Assignment No.5

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TITLE:
Write a program using a stack for push, pop, peek, and isEmpty operations. Write is Balanced() Function that Iterates through the input expression, Pushes opening brackets onto the stack. For closing brackets, it checks the top of the stack for a matching opening bracket. Ensures that all opening brackets are matched by the end of the traversal. Main Function: Accepts a string expression from the user. Uses isBalanced() to determine if the parentheses in the expression are balanced.

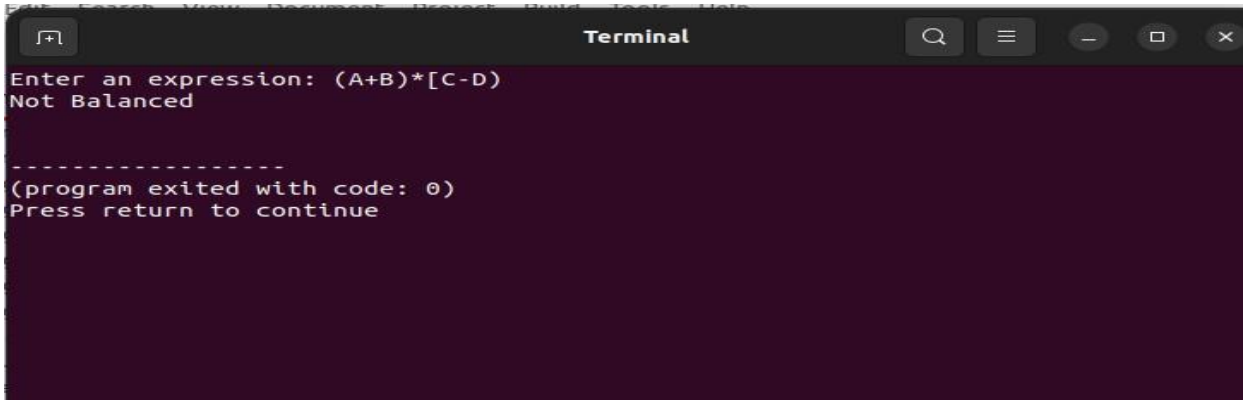
CODE:

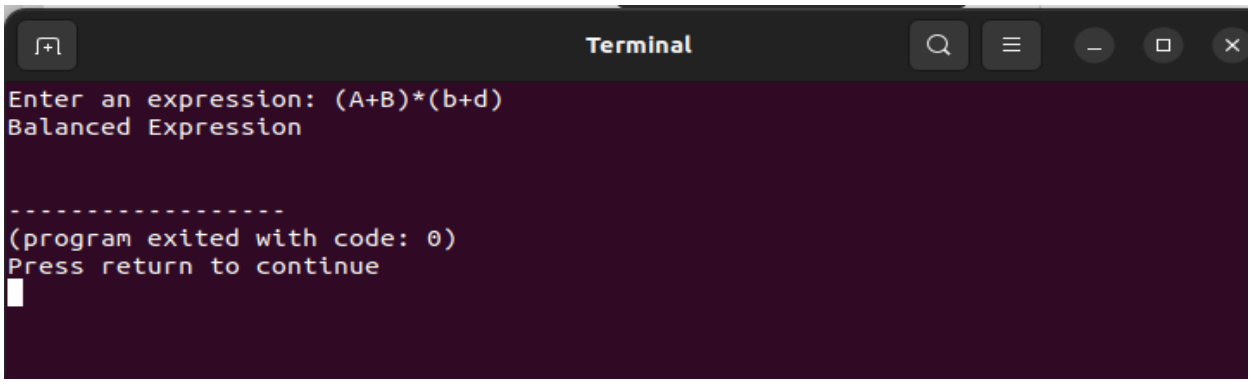
```
#include <iostream>
using namespace std;
#define MAX 100 // maximum size of stack
// Custom stack implementation
class Stack {
char
arr[MAX]; int
top;
public:
Stack() { top = -1; }
bool isEmpty() { return top == -1; }
bool isFull() { return top == MAX - 1;
}
void push(char c) {
if (!isFull()) {
arr[++top] = c;
}
}
char pop() {
if (!isEmpty()) {
 return arr[top--];
}

return '\0'; // return null char if empty
}
char peek() {
if (!isEmpty()) {
return arr[top];
}
return '\0';
}};
```

```
// Function to check if brackets are balanced
bool isBalanced(string expr) {
Stack s;
for (char ch : expr) {
if (ch == '(' || ch == '{' || ch == '[') {
s.push(ch);
}
else if (ch == ')' || ch == '}' || ch == ']')
{ if (s.isEmpty()) return false;
char top = s.pop();
if ((ch == ')' && top != '(') ||
(ch == '}' && top != '{') ||
(ch == ']' && top != '[')) {
return false;
}}}
return s.isEmpty();}
int main() {
string expression;
cout << "Enter an expression: ";
cin >> expression;
if (isBalanced(expression))
cout << "Balanced Expression " << endl;
else
cout << "Not Balanced " << endl;
return 0;
}
```

OUTPUT :





Syntax Parsing in Programming Languages:

Parsing expressions is a key step in many compilers and language processors. When a language's syntax requires parsing mathematical or logical expressions, converting between infix and postfix notation ensures that expressions are evaluated correctly. Accept an infix expression and show the expression in postfix form.

Program

```
#include <iostream>
#include <string>
using namespace std;
const int MAX_SIZE = 50;
class Stack {
private:
    char arr[MAX_SIZE];
    int top;
    int isOperator(char ch) {
        if (ch == '+' || ch == '-' || ch == '*' || ch == '/' || ch == '%'||ch=='^') {
            return 1;
        }
        return 0;  }
    int isOperand(char ch) {
        if ((ch >= 'a' && ch <= 'z') || (ch >= 'A' && ch <= 'Z') || (ch >= '0' && ch <= '9')) {
            return 1;
        }
        return 0;   }
    int precedence(char op) {
        if (op == '+' || op == '-')
            return 1;
        if (op == '*' || op == '/' || op == '%')
            return 2;
        if(op=='^')
        return 3;
        return 0;        }
public:
    Stack() {
        top = -1;
    }
    int isEmpty() {
        return (top == -1) ? 1 : 0;
    }
    int isFull() {
```

```
    return (top == MAX_SIZE - 1) ? 1 : 0;        }
void push(char ch) {
    if (isFull()) {
        cout << "Stack overflow" << endl;
        return;
    }
    arr[++top] = ch;
}
char pop() {
    if (isEmpty()) {
        return '\0';
    }
    return arr[top--];        }
char peek() {
    if (isEmpty()) { return '\0';    }
    return arr[top];          }
void infixToPostfix(const string& infix) {
    string postfix_output = "";
    for (char ch : infix) {
        if (isOperand(ch)) {
            postfix_output += ch;
        } else if (ch == '(') {
            push(ch);
        } else if (ch == ')') {
            while (isEmpty() == 0 && peek() != '(') {
                postfix_output += pop();
            }
            if (isEmpty() == 0 && peek() == '(') {
                pop();            }
        } else if (isOperator(ch)) {
            while (isEmpty() == 0 && peek() != '(' &&
                   precedence(ch) <= precedence(peek())) {
                postfix_output += pop();   }
            push(ch);
        } }
    while (isEmpty() == 0) {
        postfix_output += pop();
    }

    cout << "Postfix expression: " << postfix_output << endl;
}           };
```

```
int main() {
    string expression;
    cout << "Enter expression (e.g., A+B*C): ";
    cin >> expression;

    Stack s;
    s.infixToPostfix(expression);
    return 0;
}
```

Output: