

# Compiler Construction Lab

Rishabh Kaushick, C3, 152

## Intermediate Code Generation

Assignment7\_postfix.l

ALPHA [A-Za-z]

DIGIT [0-9]

%%

{ALPHA}{{ALPHA}}{DIGIT}\* return ID;

{DIGIT}+ {yyval = atoi(yytext); return NUM; }

[\n\t] yyterminate();

. return yytext[0];

%%

Assignment7\_postfix.y

%token ID NUM

%right '='

%left '+' '-'

%left '\*' '/'

%left UMINUS

%%

S: ID{ push(); }='{ push(); }E{ codegen\_assign(); }

;

E: E'+'{ push(); }T{ codegen(); }

| E'-'{ push(); }T{ codegen(); }

| T

;

T: T'\*'{ push(); }F{ codegen(); }

| T'/'{ push(); }F{ codegen(); }

| F

```

;
F: '('E')'
| '-'{ push(); }F{codegen_umin();}%prec UMINUS
| ID{ push(); }
| NUM{ push(); }
;
%%

#include "lex.yy.c"
#include <ctype.h>
char st[100][10];
int top = 0;
char i_[2] = "0";
char temp[2] = "t";
int main()
{
printf("Enter expresstion: ");
yyparse();
}
void push()
{
strcpy(st[++top], yytext);
}
void codegen()
{
strcpy(temp, "t");
strcat(temp, i_);
printf("%s = %s %s %s\n", temp, st[top - 2], st[top - 1], st[top]);
top -= 2;
strcpy(st[top], temp);
i_[0]++;
}
void codegen_umin()

```

```
{
strcpy(temp, "t");
strcat(temp, i_);
printf("%s = -%s\n", temp, st[top]);
top--;
strcpy(st[top], temp);
i_[0]++;
}

void codegen_assign()
{
printf("%s = %s\n", st[top - 2], st[top]);
top -= 2;
}
```

## Screenshots

```
Activities Terminal Thu 23:52
rishabh@Rishabh-Lenovo: ~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction
rishabh@Rishabh-Lenovo:~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction$ lex Assignment7_postfix.l
rishabh@Rishabh-Lenovo:~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction$ yacc Assignment7_postfix.y
rishabh@Rishabh-Lenovo:~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction$ gcc y.tab.c -ll -ly
y.tab.c: In function 'yyparse':
y.tab.c:1124:16: warning: implicit declaration of function 'yylex' [-Wimplicit-function-declaration]
    yychar = yylex ();
                   ^
Assignment7_postfix.y:7:7: warning: implicit declaration of function 'push' [-Wimplicit-function-declaration]
S: ID( push(); )'='{ push(); }E{ codegen_assign(); }
Assignment7_postfix.y:7:7: warning: implicit declaration of function 'codegen_assign' [-Wimplicit-function-declaration]
S: ID( push(); )'='{ push(); }E{ codegen_assign(); }
Assignment7_postfix.y:9:7: warning: implicit declaration of function 'codegen' [-Wimplicit-function-declaration]
E: E'+'{ push(); }T{ codegen(); }
Assignment7_postfix.y:18:6: warning: implicit declaration of function 'codegen_umin' [-Wimplicit-function-declaration]
| '-'{ push(); }F{codegen_umin(); }%prec UMINUS
y.tab.c:1343:7: warning: implicit declaration of function 'yyerror'; did you mean 'yyerrok'? [-Wimplicit-function-declaration]
    yyerror (YY_("syntax error"));
    ^
yyerrok
Assignment7_postfix.y: At top level:
Assignment7_postfix.y:34:6: warning: conflicting types for 'push'
void push()
Assignment7_postfix.y:7:7: note: previous implicit declaration of 'push' was here
S: ID( push(); )'='{ push(); }E{ codegen_assign(); }
Assignment7_postfix.y:38:6: warning: conflicting types for 'codegen'
void codegen()
Assignment7_postfix.y:9:7: note: previous implicit declaration of 'codegen' was here
E: E'+'{ push(); }T{ codegen(); }
Assignment7_postfix.y:47:6: warning: conflicting types for 'codegen_umin'
void codegen_umin()
Assignment7_postfix.y:18:6: note: previous implicit declaration of 'codegen_umin' was here
| '-'{ push(); }F{codegen_umin(); }%prec UMINUS
```

```
Activities Terminal Thu 23:52
rishabh@Rishabh-Lenovo: ~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction
y.tab.c:1343:7: warning: implicit declaration of function 'yyerror'; did you mean 'yyerrok'? [-Wimplicit-function-declaration]
    yyerror (YY_("syntax error"));
    ^
yyerrok
Assignment7_postfix.y: At top level:
Assignment7_postfix.y:34:6: warning: conflicting types for 'push'
void push()
Assignment7_postfix.y:7:7: note: previous implicit declaration of 'push' was here
S: ID( push(); )'='{ push(); }E{ codegen_assign(); }
Assignment7_postfix.y:38:6: warning: conflicting types for 'codegen'
void codegen()
Assignment7_postfix.y:9:7: note: previous implicit declaration of 'codegen' was here
E: E'+'{ push(); }T{ codegen(); }
Assignment7_postfix.y:47:6: warning: conflicting types for 'codegen_umin'
void codegen_umin()
Assignment7_postfix.y:18:6: note: previous implicit declaration of 'codegen_umin' was here
| '-'{ push(); }F{codegen_umin(); }%prec UMINUS
Assignment7_postfix.y:56:6: warning: conflicting types for 'codegen_assign'
void codegen_assign()
Assignment7_postfix.y:7:7: note: previous implicit declaration of 'codegen_assign' was here
S: ID( push(); )'='{ push(); }E{ codegen_assign(); }
rishabh@Rishabh-Lenovo:~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction$ ./a.out
Enter expression: x=(a+b)*(c*d)+(e/f)
t0 = a + b
t1 = c * d
t2 = t0 * t1
t3 = e / f
t4 = t2 + t3
x = t4
rishabh@Rishabh-Lenovo:~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction$
```

## Postfix Expression

Assignment8.l

DIGIT [0-9]

%%

{DIGIT}+ {yyval=atoi(yytext);return ID;}

[-+\*/] {return yytext[0];}

. ;

\n yyterminate();

Assignment8.y

%{

#include<stdio.h>

#include<assert.h>

void push(int val);

%}

%token ID

%%

S : E {printf("= %d\n",top());}

;

E : E E '+' {push(pop()+pop());}

| E E '-' {int temp=pop();push(pop()-temp);}

| E E '\*' {push(pop()\*pop());}

| E E '/' {int temp=pop();push(pop()/temp);}

| ID {push(yyval);}

;

%%

#include"lex.yy.c"

int st[100];

int i=0;

void push(int val)

{

```
assert(i<100);  
st[i++]=val;
```

```
}
```

```
int pop()
```

```
{
```

```
    assert(i>0);
```

```
    return st[--i];
```

```
}
```

```
int top()
```

```
{
```

```
    assert(i>0);
```

```
    return st[i-1];
```

```
}
```

```
int main()
```

```
{
```

```
    yyparse();
```

```
    return 0;
```

```
}
```

## Screenshots

```

rishabh@Rishabh-Lenovo: ~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction
rishabh@Rishabh-Lenovo:~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction$ lex Assignment8.l
rishabh@Rishabh-Lenovo:~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction$ yacc Assignment8.y
rishabh@Rishabh-Lenovo:~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction$ gcc y.tab.c -ll -ly
y.tab.c: In function 'yyparse':
y.tab.c:1109:16: warning: implicit declaration of function 'yylex' [-Wimplicit-function-declaration]
    yychar = yylex ();
                   ^~~~~
Assignment8.y:8:22: warning: implicit declaration of function 'top' [-Wimplicit-function-declaration]
    S : E {printf("= %d\n",top());}
                   ^~~~
Assignment8.y:10:11: warning: implicit declaration of function 'pop'; did you mean 'popen'? [-Wimplicit-function-declaration]
    E : E E '+' {push(pop()+pop());}
                   ^~~~
y.tab.c:1274:7: warning: implicit declaration of function 'yyerror'; did you mean 'yyerrok'? [-Wimplicit-function-declaration]
    yyerror (YY_("syntax error"));
    ^~~~~~
    yyerrok
rishabh@Rishabh-Lenovo:~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction$ ./a.out
15 20 +
= 35
rishabh@Rishabh-Lenovo:~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction$ ./a.out
15 5 -
= 10
rishabh@Rishabh-Lenovo:~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction$ ./a.out
5 5 *
= 25
rishabh@Rishabh-Lenovo:~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction$
```

