Compiler Design assignment 2

Extend Lab 4 and Lab 5 codes to support IF, IF ELSE, IF ELSE IF blocks

Details

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Extended Lab 4 :

- lexer.l

```
%{
#include<stdio.h>
#include "y.tab.h"
void yyerror(char *s);
int yylineno;
%}

letter [a-zA-Z_]
digit [0-9]
sign [+-]?
fraction (\.{digit}+)?
exp ([Ee][+-]{digit}+)?
number {sign}{digit}*{fraction}{exp}
id {letter}({letter}|{digit})*

%x state

%%
"//".* ;
```

```
\/\* {yymore(); BEGIN state;}
<state>[' '|\t] {yymore(); BEGIN state;}
<state>[\n] {yymore(); ++yylineno; BEGIN state;}
<state>[^\*] {yymore(); BEGIN state;}
<state>"*"[^/] {yymore(); BEGIN state;}
<state>"*"\/ BEGIN 0 ;

main return MAIN;
int return INT;
char return CHAR;
float return FLOAT;
double return DOUBLE;
for return FOR;
do return DO;
while return WHILE;
if return IF;
else return ELSE;
#include return INCLUDE;
{id} return ID;

"+" return *yytext;
"-" return *yytext;

{number} return NUMBER;
{id}\.h return HEADER;

"++" return INC;
"--" return DEC;

">=" return GREATEREQ;
"<=" return LESSEREQ;
"==" return EQCOMP;
"!=" return NOTEQ;

"&&" return ANDAND;
"||" return OROR;

\r ;
```

```
\t ;
[' '] ;
\n { ++yylineno; };

. return *yytext;


%%
int yywrap()
{
return(1);
}
```

