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.

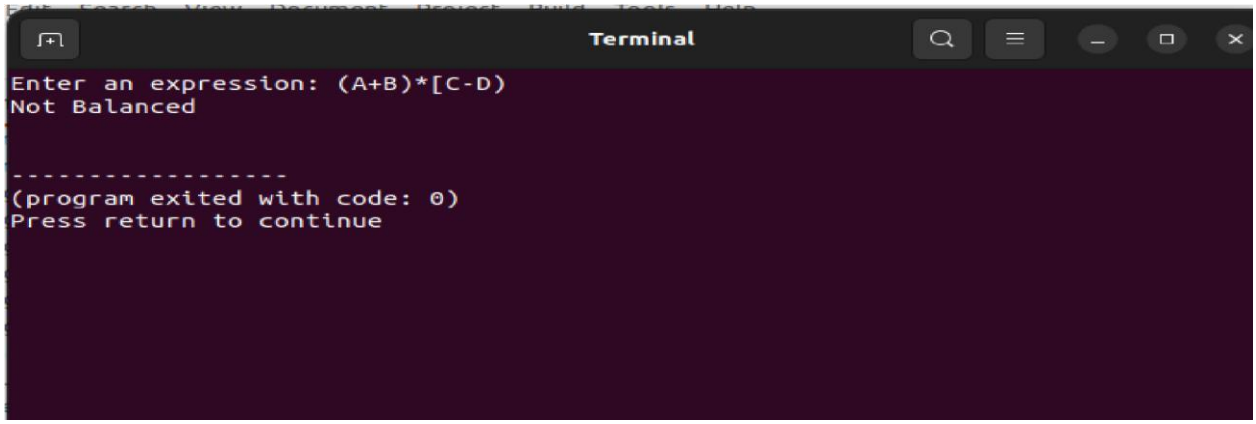
CODE:-

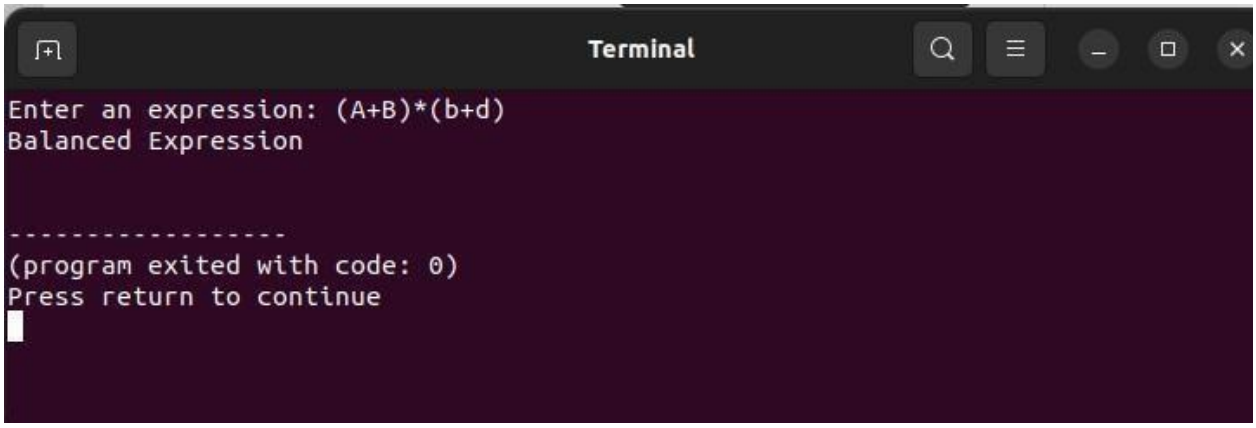
```
#include <iostream> using namespace std;

#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_S
   IZE - 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: