section: %c\n",value);
    }
    void pop() {
      if(top==NULL){
        printf("Stack is empty.Cannot pop.\n");
        return;
      }
      struct Node *temp;
                                                                              241901002
      temp=top;
top=top->next;
     printf("Removing Section: %c\n",temp->data);
```

```
24,190,1002
                                                     241901002
       free(temp);
    void displayStack() {
       if(top==NULL){
         printf("Stack is empty\n");
         return;
       printf("Enrolled Sections: ");
       struct Node *current=top;
       while(current!=NULL){
         printf("%c ",current->data);
         current=current->next;
                           241901002
printf("\n");
    int main() {
       int choice;
       char value;
       do {
         scanf("%d", &choice);
         switch (choice) {
           case 1:
              scanf(" %c", &value);
             push(value);
              break;
           case 2:
              pop();
              break;
           case 3:
              displayStack();
              break;
           case 4:
              printf("Exiting program\n");
              break;
           default:
             printf("Invalid choice\n");
                                                     241901002
       } while (choice != 4);
return 0;
```

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241901002

Status: Correct

Marks: 10/10

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NeoColab_REC_CS23231_DATA STRUCTURES

REC_DS using C_Week 3_CY

Attempt: 1 Total Mark: 30 Marks Obtained: 30

Section 1: Coding

1. Problem Statement

Buvi is working on a project that requires implementing an array-stack data structure with an additional feature to find the minimum element.

Buvi needs to implement a program that simulates a stack with the following functionalities:

Push: Adds an element onto the stack.Pop: Removes the top element from the stack.Find Minimum: Finds the minimum element in the stack.

Buvi's implementation should efficiently handle these operations with a maximum stack size of 20.

Input Format

The first line of input consists of an integer N, representing the number of

The second line consists of N space-separated integer values, representing the elements to be pushed onto the stack.

Output Format

The first line of output displays "Minimum element in the stack: " followed by the minimum element in the stack after pushing all elements.

The second line displays "Popped element: " followed by the popped element.

The third line displays "Minimum element in the stack after popping: " followed by the minimum element in the stack after popping one element.

Refer to the sample output for the formatting specifications.

Sample Test Case

```
Input: 4
5281
Output: Minimum element in the stack: 1
Popped element: 1
Minimum element in the stack after popping: 2
```

Answer

```
// You are using GCC
#include<stdio.h>
   #include<limits.h>
   #define MAX 20
   int stack[MAX],min_stack[MAX];
   int top=-1,min_top=-1;
   void push(int val){
     if(top==MAX-1)
      return;
      stack[++top]=val;
     if(min_top==-1||val<=min_stack[min_top])
        min_stack[++min_top]=val;
   dint pop(){
      if(top==-1)
```

```
if(stack[top]==min_stack[min_top])min_top--;
return stack[top-];
}
int get_min(){
    return(min_top==-1)?INT_MIN:min_stack[min_top];
}
int main(){
    int n,x;
    scanf("%d",&n);
    for(int i=0;i<n;i++){
        scanf("%d",&x);
        push(x);
}
printf("Minimum element in the stack: %d\n",get_min());
printf("Popped element: %d\n",pop());
printf("minimum element in the stack after popping: %d\n",get_min());
return 0;
}</pre>
```

2. Problem Statement

Status: Correct

return INT_MIN;

Suppose you are building a calculator application that allows users to enter mathematical expressions in infix notation. One of the key features of your calculator is the ability to convert the entered expression to postfix notation using a Stack data structure.

Marks: 10/10

Write a function to convert infix notation to postfix notation using a Stack.

Input Format

The input consists of a string, an infix expression that includes only digits (0-9), and operators (+, -, *, /).

Output Format

The output displays the equivalent postfix expression of the given infix expression.

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Refer to the sample output for formatting specifications.

24,190,1002

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```
Sample Test Case
```

```
Input: 1+2*3/4-5
Output: 123*4/+5-
```