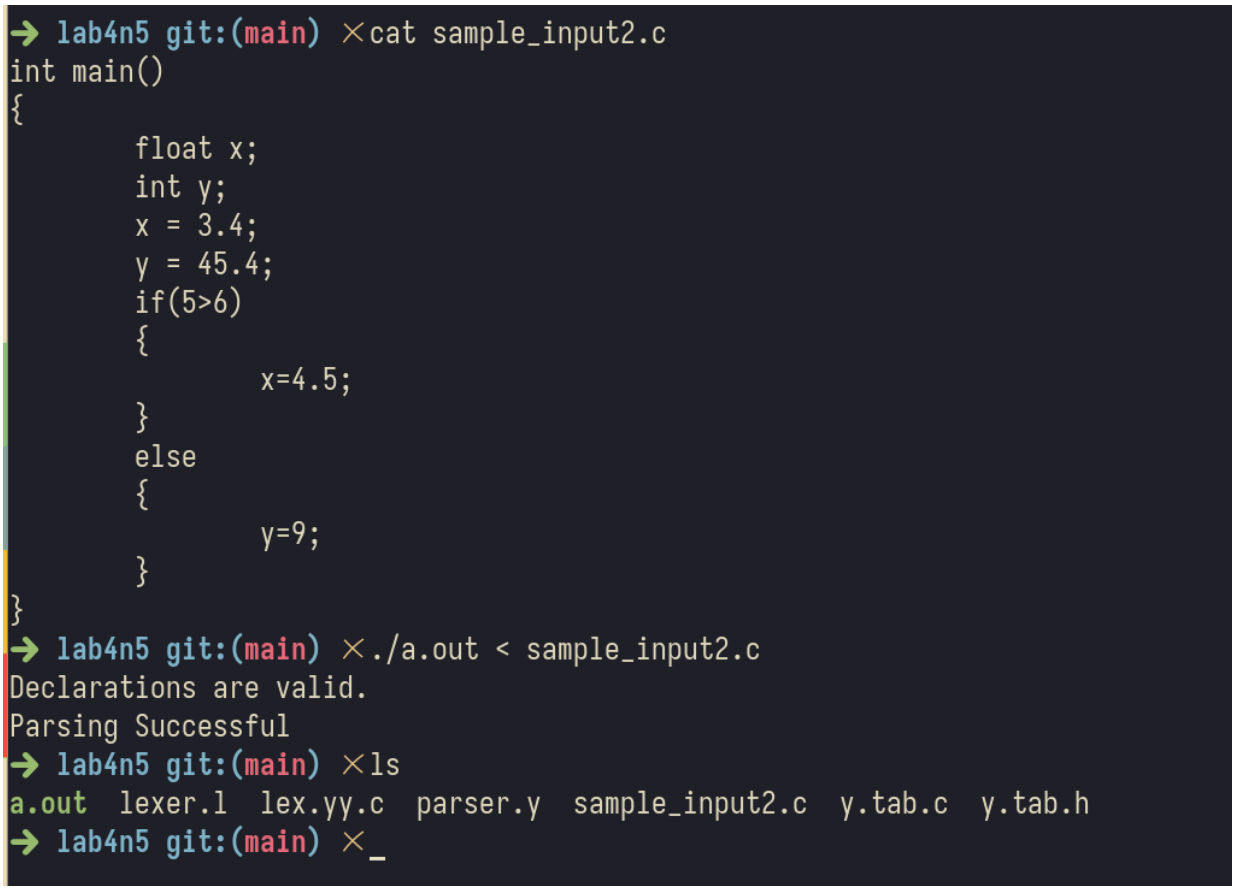
- parser.y :

```
%{
#include<stdio.h>
#include<stdlib.h>
int yylex();
void yyerror(char *s);
extern int yylineno;
extern char *yytext;
%}

%token INT FLOAT DOUBLE CHAR FOR WHILE DO IF ELSE
INCLUDE MAIN ID NUMBER HEADER
GREATEREQ LESSEREQ EQCOMP NOTEQ INC DEC ANDAND OROR
%left '+' '-'
%left '*' '/'

%%
Start : Prog { printf("Declarations are valid.\n");
YYACCEPT; };
Prog: INCLUDE '<' HEADER '>' Prog | MainF Prog | Declr
';' Prog | Assgn ';' Prog |
ArrayDecl ';' Prog | error ';' {yyerrok;yyclearin;} Prog
|;
```

```
ArrayDecl: ID Bracket;
Bracket: '[' NUMBER ']' Bracket| '[' ID ']'Bracket| ;
Declr: Type ListVar;
ListVar: ListVar ',' ID | InitDeclr | ArrayDecl | ID;
InitDeclr: Assgn ',' InitDeclr | Assgn;
Type: INT | FLOAT | DOUBLE | CHAR;
Unary_operator: '&' | '*' | '+' | '-' | '~' | '!';
IncDec: INC | DEC ;
Assgn: ID '=' Expr | ID '=' Logical | ArrayDecl '=' Expr
| ArrayDecl '=' Logical;
Logical: ID ANDAND Logical | ID OROR Logical | ID;
Expr: Expr Relop E | Unary_operator ID | ID IncDec | E;
Relop: '<' | '>' | LESSEREQ | GREATEREQ | EQCOMP |
NOTEQ;

E: E '+' T | E '-' T | T;
T: T '*' F | T '/' F | F;
F: '(' Expr ')' | ID | NUMBER;
MainF: Type MAIN '(' Empty_ListVar ')' '{' Stmt '}';
Empty_ListVar: ListVar | ;
Stmt: SingleStmt Stmt | Block Stmt | ;
SingleStmt: Declr ';' | Assgn ';' | Cond ';' | IF '('
Cond ')' Stmt | IF '(' Cond
')' Stmt ELSE Stmt | WhileL | ForL | DoWhileL | error
';' {yyerrok;yyclearin;};
Block: '{' Stmt '}';

WhileL: WHILE '(' Cond ')' Loop_body;
Cond: Expr | Assgn | Logical;
Loop_body: '{' Stmt '}' | ;
multi_expression: Cond | Type Cond | multi_expression
',' Cond;
expression_statement : ';' | multi_expression ';';
ForL: FOR '(' expression_statement expression_statement
multi_expression ')'
Loop_body;
DoWhileL: DO Loop_body WHILE '(' Cond ')' ';';
%%
```

```
void yyerror(char *s)
{
 printf("Error: %s, Line number: %d, Token: %s\n", s,
yylineno, yytext);
}

int main()
{
 if(!yyparse())
 {
 printf("Parsing Successful\n");
 }
 else
 {
 printf("Unsuccessful\n");
 }
 return 0;
}
```

- Screenshot :



```
➜ lab4n5 git:(main) ✗cat sample_input2.c
int main()
{
        float x;
        int y;
        x = 3.4;
        y = 45.4;
        if(5>6)
        {
                x=4.5;
        }
        else
        {
                y=9;
        }
}
➜ lab4n5 git:(main) ✗./a.out < sample_input2.c
Declarations are valid.
Parsing Successful
➜ lab4n5 git:(main) ✗ls
a.out  lexer.l  lex.yy.c  parser.y  sample_input2.c  y.tab.c  y.tab.h
➜ lab4n5 git:(main) ✗_
```

Extending lab 5:

