The PL/0 Programming Language

PL/0 is a simple programming language introduced by Niklaus Wirth in 1976.

Reserved words: begin, call, const, do, end, if, odd, procedure, then, var, while

Punctuation Marks: . , ; := + - * / ( )

ident: any sequence of letters and digits that starts with a letter.
number: any sequence of digits
relation: any of the strings < > <= >= <>

The Grammar

<program> → <block> .
<block> → <const-decl> <vars-decl> <procs-decl> <statement>
<const-decl> → const <seqass> ; | ε
<seqass> → ident = number
| ident = number , <seqass>
<vars-decl> → var <seqident> ; | ε
<seqident> → ident
| ident , <seqident>
<procs-decl> → <procs-decl> procedure ident ; <block> ; | ε
<statement> → ident := <expression>
| call ident
| begin <seqstmt> end
| while <condition> do <statement>
| if <condition> then <statement>
| ε
<seqstmt> → <statement>
| <statement> ; <seqstmt>
<expression> → <term> <seqterm> | <term> <seqterm>
<seqterm> → ε | <term> <seqterm>
<term> → + <term> | - <term>
<seqterm> → <condition> odd <expression>
<condition> → <term> <seqfactor>
<seqfactor> → ε | * <factor> <seqfactor>
| / <factor> <seqfactor>
<factor> → ident | number | ( <expression> )
Description
In this homework you are required to write a Lex and Yacc program that recognizes correct
PL/0 programs. Your Lex and Yacc program should use a symbol table defined as follows:

```c
/* ##########################################
   definition of an entry to the symbol table
   type = 0 when the identifier is an integer.
   type = 1 when the identifier is a function.
   is_initialized = 1 if the identifier is initialized.
   ########################################## */

typedef struct
{
   char name[MAX_ID_LEN];
   int type;
   int is_initialized;
} entry;

entry table[MAX_TABLE_LEN];

/* ##########################################
   declaration of the install_id procedure
   declaration of the install_id procedure *
*/
entry *install_id(char *);

Note that the same identifier maybe declared twice when e.g., inside a procedure and
outside of a procedure. Also, note that procedures take no parameters. The scope of a variable
is defined in a standard way (i.e., a procedure will inherit a variable that was declared in a
higher level).

Your Yacc program may also output arbitrary statistics of your liking.

Error-Handling
Your Yacc program should also handle the following errors:
  • Syntax Errors. It should print the line of the error and recover.
  • It should report the use of an identifier without having declared it first.
  • It should issue a warning for using an identifier without having initialized it first.
  • Report if an identifier is declared twice.

What to Submit
Submit (i) short description of your code (1 page) (ii) the Yacc and Lex code (iii) the output
of your program in the three sample files to be found in the web-site of the class (Use of
“PRINTSCREEN” is highly recommended).

The whole assignment should be prepared as a single file using MS Word or other word-
processing / type-setting software package of your liking. The first page should contain only: (i)
your name, (ii) the class number “CSE 244”, (iii) the semester “Fall 2003”, (iv) the homework
number “Homework #4”.

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