

Assignment 2: Lexical Analyzer and Parser for Boolean Expressions

System Programming 2023

Assigned: 19th October 2023 Due: 2nd November 2023

1 Task

Write a program that reads from terminal user-entered boolean expression. Boolean expressions have boolean operators (see table 1) applied to logical values (0 or 1).

The logical values can be supplied by:

(A) directly in the expression, ex: $0+1$, or

(B) can be assigned to a variable. The variables are represented by any letter followed by a number, ex: $x1$, $t2$, $s26$ - are all variables; values can be assigned to these variables using equality operator, ex: $x1 = 0$.

The following questions need to be implemented as per the input:

1. Enter expression from the terminal, and upon hitting enter, the value of the boolean expression should be displayed.
2. Use bitwise operators (see table 2¹) on variables².

¹Other operators such as left and right shift are also possible but not mandatory for this assignment.

²Essentially we should be able to supply input in decimal.binary representation to these operators, however, for the purposes of this assignment, applying them to 1 bit of 0 or 1 is okay. Youi can implement it for extra credit.

2 Sample Run

```
Activities Terminal
sakeena_shahid@sakeena-inspiron5570: ~/Desktop/sysprog/YACCDemo/BooleanParser-main
File Edit View Search Terminal Help
sakeena_shahid@sakeena-inspiron5570:~/Desktop/sysprog/YACCDemo/BooleanParser-main$ ./a.out
1+0
1
1+1
1
1.1
1
1.0
0
!1
0
!0
1
!00
1
syntax error
sakeena_shahid@sakeena-inspiron5570:~/Desktop/sysprog/YACCDemo/BooleanParser-main$
```

usage of logical operators

Note:

- Implication is not shown in this run.
- Syntax error appears when specified input is not supplied.

```
Activities Terminal
sakeena_shahid@sakeena-inspiron5570: ~/Desktop/sysprog/YACCDemo/BooleanParser-main
File Edit View Search Terminal Help
sakeena_shahid@sakeena-inspiron5570:~/Desktop/sysprog/YACCDemo/BooleanParser-main$ ./a.out
x1=0
x2=1
(x1+x2)
1
x1+!x2
0
x4=1
x4==>x2
1
x2==>x1
0
x1
0
x2
1
x1+x2+1
1
(!x2+x4)
1
!0.x2
1

```

assignment to variables

use of parenthesis

value of variable displayed

combination of variables and logical values

Note

- multiple expressions can be read and evaluated in a single run.

3 Submission

In lab-class discussion of your work. All files (input, lex, yacc) to be placed at appropriate places for easy compilation.

Please work on this assignment individually. If you think your programming is weak, then the assignment can be completed in groups of 2 (marks will be given accordingly).

Operator	Functionality
+	logical OR
.	logical AND
!	logical NOT
=>	implication
(boolean expression)	parenthesis have their usual meaning

Table 1: Table of Boolean Operators

Operator	Functionality
&	Bitwise AND
	Bitwise OR
^	Bitwise NOT

Table 2: Table of Bitwise Operators