# Calculator

Assignment9\_calc.l

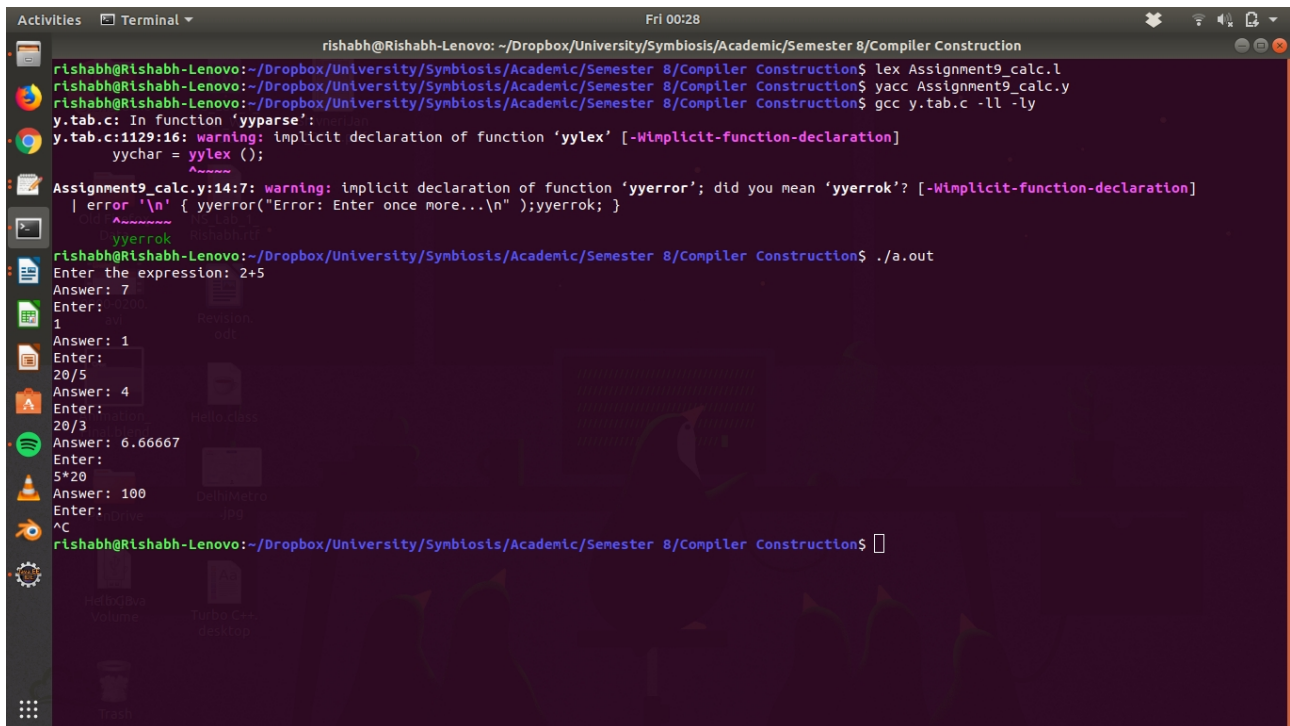
```
DIGIT [0-9]+\.[0-9]*\.[0-9]+
%%
[]
{DIGIT} {yyval=atof(yytext);return NUM;}
\n|. {return yytext[0];}
```

Assignment9\_calc.y

```
%{
#include<ctype.h>
#include<stdio.h>
#define YYSTYPE double
%}
%token NUM
%left '+' '-'
%left '*' '/'
%right UMINUS
%%
S : S E '\n' { printf("Answer: %g \nEnter:\n", $2); }
  | S '\n'
  | error '\n' { yyerror("Error: Enter once more...\n");yyerrok; }
;
E : E '+' E { $$ = $1 + $3; }
  | E '-' E { $$=$1-$3; }
  | E '*' E { $$=$1*$3; }
  | E '/' E { $$=$1/$3; }
  | '(' E ')' { $$=$2; }
  | '-' E %prec UMINUS { $$= -$2; }
  | NUM
;
%%
#include "lex.yy.c"
int main()
{
printf("Enter the expression: ");
yyparse();
}
```



## Screenshot



```

rishabh@Rishabh-Lenovo: ~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction
rishabh@Rishabh-Lenovo:~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction$ lex Assignment9_calc.l
rishabh@Rishabh-Lenovo:~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction$ yacc Assignment9_calc.y
rishabh@Rishabh-Lenovo:~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction$ gcc y.tab.c -ll -ly
y.tab.c: In function 'yyparse':
y.tab.c:1129:16: warning: implicit declaration of function 'yylex' [-Wimplicit-function-declaration]
    yychar = yylex ();
                  ^
Assignment9_calc.y:14:7: warning: implicit declaration of function 'yyerror'; did you mean 'yyerrok'? [-Wimplicit-function-declaration]
    | error '\n' { yyerror("Error: Enter once more...\n");yyerrok; }
                  ^
rishabh@Rishabh-Lenovo:~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction$ ./a.out
Enter the expression: 2+5
Answer: 7
Enter: 1
Answer: 1
Enter: 20/5
Answer: 4
Enter: 20/3
Answer: 6.66667
Enter: 5*20
Answer: 100
Enter: ^C
rishabh@Rishabh-Lenovo:~/Dropbox/University/Symbiosis/Academic/Semester 8/Compiler Construction$

```