Assignment 4 : Write a program to evaluate an arithmetic expression, check built-in functions, and valid variables using YACC specification.

Tools used: Flex and bison

1. **To evaluate an arithmetic expression using YACC tool**

Source code:

4a.l:

```
%{
#include<stdio.h>
#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;
}
```

4a.y:

```
%{
```

```
    #include<stdio.h>
    int flag=0;

%}
%token NUMBER

%left '+' '-'
%left '*' '/' '%'
%left '(' ')'
%%
ArithmeticExpression: E{
         printf("\nResult=%d\n",$$);
         return 0;
        }
E:E'+'E {$$=$1+$3;}
 |E'-'E {$$=$1-$3;}
 |E'*'E {$$=$1*$3;}
 |E'/'E {$$=$1/$3;}
 |E'%'E {$$=$1%$3;}
 |'('E')' {$$=$2;}
 | NUMBER {$$=$1;}
;
%%

void main()
{
   printf("\nEnter Any Arithmetic Expression which can have operations
Addition, Subtraction, Multiplication, Divison, Modulus and Round
brackets:\n");
   yyparse();
  if(flag==0)
   printf("\nEntered arithmetic expression is Valid\n\n");

}
void yyerror()
```

```
{
   printf("\nEntered arithmetic expression is Invalid\n\n");
   flag=1;
}
```

O/P:

```
Enter Any Arithmetic Expression which can have operations Addition, Subtraction, Multiplication, Divison, Modulus and
 Round brackets:
3+(5*6)

Result=33

Entered arithmetic expression is Valid
```

```
Enter Any Arithmetic Expression which can have operations Addition, Subtraction, Multiplication, Divison, Modulus and
 Round brackets:
4*(4+

Entered arithmetic expression is Invalid
```

2. To evaluate or check built-in functions using YACC tool

Source code:

4b.l

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

%%
[0-9]+ {yylval=atoi(yytext); return NUMBER;}
remainder {return REMAINDER;}
sqrt {return SQRT;}
exp {return EXP;}
[\t] ;
[\n] return 0;
. return yytext[0];
%%
int yywrap()
```

```
{
return 1;
}
```

4b.y:

```
%{
#include <stdio.h>
#include <math.h>
int flag=0;
%}
%token REMAINDER SQRT EXP NUMBER
%%
ArithmeticExpression: E{
         printf("\nResult=%d\n",$$);
         return 0;
        }
E:REMAINDER'('NUMBER','NUMBER')' {if($5==0){printf("nan
error");return;} $$=$3%$5;}
 | SQRT'('NUMBER')' {if($3<0){printf("negative number");return;}
$$=sqrt($3);}
 | EXP'('NUMBER','NUMBER')' {$$=1;for(int i=0;i<$5;i++) {$$=$$*$3;}}
 | NUMBER {$$=$1;}
;
%%
void main()
{
   printf("\nEnter a built-in C function:\n");
   yyparse();
   if(flag==0)
   printf("\nEntered function is Valid\n\n");

}
void yyerror()
{
```

```
    printf("\nEntered function is Invalid\n\n");
    flag=1;
}
```

O/P:

```
Enter a built-in C function:
remainder(4,5)

Result=4

Entered function is Valid
```

```
Enter a built-in C function:
remainder(4,0)
nan error
Entered function is Valid
```

```
Enter a built-in C function:
sqrt(9)

Result=3

Entered function is Valid
```

```
Enter a built-in C function:
sqrt(4,5)

Entered function is Invalid
```

```
Enter a built-in C function:
exp(4,5)

Result=1024

Entered function is Valid
```

```
Enter a built-in C function:
exp(4)

Entered function is Invalid
```

3. To recognize valid variable name using YACC tool.

Source code:

4c.l:

```
%{
#include<stdio.h>
#include "y.tab.h"
%}

%%
new return NEW;
"[" return OPEN_SQ;
"]" return CLOSE_SQ;
"=" return EQ;
"," return COMMA;
"_" return UD;
(["\t"])+ return WS;
[a-zA-Z]+[a-zA-Z0-9]* return ID;
[0-9]+ return DIGIT;
\n return 0;
%%
```

4c.y:

```
%{
#include<stdio.h>
#include "y.tab.h"
%}
%token BUILTIN UD WS ID OPEN_SQ CLOSE_SQ EQ NEW SC COMMA DIGIT
%%
start :  varlist WS varlist  {printf(" NOT Valid Declaration \n");}
        |  varlist UD DIGIT  {printf("Valid Declaration \n");}
        |  varlist  {printf("Valid Declaration \n");}
        |  varlist UD varlist {printf("Valid Declaration \n");}
        | varlist : varlist COMMA ID | ID;
```

```
%%

int yywrap()
{ return 1;
}

int main()
{
   printf("\nEnter variable declaration  :  ");
   yyparse();
   return 1;
}

int yyerror(char *s)
{
   fprintf(stderr,"\n",s);
   return 1;
}
```

O/P:

```
Enter variable declaration  :  a=7
Valid Declaration
```

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