IT250 – AUTOMATA & COMPILER DESIGN

ASSIGNMENT 5

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1)

Code Written:

LEX CODE:

```
%{
    #include "y.tab.h"
    extern int yylval;
%}

%%

[0-9.0-9]+      {                       //Numbers are valid and can be
calculated
              yylval = atoi(yytext);
              return NUMBER;
            }

[ \t]+          ;  //White Spaces are ignored

.            { return yytext[0]; }
```

```
[a-zA-Z)]+    { return 0; }

\n           { return 0; }

%%

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

YACC CODE:

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

%token ID NUMBER

//Operator Associativity

%left '+' '-'
%left '*' '/' '%'
%left '^'


%%
Statement : Expression    { printf("Valid\n%d\n\n", $$); return 0;}

Expression :
    Expression '+' Expression { $$ = $1 + $3; }
    | Expression '-' Expression { $$ = $1 - $3; }
    | Expression '*' Expression { $$ = $1 * $3; }
    | Expression '/' Expression { $$ = $1 / $3;
      if($3 == 0){
            printf("Division by Zero!!");
            exit(0);
        }}
    | Expression '%' Expression { $$ = $1 % $3; }
```

```
    | Expression '^' Expression { $$ = $1 ^ $3; }
    | '-' ID { $$ = -$2; }
    | '-' NUMBER { $$ = -$2; }
    | '(' Expression ')' { $$ = $2; }
    | ID { $$ = $1;}
    | NUMBER { $$ = $1;}
    | error { exit(0);}
    ;
%%

int main() {
    yyparse();
}

void yyerror(char *msg) {
    printf("Invalid\n\n");
}
```

Outputs:

Here, the answer should be 0 and not 3. The example test case in the paper has a mistake.

```
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ yacc -d ex1.y
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ lex ex1.l
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ cc lex.yy.c y.tab.c -ll
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ ./a.out
(( 7 * 2 - 12 * 1 + 2) / 7) % 3
Valid
0
```

```
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ yacc -d ex1.y
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ lex ex1.l
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ cc lex.yy.c y.tab.c -ll
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ ./a.out
(2 * 4) + (4 / 5) + 5 - 2 - 1 * 7 %
Invalid
```

```
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ yacc -d ex1.y
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ lex ex1.l
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ cc lex.yy.c y.tab.c -ll
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ ./a.out
(5 ^ 12 * 4 / 2486 + ( 578 - 124) / 4))
Invalid
```

```
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ yacc -d ex1.y
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ lex ex1.l
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ cc lex.yy.c y.tab.c -ll
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ ./a.out
4 * 3.142 * r * r
Invalid
```

```
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ yacc -d ex1.y
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ lex ex1.l
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ cc lex.yy.c y.tab.c -ll
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ ./a.out
(5+4)*99/34+54-2
Valid
78
```

2)

Code Written:

LEX CODE:

```
%{
#include"y.tab.h"
extern int yylval;
%}
%%
[0-9]+  {yylval=atoi(yytext); return NUMBER;}

[ \t]+   ;

[\n]      return 0;
.       return yytext[0];
%%

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

YACC CODE:

```
%{
    #include<stdio.h>
    #include<stdlib.h>
    #include<string.h>
    int yylex(void);
```

```
    int yyerror(char *msg);
    int findPower(int, int);
    char password[100] = "";
    int i=0;
%}


%token NUMBER

//Operator Associativity

%left '+' '-'
%left '*' '/' '%'
%left '^'


%%

Statement:  Expression {printf("\n%d\n%s_%d\n\n", $$, password, $$);}
    ;


Expression:      Expression '+' Expression {printf("+"); $$ = $1 + $3;
password[i++] = '+';}

    |   Expression '*' Expression {printf("*");$$ = $1 * $3; password[i++] =
'*';}
    |   Expression '-' Expression {printf("-");$$ = $1 - $3; password[i++] = '-
';}
    |   Expression '/' Expression {printf("/");
        if($3 == 0){
            printf("Division by Zero!!");
            exit(0);
        }
        $$ = $1 / $3; password[i++] = '/';}
    |   Expression '%' Expression {printf("%%");$$ = $1 % $3; password[i++] =
'%';}
    |   Expression '^' Expression {printf("^");$$ = $1^$3; password[i++] = '^';}
    |   '(' Expression ')' {$$ = $2; }


    |   NUMBER     {printf("%d", yylval);

            //Append each digit to the password by this method, traversing
through the number
```

```
            int temp = yylval;
            int count = 0;

            // Counting number of digits
            while (temp > 0) {
                count++;
                temp /= 10;
            }

            // Main loop, to add each digit
            while (count > 0) {
                int digit = (yylval / findPower(10, count-1)) % 10;
                password[i++] = (char)(digit + 48);
                count--;
        }}

    | error { exit(0); }
    ;
%%


int main(){
    yyparse();
}

int findPower(int a, int b){
    int result = 1;
    for(int i=0; i<b; i++){
        result *= a;
    }
    return result;
}

int yyerror (char *msg) {
    return printf ("\nInvalid Expression\n");
}
```

Outputs:

```
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ lex ex2.l
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ yacc -d ex2.y
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ cc lex.yy.c y.tab.c -ll
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ ./a.out
8 ^ 10 / (5 * 3) + 10
810^53*/10+
10
810^53*/10+_10
```

The final % in this test case, as that will make it an invalid expression, so that has been omitted for the calculation purpose

```
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ lex ex2.l
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ yacc -d ex2.y
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ cc lex.yy.c y.tab.c -ll
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ ./a.out
(( (7 % 2) - 12 / 12 * 8) + 3)
72%1212/8*-3+
-4
72%1212/8*-3+_-4
```

```
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ lex ex2.l
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ yacc -d ex2.y
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ cc lex.yy.c y.tab.c -ll
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ ./a.out
(55 ^ 12 )* (4 / 2486) + ( 578 - 124) % 351
5512^42486/*578124-351%+
103
5512^42486/*578124-351%+_103
```

```
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ lex ex2.l
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ yacc -d ex2.y
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ cc lex.yy.c y.tab.c -ll
sachinprasanna@LAPTOP-740CVK81:/mnt/c/Users/91900/Desktop/Computer/Semester 4/IT250 - Automata and Compiler Design/Labs/assignment 6$ ./a.out
3+5*55-9/21
3555*+921/-
278
3555*+921/-_278
```

****