ALGORITHM:

Step1: Reading an expression.

Step2: Calculate the value of given expression

Step3: Display the value of the nodes based on the precedence.

Step4: Using expression rule print the result of the given values

PROGRAM CODE:

//Convert the BNF rules into YACC form and

//write code to generate Abstract Syntax Tree

LEX PART:

```
%{

#include"y.tab.h"

#include<stdio.h>

#include<string.h>

int LineNo=1;

%}

identifier [a-zA-Z][_a-zA-Z0-9]*

number [0-9]+|([0-9]*\.[0-9]+)

%%

main\(\) return MAIN;

if return IF;

else return ELSE;

while return WHILE;

int |

char |

float return TYPE;
```

```
{identifier} {strcpy(yylval.var,yytext);

return VAR;}

{number} {strcpy(yylval.var,yytext);

return NUM;}

\< |

\> |

\>= |

\<= |

== {strcpy(yylval.var,yytext);

return RELOP;}

[ \t] ;

\n LineNo++;

. return yytext[0];

%%
```

YACC PART:

```
%{

#include<string.h>

#include<stdio.h>

struct quad

{

char op[5];

char arg1[10];

char arg2[10];

char result[10];

}QUAD[30];
struct stack

{

int items[100];

int top;

}stk;

int Index=0,tIndex=0,StNo,Ind,tInd;

extern int LineNo;

%}

%union

{

char var[10];

}

%token <var> NUM VAR RELOP

%token MAIN IF ELSE WHILE TYPE

%type <var> EXPR ASSIGNMENT CONDITION IFST ELSEST WHILELOOP

%left '-' '+'

%left '*' '/'

%%

PROGRAM : MAIN BLOCK

;

BLOCK: '{' CODE '}'

;

CODE: BLOCK

| STATEMENT CODE

| STATEMENT

;
```

```
STATEMENT: DESCT ';'

| ASSIGNMENT ';'

| CONDST

| WHILEST

;

DESCT: TYPE VARLIST

;

VARLIST: VAR ',' VARLIST

| VAR

;

ASSIGNMENT: VAR '=' EXPR{

strcpy(QUAD[Index].op,"=");

strcpy(QUAD[Index].arg1,$3);

strcpy(QUAD[Index].arg2,"");

strcpy(QUAD[Index].result,$1);

strcpy($$,QUAD[Index++].result);

}

;

EXPR: EXPR '+' EXPR {AddQuadruple("+",$1,$3,$$);}
| EXPR '-' EXPR {AddQuadruple("-",$1,$3,$$);}
| EXPR '*' EXPR {AddQuadruple("*",$1,$3,$$);}
| EXPR '/' EXPR {AddQuadruple("/",$1,$3,$$);}
| '-' EXPR {AddQuadruple("UMIN",$2,"",$$);}
| '(' EXPR ')' {strcpy($$,$2);}
| VAR
| NUM




;
```

```
CONDST: IFST{

Ind=pop();

sprintf(QUAD[Ind].result,"%d",Index);

Ind=pop();

sprintf(QUAD[Ind].result,"%d",Index);

}

| IFST ELSEST

;

IFST: IF '(' CONDITION ')' {

strcpy(QUAD[Index].op,"==");

strcpy(QUAD[Index].arg1,$3);

strcpy(QUAD[Index].arg2,"FALSE");

strcpy(QUAD[Index].result,"-1");

push(Index);

Index++;

}

BLOCK { strcpy(QUAD[Index].op,"GOTO"); strcpy(QUAD[Index].arg1,"");

strcpy(QUAD[Index].arg2,"");

strcpy(QUAD[Index].result,"-1");

push(Index);

Index++;

};

ELSEST: ELSE{

tInd=pop();

Ind=pop();
```