Answer

```
// You are using GCC
    #include<stdio.h>
    #include<ctype.h>
    #include<string.h>
   #define MAX 30
char stack[MAX];
    int top=-1;
    void push(char x){
      if(top<MAX-1){
         stack[++top]=x;
      }
    char pop(){
      if(top>=0){
        return stack[top--];
      return '\0';
char peek(){
      if(top>=0){
        return stack[top];
      }
      return '\0';
    int pres(char op){
      switch(op){
         case '+':
         case '-':return 1;
         case '*':
      case '/':return 2;
         case '^':return 3;
         default:return 0;
```

```
void intopost(char* infix,char* postfix){
       int i,j=0;
       while(infix[i]!='\0'){
         char token=infix[i];
         if(isdigit(token)){
            while(isdigit(infix[i])){
              postfix[j++]=infix[i++];
            postfix[j++]=' ';
         else if(token=='('){
            push(token);
         else if(token==')'){
            while(top!=-1 && peek()!='('){
              postfix[j++]=pop();
              postfix[j++]=' ';
            }
            if(top==-1){
              printf("Invalid:Mismatched parantheses\n");
              return;
            pop();
         else if(token=='+'|| token=='-'|| token=='*'|| token=='/'){
            while(top!=-1 && pres(token)<=pres(peek())){
              postfix[j++]=pop();
              postfix[i++]=' ';
            push(token);
         j++;
while(top!=-1){
```

```
if(peek()=='('){
    printf("Invalid:Mismatched parantheses\n");
    return;
}
postfix[j++]=pop();
postfix[j++]=' ';

}
postfix[j]='\0';
}
int main(){
    char infix[MAX],postfix[MAX*2];
    scanf("%s",infix);
    intopost(infix,postfix);
    printf("%s",postfix);
    return 0;
}
```

Status: Correct Marks: 10/10

3. Problem Statement

Latha is taking a computer science course and has recently learned about infix and postfix expressions. She is fascinated by the idea of converting infix expressions into postfix notation. To practice this concept, she wants to implement a program that can perform the conversion for her.

Help Latha by designing a program that takes an infix expression as input and outputs its equivalent postfix notation.

241901002

```
Example
```

Input:

(3+4)5

Output:

34+5

Input Format

The input consists of a string, the infix expression to be converted to postfix notation.

Output Format

The output displays a string, the postfix expression equivalent of the input infix expression.

Refer to the sample output for the formatting specifications.

Sample Test Case

```
Input: A+B*C-D/E
Output: ABC*+DE/-
Answer
// You are using GCC
#include<stdio.h>
#include<ctype.h>
#include<string.h>
#include<stdlib.h>
#define MAX 100
char stack[MAX];
int top=-1;
void push(char x){
  if(top==MAX-1){}
     printf("Stack overflow\n");
     return;
     stack[++top]=x;
char pop(){
  if(top==-1){
     return '\0';
  }
     return stack[top--];
```

int pres(char op)

```
24,190,1002
switch(op){
         case '-':return 1;
         case '*':
         case '/':return 2;
         default:return 0;
      }
    }
    void intopost(const char* infix,char* postfix){
      int i,j=0;
                                                                                 241901002
      char token,popped;
      for(i=0;(token=infix[i])!='\0';i++){
        if(isalnum(token)){
           postfix[j++]=token;
         else if(token=='('){
           push(token);
         else if(token==')')
           while((popped=pop())!='('){
             postfix[j++]=popped;
           }
         else{
           while(top!=-1 && pres(stack[top])>=pres(token)){
             postfix[j++]=pop();
           }
           push(token);
         }
      }
      while(top!=-1){
         postfix[j++]=pop();
                                                                                 241901002
                          241901002
                                                      241901002
      postfix[j]='\0';
int main(){
```

```
241901002
                                                       24,190,1002
fgets(infix,MAX,stdin);
infix[strcspn(infix"\"\"\"\"
       char infix[MAX],postfix[MAX];
       \inf[x[strcspn(infix,"\n")]='\0';
       intopost(infix,postfix);
       printf("%s\n",postfix);
       return 0;
     }
                                                                           Marks: 10/10
     Status: Correct
                           24,190,1002
                                                                                   241901002
241901002
                                                       24,190,1002
241901002
                                                                                   241901002
                           241901002
                                                       241901002
```

241901002

241901002

24,190,1002