CS421 Theory of Computation

SP16 Programming Assignment

Due Wednesday May 4 by 3 pm

Design and implement a pushdown automaton that accepts the language of all arithmetic expressions in a programming language that are syntactically correct. An arithmetic expression is syntactically correct if and only if it is generated by the context-free grammar below.

G = (V,T,S,P), where

V = { <expr>, <term>, <factor>, <id> }

T = { x, y, z, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, +, -, *, / , (,) }

<expr> is S, the start symbol

P:

```
<expr>    →   <expr> + <term> | <expr> - <term> | <term>

<term>    →   <term> * <factor> | <term> / <factor> | <factor>

<factor>  →   <id> | <dig> | (<expr>)

<id>      →   <letter> | <id><letter> | <id><digit> | <digit>

<letter   →   x | y | z

<digit>   →   <digit><digits> | 0 | 1 | 2 | 3 | 4 | 5 | 6 |7 | 8 | 9

<digits>  →   0 | 1 | 2 | 3 | 4 | 5 | 6 |7 | 8 | 9
```

1. This is a two-team student assignment.
2. Programming languages you can choose from: C, C++, Java. Your programs must run on empress.
3. For input: expressions such as:

   (x * y / (3 + z)),

   3 + 4 * 5,

   x * x * x

   Your program must display:

   “Expression is syntactically correct”

For input expressions such as:

```
  Z )(3 ** y

  f * x )

  / 5 y

((( z + 3 – x))
```

Your program must display:

```
“Expression is not an arithmetic expression”
```

4. You can prompt the user to input an expression or you can prompt the user to type the name of a file. If you do the latter name your file **`expressions.txt`**.

5. Upload the files with 1) your source code, 2) executable/runnable code, and 3) a README file where you describe how to compile and run your program. Name your files using your *lastnames*.

6. **Make sure that you start early to meet the deadline.** No hardcopies will be given credit. No emailed files will be given credit. Programs that cannot be compiled/run on empress will not be given credit.