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**Roll No : 2339**

\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\***Assignment No : 1** \*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*\*

**Title :** Implement stack as an abstract data type using linked list and use this ADT for conversion of infix expression to postfix, prefix and evaluation of postfix and prefix expression.

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#include<iostream>

#include<cstring>

#include<stdlib.h>

#include<stdio.h>

#include<ctype.h>

using namespace std;

class node

{

public:

char data;

node \*next;

};

class stack

{

public:

node \*top;

stack()

{

top = NULL;

}

int empty();

void push(char );

char pop();

void dis();

char Top();

};

char stack :: Top()

{

node \*p = top;

if( empty() == 1 )

return -1;

else

return p->data;

}

int stack :: empty()

{

if( top == NULL )

return 1;

else

return 0 ;

}

void stack :: push(char x)

{

node \*p;

p = new node;

p->data = x;

p->next = top;

top = p;

}

char stack :: pop()

{

char x;

node \*p;

if( empty() == 1 )

return -1;

else

{

p = top;

top = top->next;

x = p->data;

delete p;

return x;

}

}

void stack :: dis()

{

node \*p = top;

while(p! = NULL)

{

cout<<p->data;

p = p->next;

}

}

class convert

{

public:

char in[200], po[200], pe[200];

int c;

void infixtopostfix(char in[],char po[]);

void infixtoprefix(char in[],char pe[]);

void prefix(char in[],char pe[]);

void Epostfix(char po[]);

void Eprefix(char pe[]);

int evaluate(char,int,int);

int pri(char);

void exp()

{

do

{

cout<<" \n\t 1. Infix To Postfix \n\t 2. Infix To Prefix \n\t 3. Postfix

Evalution \n\t 4. Prefix Evaluation \n\t 5. Exit \n";

cout<<"\n\t Enter Your choice : ";

cin>>c;

switch(c)

{

case 1 : cout<<" \n Enter expression for convert to Postfix -->> ";

cin>>in;

infixtopostfix(in,po);

cout<<" \n\t Infix :->> "<<in;

cout<<" \n\t Postfix->> "<<po<<"\n\n";

break;

case 2 : cout<<" \n Enter expression for convert to Prefix -->> ";

cin>>in;

infixtoprefix(in,pe);

cout<<" \n\t Infix :->> "<<in;

cout<<" \n\t Prefix :->> "<<pe<<"\n\n";

break;

case 3 : cout<<" \n Enter Postfix expression to Evalute -->> ";

cin>>po;

Epostfix(po);

break;

case 4 : cout<<" \n Enter Postfix expression to Evalute -->> ";

cin>>pe;

Eprefix(pe);

break;

case 5 : break;

default : cout<<” \n\n\t !!!...Invalid Choice…!!! ”;

}

} while (c!=5);

}

};

void convert :: Epostfix(char po[])

{

stack s;

int i, ch1, ch2, n;

char x;

for(i =0 ; po[i]!='\0' ; i++)

{

x = po[i];

if(isalpha(x))

{

cout<<" \n\t Enter the value of "<<x<<" : ";

cin>>n;

s.push(n);

}

else if(isdigit(x))

s.push(x-48);

else

{

ch2 = s.pop();

ch1 = s.pop();

n = evaluate(x,ch1,ch2);

s.push(n);

}

}

n = s.pop();

cout<<" \n\n\t Value of Expression = "<<n<<"\n\n";

}

void convert :: Eprefix(char pe[])

{

stack s;

int i, ch1, ch2, n;

char x;

for(i=strlen(pe)-1 ; i>=0 ; i--)

{

x = pe[i];

if(isalpha(x))

{

cout<<" \n\t Enter the value of "<<x<<" : ";

cin>>n;

s.push(n);

}

else if(isdigit(x))

s.push(x-48);

else

{

ch1 = s.pop();

ch2 = s.pop();

n = evaluate(x,ch1,ch2);

s.push(n);

}

}

n = s.pop();

cout<<" \n\n\t Value of Expression = "<<n<<"\n\n";

}

int convert :: evaluate(char x, int ch1, int ch2)

{

if(x=='+')

return(ch1+ch2);

if(x=='-')

return(ch1-ch2);

if(x=='\*')

return(ch1\*ch2);

if(x=='/')

return(ch1/ch2);

if(x=='%')

return(ch1%ch2);

if(x=='^')

{

int i,n=1;

for(i=1 ; i<=ch2 ; i++)

n=ch1\*n;

return(n);

}

if(x=='$')

