实验：TINY 扩充语言的语法分析

一、实验内容：
1.tiny 语言的文法（语法）规则(BNF)

BNF中的TINY的文法

program → stmt-sequence
stmt-sequence → stmt-sequence ; statement | statement
statement → if-stmt | repeat-stmt | assign-stmt | read-stmt | write-stmt
if-stmt → **if** exp **then** stmt-sequence **end**
      | **if** exp **then** stmt-sequence **else** stmt-sequence **end**
repeat-stmt → **repeat** stmt-sequence **until** exp
assign-stmt → **identifier** := exp
read-stmt → **read identifier**
write-stmt → **write** exp
exp → simple-exp comparison-op simple-exp | simple-exp
comparison-op → < | =
simple-exp → simple-exp addop term | term
addop → + | –
term → term mulop factor | factor
mulop → * | /
factor → (exp) | **number** | **identifier**

2.tiny 语言的文法（语法）规则(EBNF)

EBNF中TINY语言的文法

program → stmt-sequence
stmt-sequence → statement { ; statement }
statement → if-stmt | repeat-stmt | assign-stmt | read-stmt | write-stmt
if-stmt → **if** exp **then** stmt-sequence [**else** stmt-sequence] **end**
repeat-stmt → **repeat** stmt-sequence **until** exp
assign-stmt → **identifier** := exp
read-stmt → **read identifier**
write-stmt → **write** exp
exp → simple-exp [comparison-op simple-exp]
comparison-op → < | =
simple-exp → term { addop term }
addop → + | –
term → factor { mulop factor }
mulop → * | /
factor → (exp) | **number** | **identifier**

3.在 1 或 2 的 Tiny 语言文法规则基础上扩充的新语法规则。

新的规则有：实现 while、do while、for、if 语句、+= 加法赋值运算符号（类似于 C 语言的 +=）

以及乘方运算符号，具体文法规则自行构造。

(1) While-stmt --> while exp do stmt-sequence endwhile

(2) Dowhile-stmt-->do stmt-sequence while(exp);

(3) for-stmt-->for identifier:=simple-exp to simple-exp do stmt-sequence enddo   步长递增 1

(4) for-stmt-->for identifier:=simple-exp downto simple-exp do stmt-sequence enddo 步长递减 1

(5) += 加法赋值运算符号以及乘方运算符号的文法规则请自行组织。

(6) 把 TINY 语言原有的 if 语句书写格式

    if_stmt-->if exp then stmt-sequence end | | if exp then stmt-sequence else stmt-sequence end

改写为：

    if_stmt-->if(exp) stmt-sequence else stmt-sequence | if(exp) stmt-sequence

二、要求：
  （1）要提供一个源程序编辑界面，以让用户输入源程序（可保存、打开源程序）
  （2）可由用户选择是否生成语法树，并可查看所生成的语法树。
  （3）应该书写完善的软件文档

三、完成时间：17 周周五上交

四、上交方法：
    由各班班长或学习委员将每个同学的实验源程序、可执行程序、测试用例、文档刻录成光盘。

五、完成方式：每个学生自行独立完成。

六、参考资料
1．百度云盘上《编译原理及实践》电子书
P14-P18,P52-P57,P97-P101,P136-P137,P141-P143,P257-P260,P296-P297,P346-P356
2．百度云盘上【Tiny 语言编译器源程序】

七、测试数据

测试文件 1：

```
{ Sample program
    in TINY language -
    computes factorial
}
read x; { input an integer }
if （0<x）  { don't compute if x <= 0 }
    fact := 1;
    do
        fact := fact * x;
        x := x - 1
    while ( 0<x );
    write fact;    { output factorial of x }
```

测试文件 2：

```
{ Sample program
    in TINY language -
    computes factorial
}
read x; { input an integer }
if ( 0<x ) { don't compute if x <= 0 }
    for    fact := x downto 1 do
        fact := fact * x;
    enddo
    write fact;    { output factorial of x }
```

测试文件 3：

```
{ Sample program
    in TINY language -
    computes factorial
}
read x; { input an integer }
if ( 0<x ) { don't compute if x <= 0 }
```

```
fact := 1;
while 0<x do
   fact := fact * x;
   x := x - 1
endwhile
write fact;    { output factorial of x }
```