Fundamentals of Programming Languages

Programming Assignment # 2
Interpreter for a First Language Plus (*FirLan* +)
(30 Points)
Due April 7, 2001

A. **Given *FirLan+* Syntax described in BNF rules:**

<program> → <prog_name> PROG_START; **<blocks>** PROG_END;
<prog_name> → <ident>
<blocks> → <block> | <block> <blocks>
<block> → BLOCK_BEGIN <stmts> BLOCK_END;
<stmts> → <stmt> | <stmt> <stmts>
<stmt> → <assign> | <write> | **<read> | <blocks>**
<write> → Write (**<varl>**);
<read> → Read (<varl>);
<assign> → <var> := <expr>;
<varl> → <var> | <var> , <varl>
<var> → <ident>
<ident> → <char> | <char> <ident>
<char> → A | B | C | … | Z | a | b | … | z
<expr> → <expr> + <term> | <expr> - <term> | <term>
<term> → <term> * <factor> | <term> / <factor> | <factor>
<factor> → (<expr>) | <var> | <integer>
<integer> → <digit> | <digit> <integer>
<digit> → 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

B. **Your Program**

Develop an interpreter for the *FirLan* + language. The interpreter should read a *FirLan* + source program from a file and write its output to an output file. The interpreter should write into the output file the results of excuting a statement only if it is syntacticaly correct. Otherwise, in case of a syntax error, your program should write into the output file the erronous line along with an error message indicating the type of error.

Example of error types are:
- unmatched blocks
- invalid expression
- invalid statement
- no value assigned to variable XX
- input error

The following program is an example of a correct *FirLan* + program:

```
ExampleProg
PROG_START ;
BLOCK_BEGIN
A := 6;
B := 10;
Read ( C, D );
        BLOCK_BEGIN
                AA := C *  ( B  - A );
                AB := AA / C + D + 6;
                BLOCK_BEGIN
                        Write ( A, B, C, D );
                        Write ( AA, AB );
                BLOCK_END;
        BLOCK_END;
Read ( A , B , C );
D := 7;
E := 9;
        BLOCK_BEGIN
                BA :=  A /  3 * (B  - C * 2) ;
                BB := BA + B / A + D - E;
                Write ( A , B , C , D , E );
                Write ( BA,  BB );
        BLOCK_END;
BLOCK_END;
PROG_END ;
```

If the input to this program is:
2   5
3 9 2
then the output of the program is:
-6 10 2 5
32 27
3 9 -2 7 9
13 14

Important notes:

1- Your interpreter must read a *FirLan+* program from an input file named *firlan.in*.

2- Your interpreter must write the *FirLan* results into an output file named *firlan.out*.

3- The source file *firlan.ext* must include the following:

- your name, ID number
- Course title, number, and section number
- the statement of the problem
- a brief summary of your interpreter implementation method
- a dictionary of all global variables (name, type, and usage)
- for each procedure or function include the following:
    - Usage of the procedure or function
    - Meanings of the input variables
    - Meanings of the output variables

4- No assignment will be accepted after the due date.

5- Hand out a print out and a diskette contain all files.