Experiment No.3
Evaluate Postfix Expression using Stack ADT.
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Experiment No. 3: Evaluation of Postfix Expression using stack ADT

Aim : Implementation of Evaluation of Postfix Expression using stack ADT

Objective:

1) Understand the use of Stack.

2) Understand importing an ADT in an application program.

3) Understand the instantiation of Stack ADT in an application program.

4) Understand how the member functions of an ADT are accessed in an application program

Theory:

An arithmetic expression consists of operands and operators. For a given expression in a postfix form, stack can be used to evaluate the expression. The rule is whenever an operand comes into the string, push it onto the stack and when an

operator is found then the last two elements from the stack are popped and computed and the result is pushed back onto the stack. One by one the whole string of postfix expressions is parsed and the final result is obtained at an end of computation that remains in the stack.

Algorithm

Step 1: Add a ")" at the end of the postfix expression
Step 2: Scan every character of the postfix expression and repeat Steps 3 and 4 until ")"is
encountered
Step 3: IF an operand is encountered, push it on the stack
IF an operator 0 is encountered, then
a. Pop the top two elements from the stack as A and B as A and B
b. Evaluate BOA, where A is the topmost element and B is the element below A.
c. Push the result of evaluation on the stack [END OF IF]
Step 4: SET RESULT equal to the topmost element of the stack
Step 5: EXIT

Code:

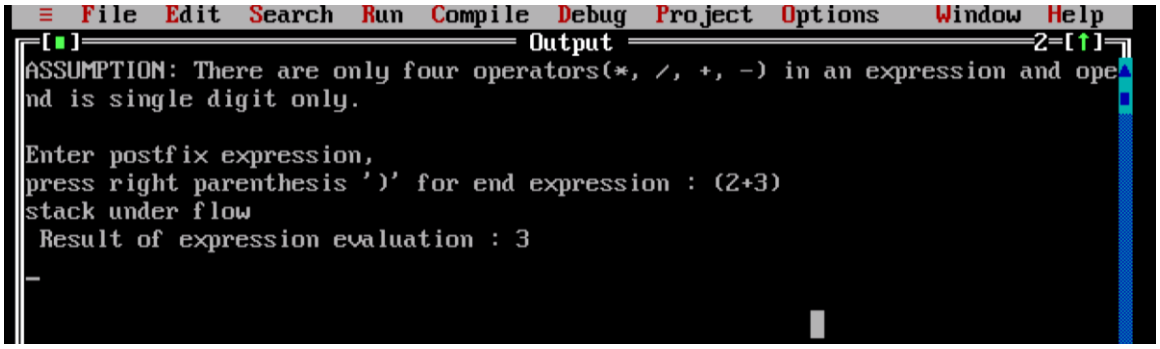
```
#include <stdio.h>

#include <ctype.h>

#define MAXSTACK 100

#define POSTFIXSIZE 100

int stack[MAXSTACK];

int top = -1;

void push(int item)

{

 if (top >= MAXSTACK - 1) {

 printf("stack over flow");

 return;
```

```
 }
 else {
 top = top + 1;
 stack[top] = item;
 }
}
int pop()
{
 int item;
 if (top < 0) {
 printf("stack under flow");
 }
 else {
 item = stack[top];
top = top - 1;
 return item;
 }
}
void EvalPostfix(char postfix[])
{
 int i;
 char ch;
 int val;
 int A, B;
 for (i = 0; postfix[i] != ')'; i++) {
```

```
ch = postfix[i];
if (isdigit(ch)) {
push(ch - '0');
}
else if (ch == '+' || ch == '-' || ch == '*' || ch == '/') {
A = pop();
B = pop();
switch (ch)
{
case '*':
val = B * A;
break;
case '/':
val = B / A;
break;
case '+':
val = B + A;
break;
case '-':
val = B - A;
break;
}
push(val);
}
}
```

```
 printf(" \n Result of expression evaluation : %d \n", pop());
}
int main()
{
 int i;
 char postfix[POSTFIXSIZE];
 printf("ASSUMPTION: There are only four operators(*, /, +, -) in an expression and operand
is single digit only.\n");
 printf(" \nEnter postfix expression,\npress right parenthesis ')' for end expression : ");
 for (i = 0; i <= POSTFIXSIZE - 1; i++) {
 scanf("%c", &postfix[i]);
 if (postfix[i] == ')')
 {
 break;
 }
 }
 EvalPostfix(postfix);
return 0;
}
```

Output:



Conclusion:

1) Elaborate the evaluation of the following postfix expression in your program.

AB+C-

The provided program is specifically designed to assess postfix expressions. Let's take the expression "AB+C-" as an example to illustrate the process:

1. We start by placing 'A' onto the stack.
2. Next, 'B' is added to the stack.
3. Upon encountering the '+' operator, we remove 'B' and 'A' from the stack, perform the addition ('B + A' or 'B' plus 'A' in this context), and push the result back onto the stack.
4. We then add 'C' to the stack.
5. When we reach the '-' operator, we pop 'C' and the outcome of the prior addition ('B + A') from the stack, and perform the subtraction, yielding 'C - (B + A)'. This result is subsequently pushed back onto the stack.

Upon completing the evaluation of the entire expression, the program will display the final result, which corresponds to the answer for the "AB+C-" expression.

2) Will this input be accepted by your program. If so, what is the output?

To successfully process the input "AB+C-" using the program, it is essential to input specific values for 'A', 'B', and 'C' during the program's execution. The program will

then utilize these provided values to perform the expression evaluation, and the output it produces will be determined by these input values. In essence, you will need to furnish actual numerical values for 'A', 'B', and 'C' when the program is running in order to obtain the calculated result, which will be displayed as the program's output.