

## Assignment 4 – Yacc

Language : python

lex.l:

```
%{
    #include<stdio.h>
    #include<stdlib.h>
    #include<string.h>
    #include "y.tab.h"
    int yylex(void);
    int yyerror(char* s);
    extern int yylval;
    int debug=0;
    int line=1;
}%

newline [\n]

/* Rules Section*/
%%
[ \t]+ ;
{newline} {++line;}

"-"?[0-9]+ {return NUM;}

"def" {return DEF;}
"for" {return FOR;}
"in" {return IN;}
"if" {return IF;}
"else" {return ELSE;}
"return" {return RETURN;}

[a-zA-Z_][a-zA-Z0-9_]* {return ID;}

(","|"("|")"|"["|"]"|" ":" ) {return *yytext;}
("+","-","*","/","//","%"|"**") {return ARITHMETIC_OP;}
(">","<",">=","<=","=="|"!=") {return RELATIONAL_OP;}
("+=","-=","*=","/=","=") {return ASSIGNMENT_OP;}
"~" {return *yytext;}
"@ " {return *yytext;}

[^a-zA-Z0-9_]"[".*"]" {return LIST;}
("#"|"."|" ","|"("|")"|"'"') {return *yytext;}

. {fprintf(stderr,"Unknown token found: [%s]\n", yytext);}
```

%%

yacc.y:

```
%{
#include <stdio.h>
#include <stdlib.h>
#include <fcntl.h>
#include <unistd.h>
int ylex(void);
extern FILE* yyin;
#include "y.tab.h"
int error = 0;
extern int line;
%}
```

%token DEF FOR IN IF ELSE RETURN ARITHMETIC\_OP RELATIONAL\_OP  
ASSIGNMENT\_OP ID NUM LIST

%%

```
long_stmt: statement long_stmt
         | statement
         ;
```

```
statement: DEF ID '(' expr ')' ':' '~' long_stmt '@'
         | FOR ID IN ID '(' expr ')' ':' '~' long_stmt '@'
         | cond_stmt
         | RETURN ID
         | assign_statement
         ;
```

```
cond_stmt: IF expr ':' '~' long_stmt '@' ELSE ':' '~' long_stmt '@'
         | IF expr ':' '~' long_stmt '@'
         ;
```

```
assign_statement: assign_statement ASSIGNMENT_OP expr
                 | expr
                 ;
```

```
expr: expr ARITHMETIC_OP expr
     | expr RELATIONAL_OP expr
     | expr ',' expr
     | ID '(' expr ')'
     | ID
     | NUM
     | ID '[' ID ']'
     | LIST
```

```
;
%%

int yyerror(){
    fprintf(stderr, "Syntax is NOT valid!\nError at line: %d\n",
line);
    error = 1;
    return 0;
}

int yywrap(){
    return 1;
}

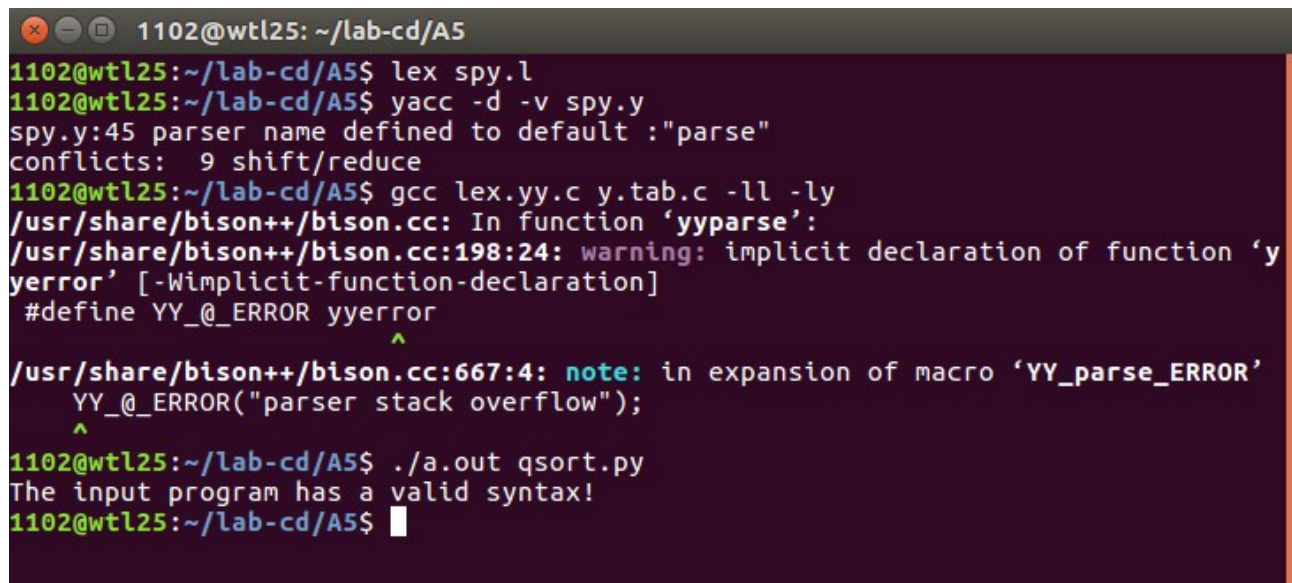
int main(int argc, char** argv){
    yyin = fopen(argv[1], "rt");
    if(!yyin)
    {
        printf("File not found!\n");
        return 0;
    }
    yyparse();
    if(!error){
        printf("The input program has a valid syntax!\n");
    }
    return 0;
}
```

qsort.py: (input python code)

```
def partition(arr, l, r):
~
    pivot = arr[l]
    p = r
    for i in range(r, l - 1 , -1):
~
        if arr[i] >= pivot:
~
            arr[i], arr[p] = arr[p], arr[i]
            p -= 1
        @
        a = 1
    @
    p += 1
    return p
@
```

```
def quick_sort(arr, l, r):
~
    if l < r:
~
        p = partition(arr, l, r)
        quick_sort(arr, l, p - 1)
        quick_sort(arr, p + 1, r)
    @
@
arr = [1, 5, 4, 2, 3, 6, 8, 7]
quick_sort(arr, 0, 7)
print(arr)
```