- lexer.l :

```
%{
    #define YYSTYPE char*
    #include <unistd.h>
    #include "y.tab.h"
    #include <stdio.h>
    extern void yyerror(const char *); // declare the error handling function
%}

/* Regular definitions */
digit    [0-9]
letter   [a-zA-Z]
id       {letter}({letter}|{digit})*
digits   {digit}+
opFraction       (\.{digits})?
opExponent       ([Ee][+-]?{digits})?
number   {digits}{opFraction}{opExponent}
%option yylineno

%%
\/\/(.*) ; // ignore comments
[\t\n] ; // ignore whitespaces
"<="             {return LTEQ;}
">="             {return GTEQ;}
"=="             {return EQQ;}
"!="             {return NEQ;}
"{"              {return OC;}
"}"              {return CC;}
"("              {return *yytext;}
")"              {return *yytext;}
"."              {return *yytext;}
","              {return *yytext;}
"*"              {return *yytext;}
```

```
"+"                {return *yytext;}
";"                {return *yytext;}
"-"                {return *yytext;}
"/"                {return *yytext;}
"="                {return *yytext;}
">"                {return GT;}
"<"                {return LT;}
{number}           {
                           yylval = strdup(yytext);
//stores the value of the number to be used later for
symbol table insertion
                           return T_NUM;
                   }
"if"               {return T_IF;}
"else"             {return T_ELSE;}
{id}               {
                                           yylval =
strdup(yytext); //stores the identifier to be used later
for symbol table insertion
                                           return T_ID;
                                   }
.                  {} // anything else => ignore
%%
```

- parser.y :

```
%{
        #include "quad_generation.c"
        #include <stdio.h>
        #include <stdlib.h>
        #include <string.h>

        #define YYSTYPE char*

        void yyerror(char* s);
// error handling function
        int yylex();
```