{

int i,n=1;

for(i=1 ; i<=ch2 ; i++)

n=ch1\*n;

return(n);

}

if(x=='#')

{

int i,n=1;

for(i=1 ; i<=ch2 ; i++)

n=ch1\*n;

return(n);

}

}

void convert :: infixtopostfix(char in[],char po[])

{

stack s;

int i=0, k=0, m, n, a=0, b;

char ch, x;

n=strlen(in);

for(i=0 ; in[i]!='\0' ; i++)

{

ch = in[i];

if(isalnum(ch))

po[k++]=ch;

else

{

if(ch=='(')

s.push(ch);

else

{

if(ch==')')

{

while((x=s.pop())!='(')

po[k++]=x;

}

else

{

while(pri(ch)<=pri(s.Top()) && !s.empty())

{

x = s.pop();

po[k++] = x;

}

s.push(ch);

}

}

}

po[k] = '\0';

}

while(!s.empty())

{

x = s.pop();

po[k++] = x ;

}

po[k++] = '\0';

}

void convert :: infixtoprefix(char in[],char pe[])

{

stack s;

int i=0, k=0;

char ch, temp[200];

for(i=strlen(in)-1 ; k>=0, i>=0 ; i--,k++)

temp[k] = in[i];

temp[k] = '\0';

for(i=0 ; temp[i]!='\0' ; i++)

{

if(temp[i]=='(')

temp[i]=')';

else

if(temp[i]==')')

temp[i]='(';

}

prefix(temp,pe);

for(i=0, k=strlen(pe)-1 ; i<k ; i++, k--)

{

ch = pe[i];

pe[i] = pe[k];

pe[k] = ch;

}

}

void convert :: prefix(char in[],char pe[])

{

stack s;

int i=0, k=0, m, n, a=0, b;

char ch, x;

n=strlen(in);

for(i=0 ; in[i]!='\0' ; i++)

{

ch = in[i];

if(isalnum(ch))

pe[k++] = ch;

else

{

if(ch=='(')

s.push(ch);

else

{

if(ch==')')

{

while((x=s.pop())!='(')

pe[k++] = x;

}

else

{

while(pri(ch)<pri(s.Top()) && !s.empty())

{

x = s.pop();

pe[k++] = x;

}

s.push(ch);

}

}

}

pe[k]='\0';

}

while(!s.empty())

{

x = s.pop();

pe[k++] = x;

}

pe[k] = '\0';

}

int convert :: pri(char x)

{

switch(x)

{

case '$' :

case '#' :

case '^' : return 3;

case '%' :

case '\*' :

case '/' : return 2;

case '+' :

case '-' : return 1;

default : return 0;

}

}

int main()

{

convert c;

c.exp();

}

***OUTPUT :***

resham@ubuntu:~/Desktop/resham$ g++ assgn1.cpp

resham@ubuntu:~/Desktop/resham$ ./a.out

1.Infix To Postfix

2.Infix To Prefix

3.Postfix Evalution

4.Prefix Evaluation

5.Exit

Enter Your choice: 1

Enter expression for convert to Postfix -->> (a+b^c)\*d+e^5

Infix:->> (a+b^c)\*d+e^5

Postfix->> abc^+d\*e5^+

1.Infix To Postfix

2.Infix To Prefix

3.Postfix Evalution

4.Prefix Evaluation

5.Exit

Enter Your choice: 2

Enter expression for convert to Prefix -->> (a+b^c)\*d+e^5

Infix:->> (a+b^c)\*d+e^5

Prefix:->> +\*+a^bcd^e5

1.Infix To Postfix

2.Infix To Prefix

3.Postfix Evalution

4.Prefix Evaluation

5.Exit

Enter Your choice: 3

Enter Postfix expression to Evalute -->> ab-cd/\*e+

Enter the value of a : 8

Enter the value of b : 6

Enter the value of c : 10

Enter the value of d : 5

Enter the value of e : 7

Value of Expression = 11

1.Infix To Postfix

2.Infix To Prefix

3.Postfix Evalution

4.Prefix Evaluation

5.Exit

Enter Your choice: 4

Enter Prefix expression to Evalute -->> +\*-ab/cde

Enter the value of e : 7

Enter the value of d : 5

Enter the value of c : 10

Enter the value of b : 6

Enter the value of a : 8

Value of Expression = 11

1.Infix To Postfix

2.Infix To Prefix

3.Postfix Evalution

4.Prefix Evaluation

5.Exit

Enter Your choice: 5

resham@ubuntu:~/Desktop/resham$