### Output:



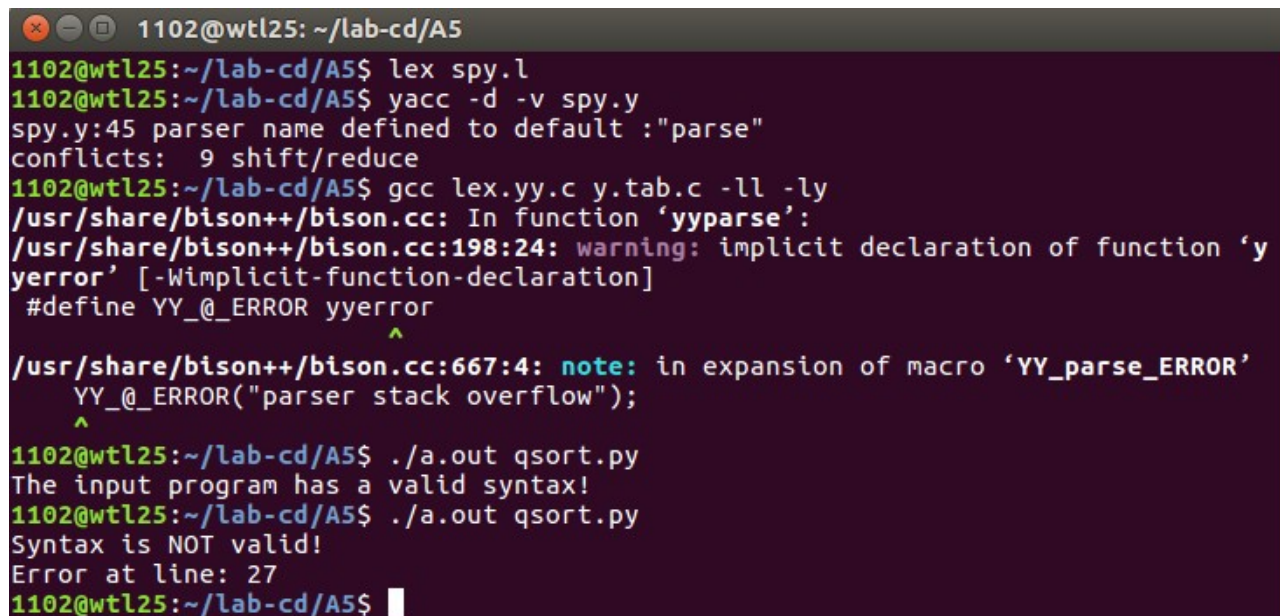
```
1102@wtl25: ~/lab-cd/A5
1102@wtl25:~/lab-cd/A5$ lex spy.l
1102@wtl25:~/lab-cd/A5$ yacc -d -v spy.y
spy.y:45 parser name defined to default : "parse"
conflicts: 9 shift/reduce
1102@wtl25:~/lab-cd/A5$ gcc lex.yy.c y.tab.c -ll -ly
/usr/share/bison++/bison.cc: In function 'yyparse':
/usr/share/bison++/bison.cc:198:24: warning: implicit declaration of function 'yyerror' [-Wimplicit-function-declaration]
#define YY_@_ERROR yyerror
                        ^
/usr/share/bison++/bison.cc:667:4: note: in expansion of macro 'YY_parse_ERROR'
YY_@_ERROR("parser stack overflow");
    ^
1102@wtl25:~/lab-cd/A5$ ./a.out qsort.py
The input program has a valid syntax!
1102@wtl25:~/lab-cd/A5$
```

Incase of wrong syntax:

```
def partition(arr, l, r):
~
    pivot = arr[l]
    p = r
    for i in range(r, l - 1, -1):
~
        if arr[i] >= pivot:
~
            arr[i], arr[p] = arr[p], arr[i]
            p -= 1
    @
    a = 1
    @
```

```
    p += 1
    return p
@
def quick_sort(arr, l, r):
~
    if l < r:
~
        p = partition(arr, l, r)
        quick_sort(arr, l, p - 1)
        quick_sort(arr, p + 1, r)
    @
@
arr = [1, 5, 4, 2, 3, 6, 8, 7 #node closing ']' - line 27
quick_sort(arr, 0, 7)
print(arr)
```

### Output:



```
1102@wtl25: ~/lab-cd/A5
1102@wtl25:~/lab-cd/A5$ lex spy.l
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                        ^
/usr/share/bison++/bison.cc:667:4: note: in expansion of macro 'YY_parse_ERROR'
    YY_@_ERROR("parser stack overflow");
    ^
1102@wtl25:~/lab-cd/A5$ ./a.out qsort.py
The input program has a valid syntax!
1102@wtl25:~/lab-cd/A5$ ./a.out qsort.py
Syntax is NOT valid!
Error at line: 27
1102@wtl25:~/lab-cd/A5$
```