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Founder: Prof. Dr. S. B. Mujumdar, M. Sc., Ph. D. (Awarded Padma Bhushan and Padma Shri by President of India)

Assignment No. 07

Subject:	Compiler Construction Lab
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Branch	CSE B2, Batch (2022-26)
Academic Year & Semester	2022-26
Date of Performance	09/09/2025
Title of Assignment:	Postfix Expression Evaluation.
Practice Questions	<ol style="list-style-type: none">YACC program for Postfix Expression Evaluation.YACC program for Conversion of Infix to Postfix expression. <p>PostLab Question</p> <p>3.YACC program for evaluating postfix expressions containing decimal numbers.</p>
Source Code	<pre>1. postfix.l %{ #include "postfix.tab.h" #include <stdlib.h> %} %% [0-9] { yyval = atoi(yytext); return NUMBER; } [+\-*/] { return yytext[0]; } \n { return '\n'; } . /* ignore other characters */ %%</pre>

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

postfix.y

```
%{  
#include <stdio.h>  
#include <stdlib.h>  
  
int yylex();  
void yyerror(const char *s);  
%}  
  
%token NUMBER  
  
%%  
input:  
/* empty */  
| input line  
;  
  
line:  
expr '\n' { printf("Result = %d\n", $1); }  
;  
  
expr:  
NUMBER           { $$ = $1; }  
| expr expr '+' { $$ = $1 + $2; }  
| expr expr '-' { $$ = $1 - $2; }  
| expr expr '*' { $$ = $1 * $2; }  
| expr expr '/' { $$ = $1 / $2; }  
;  
%%  
  
void yyerror(const char *s) {  
    fprintf(stderr, "Error: %s\n", s);  
}  
  
int main() {  
    printf("Enter postfix expression:\n");  
    yyparse();  
    return 0;  
}
```

2. **infix.l**

```
%{  
#include "infix.tab.h"  
%}  
  
%%  
[a-zA-Z] { yylval = *yytext; return ID; }  
[+\-*/0] { return yytext[0]; }  
\n { return '\n'; }  
[\t] { /* ignore spaces */ }  
. { /* ignore other characters */ }  
%%  
  
int yywrap() { return 1; }
```

infix.y

```
%{  
#include <stdio.h>  
#include <stdlib.h>  
  
int yylex();  
void yyerror(const char *s);  
void print(char c);  
%}  
  
%token ID  
  
%%  
input:  
/* empty */  
| input line  
;  
  
line:  
expr '\n' { printf("\n"); }  
;  
  
expr:  
expr '+' expr { print('+'); }  
| expr '-' expr { print('-'); }
```

```

| expr '*' expr { print('*'); }
| expr '/' expr { print('/'); }
| '(' expr ')' /* brackets handled */
| ID      { print($1); }
;
%%

void print(char c) {
    printf("%c", c);
}

void yyerror(const char *s) {
    fprintf(stderr, "Error: %s\n", s);
}

int main() {
    printf("Enter infix expression:\n");
    yyparse();
    return 0;
}

```

3.

postfix_decimal.l

```

%{
#include "postfix_decimal.tab.h"
#include <stdlib.h>
%}

%%

[0-9]+(\.[0-9]+)? { yyval.fval = atof(yytext); return NUMBER; }
[+\-*/]      { return yytext[0]; }
\n          { return '\n'; }
[\t]         { /* ignore spaces and tabs */ }
.            { /* ignore invalid characters */ }
%%

int yywrap() { return 1; }

```

postfix_decimal.y

```

%{
#include <stdio.h>
#include <stdlib.h>
%
```

```

int yylex();
void yyerror(const char *s);
%}

%union {
    float fval;
}

%token <fval> NUMBER
%type <fval> expr

%%

input:
/* empty */
| input line
;

line:
expr '\n' { printf("Result = %.2f\n", $1); }
;

expr:
NUMBER      { $$ = $1; }
| expr expr '+' { $$ = $1 + $2; }
| expr expr '-' { $$ = $1 - $2; }
| expr expr '*' { $$ = $1 * $2; }
| expr expr '/' {
    if ($2 == 0) {
        yyerror("Division by zero");
        YYABORT;
    } else {
        $$ = $1 / $2;
    }
}
;

%%

void yyerror(const char *s) {
    fprintf(stderr, "Error: %s\n", s);
}

int main() {
    printf("Enter postfix expression (with decimals):\n");
}

```

	<pre> yyparse(); return 0; } </pre>
Output Screenshot	<p>1.</p> <pre> battlemachine@DESKTOP-FU1975B:~/CCL\$ mkdir Exp7 battlemachine@DESKTOP-FU1975B:~/CCL\$ cd Exp7/ battlemachine@DESKTOP-FU1975B:~/CCL/Exp7\$ nano postfix.l battlemachine@DESKTOP-FU1975B:~/CCL/Exp7\$ nano postfix.y battlemachine@DESKTOP-FU1975B:~/CCL/Exp7\$ bison -d postfix.y battlemachine@DESKTOP-FU1975B:~/CCL/Exp7\$ flex postfix.l battlemachine@DESKTOP-FU1975B:~/CCL/Exp7\$ gcc lex.yy.c postfix.tab.c -o postfix battlemachine@DESKTOP-FU1975B:~/CCL/Exp7\$ ls lex.yy.c postfix postfix.l postfix.tab.c postfix.tab.h postfix.y battlemachine@DESKTOP-FU1975B:~/CCL/Exp7\$./postfix Enter postfix expression: 23*54**9- Result = 17 23*54**9- Result = 17 234**+ Result = 14 ^C </pre> <p>2.</p> <pre> battlemachine@DESKTOP-FU1975B:~/CCL/Exp7\$ nano infix.y battlemachine@DESKTOP-FU1975B:~/CCL/Exp7\$ nano infix.y battlemachine@DESKTOP-FU1975B:~/CCL/Exp7\$ bison -d infix.y infix.y: warning: 16 shift/reduce conflicts [-Wconflicts-sr] infix.y: note: rerun with option '-Wcounterexamples' to generate conflict counterexamples battlemachine@DESKTOP-FU1975B:~/CCL/Exp7\$ flex infix.l battlemachine@DESKTOP-FU1975B:~/CCL/Exp7\$ gcc lex.yy.c infix.tab.c -o infix battlemachine@DESKTOP-FU1975B:~/CCL/Exp7\$ ls infix infix.l infix.tab.c infix.tab.h infix.y lex.yy.c postfix postfix.l postfix.tab.c postfix.tab.h postfix.y battlemachine@DESKTOP-FU1975B:~/CCL/Exp7\$./infix Enter infix expression: a+b*c-d abcd-** a+b ab+ (a+b)*c ab+* a+b*c-d abcd-** ^C </pre>

```
battlemachine@DESKTOP-FU1975B:~/CL/Exp$ nano infix.l
battlemachine@DESKTOP-FU1975B:~/CL/Exp$ nano infix.y
infix.y: warning: 16 shift/reduce conflicts [-Wconflicts=sr]
infix.y: note: return with option '-Wcounterexamples' to generate conflict counterexamples
battlemachine@DESKTOP-FU1975B:~/CL/Exp$ flex infix.y
battlemachine$ gedit infix.l
battlemachine$ cat infix.l
1 #include "infix.tab.h"
2 #include "infix.y"
3
4 int yylex();
5
6 void yywrap() { return; }
7
8 char yytext[100];
9
10 void yyerror(const char *s) {
11     fprintf(stderr, "%s\n", s);
12 }
13
14 void print(char c) {
15     printf("%c", c);
16 }
17
18 void yyerror(const char *s) {
19     fprintf(stderr, "%s\n", s);
20 }
21
22 void print(char c) {
23     printf("%c", c);
24 }
25
26 void print(char c) {
27     printf("%c", c);
28 }
29
30 void print(char c) {
31     printf("%c", c);
32 }
33
34 void print(char c) {
35     printf("%c", c);
36 }
37
38 void yyerror(const char *s) {
39     fprintf(stderr, "%s\n", s);
40 }
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3. PostLab Experiment

```

battlemachine@DESKTOP-FU1975B:/CCL/Exp$ nano postfix_decimal.l
battlemachine@DESKTOP-FU1975B:/CCL/Exp$ nano postfix_decimal.y
battlemachine@DESKTOP-FU1975B:/CCL/Exp$ bison -d postfix_decimal.y
battlemachine@DESKTOP-FU1975B:/CCL/Exp$ flex postfix_decimal.l
battlemachine@DESKTOP-FU1975B:/CCL/Exp$ gcc lex.yy.c postfix_decimal.tab.c -o postfix_decimal
battlemachine@DESKTOP-FU1975B:/CCL/Exp$ ls
infix_ infix.tab_c infix_y postfix_ postfix.tab_c postfix.y postfix_decimal.l postfix_decimal.tab.h
infix_l infix.tab_h lex.yyy.c postfix_l postfix.tab_h postfix_decimal postfix_decimal.tab.c postfix_decimal.y
battlemachine@DESKTOP-FU1975B:/CCL/Exp$ ./postfix_decimal
Enter postfix expression (with decimals):
23.5 4.2 + 2 *
Result = 55.40
5.5 2.2 +
Result = 7.70
10 3 /
Result = 3.33
^C
battlemachine@DESKTOP-FU1975B:/CCL/Exp$ 
```

The screenshot shows two terminal windows side-by-side. The left window displays the source code for a postfix decimal calculator, while the right window shows the resulting assembly-like output from the compiler.

Left Terminal (Source Code):

```
battleMachine@DESKTOP-FU1979B:~/Desktop$ nano postfix_decimal.y
battleMachine@DESKTOP-FU1979B:~/Desktop$ g++ -fasm-listing -S postfix_decimal.y
battleMachine@DESKTOP-FU1979B:~/Desktop$ g++ -fasm-listing -S postfix_decimal.tab.c -o postfix_decimal
```

Right Terminal (Assembly Output):

```
battleMachine@DESKTOP-FU1979B:~/Desktop$ ./postfix_decimal
144
2 #include <stdio.h>
3 #include <stropts.h>
4
5 int yylex();
6 void yyerror(const char *s);
7 {
8     union {
9         float fval;
10    } yylval;
11 }
12
13 token <val> NUMBER
14 type <val> expr
15
16 yyin;
17 input:
18     /* empty */
19     | input line
20     ;
21
22 line:
23     expr /*\n*/ { printf("Result = %.2f\n", $1); }
24     |
25
26 expr:
27     NUMBER
28     | expr expr '+' { $5 = $1 + $2; }
29     | expr expr '-' { $5 = $1 - $2; }
30     | expr expr '*' { $5 = $1 * $2; }
31     | expr expr '/' {
32         if ($2 == 0) {
33             yyerror("Division by zero");
34             YYABORT;
35         } else {
36             $5 = $1 / $2;
37         }
38     }
```

Conclusion

These experiments demonstrate the effective use of YACC and LEX for expression processing, converting infix to postfix and accurately evaluating both integer and decimal postfix expressions, showcasing the power of syntax analysis and compiler design principles in handling arithmetic expressions.