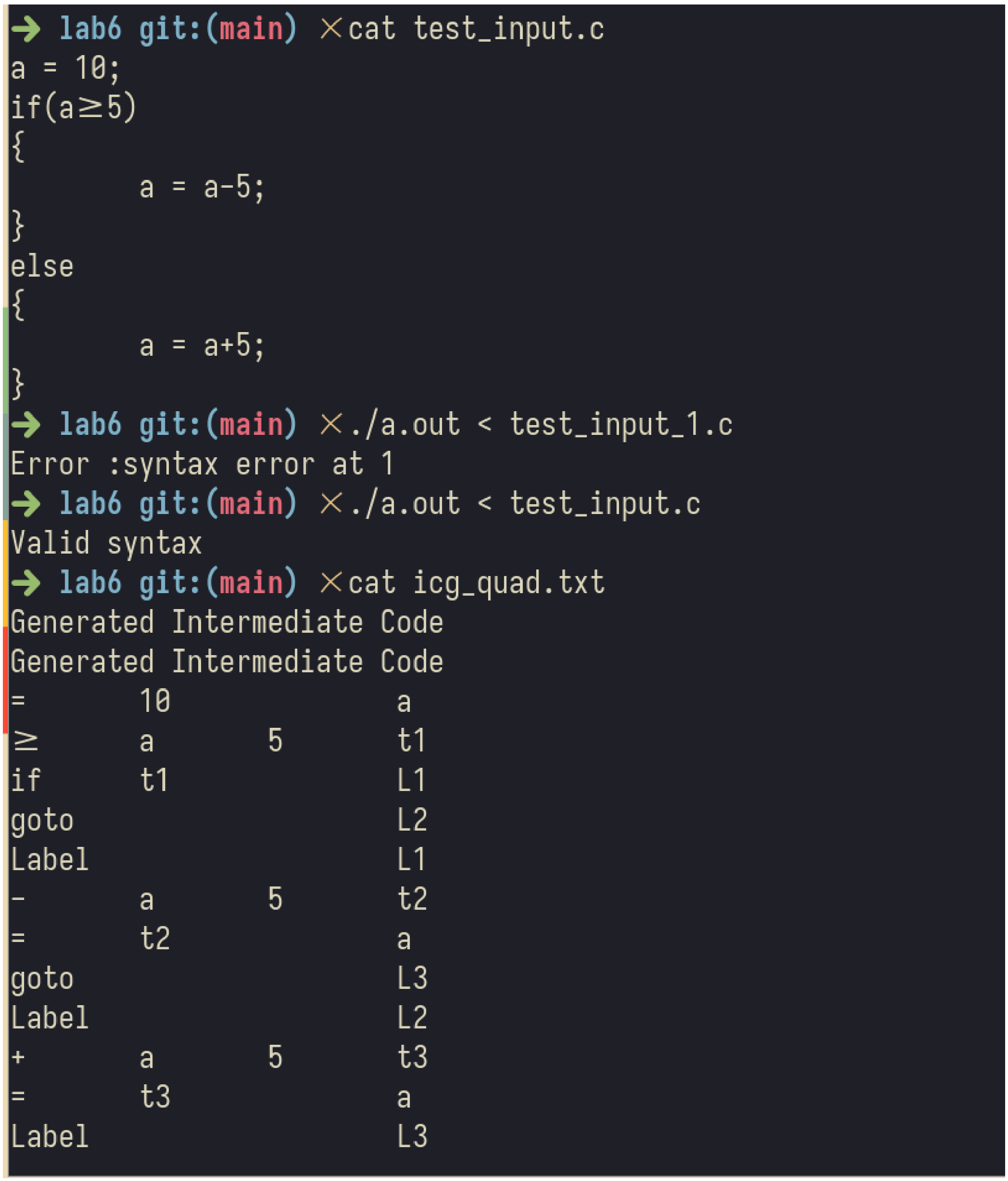
```
// declare the function performing lexical analysis
        extern int yylineno;
// track the line number

        FILE* icg_quad_file;
        int temp_no = 1;
        int label_no=1;
%}



%token T_ID T_NUM T_IF T_ELSE GTEQ LTEQ EQQ NEQ GT LT OC
CC
/* specify start symbol */
%start START

%nonassoc T_IF
%nonassoc T_ELSE

%%
START : S {
                printf("Valid syntax\n");
                YYACCEPT;
        };



/* Grammar for assignment */
ASSGN : T_ID '=' E      {

                                quad_code_gen($1, $3,
"=", " ");

                        }
        ;

/* Expression Grammar */
E : E '+' T     {
```

```
            $$ = new_temp();
            quad_code_gen($$, $1, "+", $3);
        }
    | E '-' T   {

                $$ = new_temp();
                quad_code_gen($$, $1, "-
", $3);
            }
    | T
    ;


T : T '*' F {
            $$ = new_temp();
            quad_code_gen($$, $1, "*", $3);
        }
    | T '/' F   {


                $$ = new_temp();
                quad_code_gen($$, $1,
"/", $3);
            }
    | F
    ;

F : '(' E ')'   {

            $$=strdup($2);
        }
    | T_ID      {
                    $$=strdup($1);
                }
    | T_NUM     {
                $$=strdup($1);
            }
```

```
         ;

S : T_IF '('C')' OC S CC
{quad_code_gen($3,"","Label","");} S
       | T_IF '('C')' OC S CC {
                                $2 = new_label();

quad_code_gen($2,"","goto","");

quad_code_gen($3,"","Label","");} T_ELSE OC S CC
{quad_code_gen($2,"","Label","");}S
       | ASSGN ';' S
       |'{'S'}'
       |
       ;

C : E rel E  {  $$ = new_temp();
                quad_code_gen($$, $1, $2, $3);
                $1 = new_label();
                quad_code_gen($1,$$,"if","");
                $$ = new_label();
                quad_code_gen($$,"","goto","");
                quad_code_gen($1,"","Label","");

                };

rel :  GT {strcpy($$,">");}
     | LT {strcpy($$,"<");}
     | LTEQ {strcpy($$,"<=");}
     | GTEQ {strcpy($$,">=");}
     | EQQ {strcpy($$,"==");}
     | NEQ {strcpy($$,"!=");}
     ;

%%


/* error handling function */
```

```
void yyerror(char* s)
{
        printf("Error :%s at %d \n",s,yylineno);
}


/* main function - calls the yyparse() function which
will in turn drive yylex() as well */
int main(int argc, char* argv[])
{

        icg_quad_file = fopen("icg_quad.txt","a");
        yyparse();
        fclose(icg_quad_file);
        return 0;
}
```

- Screenshots :



```
➜ lab6 git:(main) ✗cat test_input.c
a = 10;
if(a≥5)
{
        a = a-5;
}
else
{
        a = a+5;
}
➜ lab6 git:(main) ✗./a.out < test_input_1.c
Error :syntax error at 1
➜ lab6 git:(main) ✗./a.out < test_input.c
Valid syntax
➜ lab6 git:(main) ✗cat icg_quad.txt
Generated Intermediate Code
Generated Intermediate Code
=       10              a
≥       a       5       t1
if      t1              L1
goto                    L2
Label                   L1
-       a       5       t2
=       t2              a
goto                    L3
Label                   L2
+       a       5       t3
=       t3              a
Label                   L3
```