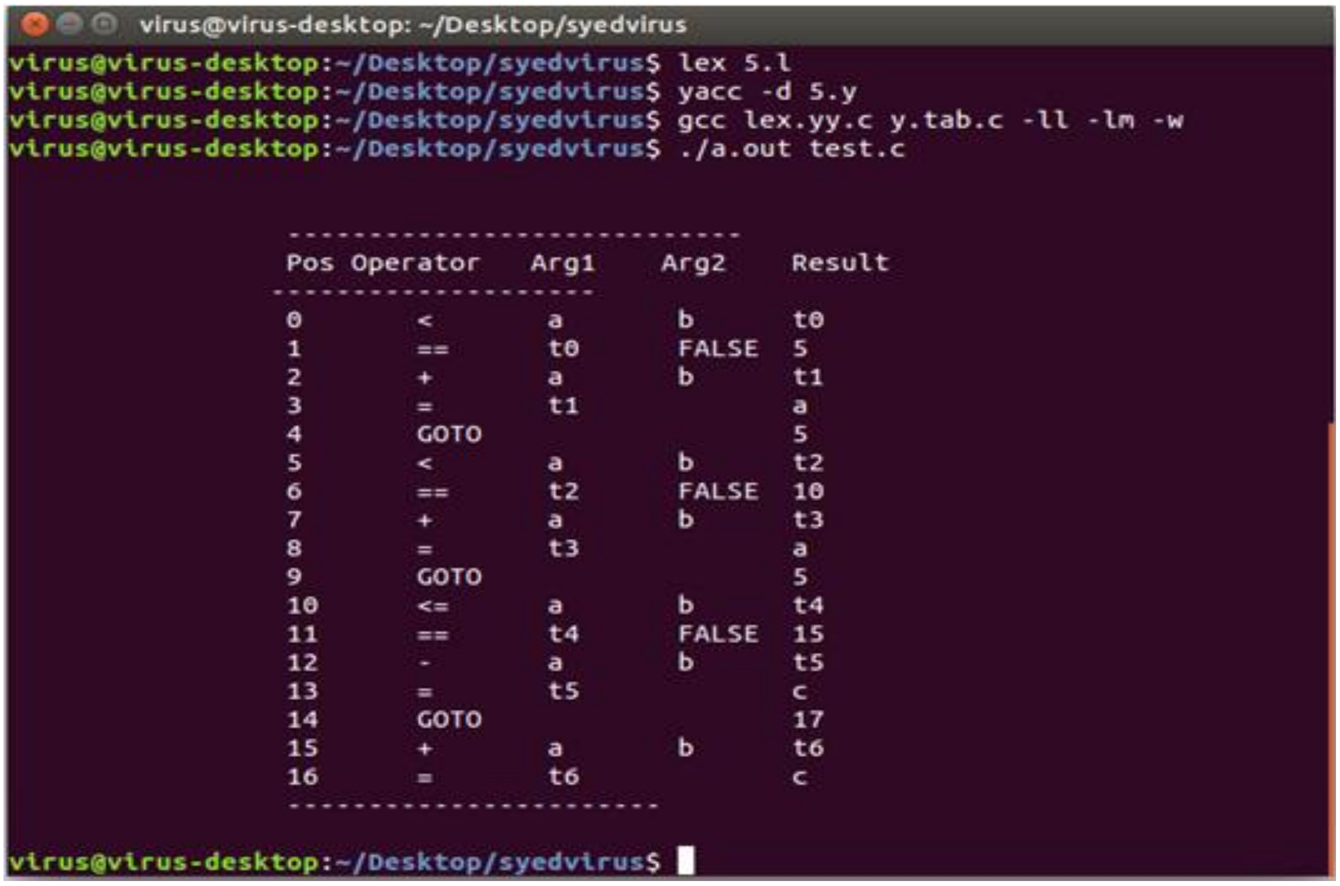
```
push(tInd);

sprintf(QUAD[Ind].result,"%d",Index);

}

BLOCK{

Ind=pop();

sprintf(QUAD[Ind].result,"%d",Index);

};

CONDITION: VAR RELOP VAR {AddQuadruple($2,$1,$3,$$);

StNo=Index-1;

}

| VAR

| NUM

;

WHILEST: WHILELOOP{

Ind=pop();

sprintf(QUAD[Ind].result,"%d",StNo);

Ind=pop();

sprintf(QUAD[Ind].result,"%d",Index);

}

;
WHILELOOP: WHILE'('CONDITION ')' {
strcpy(QUAD[Index].op,"==");
strcpy(QUAD[Index].arg1,$3);
strcpy(QUAD[Index].arg2,"FALSE");
strcpy(QUAD[Index].result,"-1");
push(Index);
Index++;
}
BLOCK {
strcpy(QUAD[Index].op,"GOTO");
strcpy(QUAD[Index].arg1,"");
strcpy(QUAD[Index].arg2,"");

strcpy(QUAD[Index].result,"-1");

push(Index);

Index++;

}

;

%%

extern FILE *yyin;
int main(int argc,char *argv[])
{

FILE *fp;
int i;
if(argc>1)
{
fp=fopen(argv[1],"r");
if(!fp)
{
printf("\n File not found");
exit(0);
}
yyin=fp;

}
yyparse();

printf("\n\n\t\t ----------------------------""\n\t\t Pos Operator \tArg1 \tArg2 \tResult" "\n\t\t---------------
-----");

for(i=0;i<Index;i++)

{

printf("\n\t\t %d\t %s\t %s\t %s\t%s",i,QUAD[i].op,QUAD[i].arg1,QUAD[i].arg2,QUAD[i].result);

}

printf("\n\t\t -----------------------");

printf("\n\n"); return 0; }

void push(int data)

{ stk.top++;
```

```
if(stk.top==100)

{

printf("\n Stack overflow\n");

exit(0);

}

stk.items[stk.top]=data;

}

int pop()

{

int data;

if(stk.top==-1)

{

printf("\n Stack underflow\n");

exit(0);

}

data=stk.items[stk.top--];

return data;

}

void AddQuadruple(char op[5],char arg1[10],char arg2[10],char result[10])

{

strcpy(QUAD[Index].op,op);

strcpy(QUAD[Index].arg1,arg1);

strcpy(QUAD[Index].arg2,arg2);

sprintf(QUAD[Index].result,"t%d",tIndex++);

strcpy(result,QUAD[Index++].result);
```

```
}

yyerror()

{

printf("\n Error on line no:%d",LineNo);

}
```

INPUT:

```
main()

{

int a,b,c;

if(a<b)

{

a=a+b;

}

while(a<b)

{

a=a+b;

}

if(a<=b)

{

c=a-b;

}

else

{

c=a+b;

}

}
```



```
virus@virus-desktop:~/Desktop/syedvirus$ lex 5.l
virus@virus-desktop:~/Desktop/syedvirus$ yacc -d 5.y
virus@virus-desktop:~/Desktop/syedvirus$ gcc lex.yy.c y.tab.c -ll -lm -w
virus@virus-desktop:~/Desktop/syedvirus$ ./a.out test.c


                ----------------------------
                Pos Operator   Arg1    Arg2    Result
               --------------------
                0       <       a       b       t0
                1       ==      t0      FALSE   5
                2       +       a       b       t1
                3       =       t1              a
                4       GOTO                    5
                5       <       a       b       t2
                6       ==      t2      FALSE   10
                7       +       a       b       t3
                8       =       t3              a
                9       GOTO                    5
                10      <=      a       b       t4
                11      ==      t4      FALSE   15
                12      -       a       b       t5
                13      =       t5              c
                14      GOTO                    17
                15      +       a       b       t6
                16      =       t6              c
                -----------------------

virus@virus-desktop:~/Desktop/syedvirus$
```