Ex No: 1
Date:

IMPLEMENT CODE TO RECOGNIZE TOKENS IN C

AIM:

To implement the program to identify C keywords, identifiers, operators, end statements like [], {} using C tool.

ALGORITHM:

- We identify the basic tokens in c such as keywords, numbers, variables, etc.
- Declare the required header files.
- Get the input from the user as a string and it is passed to a function for processing.
- The functions are written separately for each token and the result is returned in the form of bool either true or false to the main computation function.
- Functions are issymbol() for checking basic symbols such as () etc , isoperator() to check for operators like +, -, *, / , isidentifier() to check for variables like a,b, iskeyword() to check the 32 keywords like while etc., isInteger() to check for numbers in combinations of 0-9, isnumber() to check for digits and substring().
- Declare a function detecttokens() that is used for string manipulation and iteration then the result is returned from the functions to the main. If it's an invalid identifier error must be printed.
- Declare main function get the input from the user and pass to detecttokens() function.

PROGRAM:

```
#include<stdio.h>
int main(){
    int count=0,k=0,i=0;
    char a[25];
    printf("Enter expression : ");
    fgets(a,25,stdin);
    while(a[i]!='\0'){
        if(isalpha(a[i])){
            printf("%c - identifier\n",a[i]);
        }
        else if(a[i]=='+' || a[i]=='-'||a[i]=='*'||a[i]=='/'){
            printf("%c - arithmetic operator\n",a[i]);
        }
        else if(a[i]=='='){
            printf("%c - assignment operator\n",a[i]);
        }
        else if(isdigit(a[i])){
            char b[k];
            while(isdigit(a[i])){
                b[k++]=a[i];
                i++;
            }
            printf("%s - digit\n",b);
            k=0;
```

```
            i=i-1;
         }
         i++;
      }
   }
```

OUTPUT:

```
[root@localhost-Live 210701310]# vi 310.c
[root@localhost-Live 210701310]# cc 310.c
[root@localhost-Live 210701310]# ./a.out
Enter expression : b=a+c
b   - identifier
=   -  assignment operator
a   -  identifier
+  -  arithmetic operator
c   -  identifier
```

RESULT:

Ex No: 2
Date:

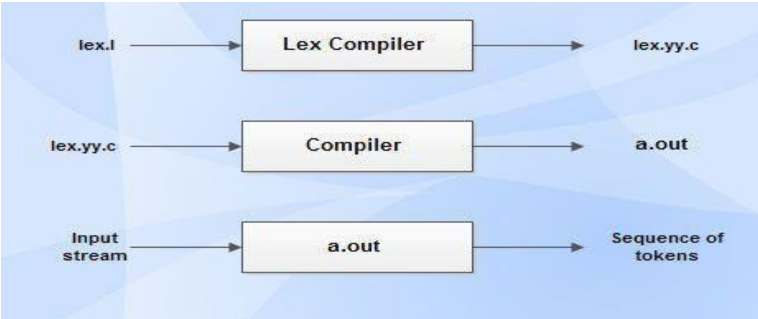
IMPLEMENT A LEXICAL ANALYZER TO COUNT THE NUMBER OF WORDS USING LEX TOOL

AIM:

To implement the program to count the number of words in a string using LEX tool.

STUDY:

Lex is a tool in lexical analysis phase to recognize tokens using regular expression. Lex tool itself is a lex compiler.



- lex.l is an a input file written in a language which describes the generation of lexical analyzer. The lex compiler transforms lex.l to a C program known as lex.yy.c.
- lex.yy.c is compiled by the C compiler to a file called a.out.
- The output of C compiler is the working lexical analyzer which takes stream of input characters and produces a stream of tokens.
- yylval is a global variable which is shared by lexical analyzer and parser to return the name and an attribute value of token.
- The attribute value can be numeric code, pointer to symbol table or nothing.
- Another tool for lexical analyzer generation is Flex.

STRUCTURE OF LEX PROGRAMS:

Lex program will be in following form

declarations

%%

translation rules

%%

auxiliary functions

ALGORITHM:

- Declare necessary header files and variables in the beginning.
- Define rules in the form of regular expressions to identify words and newline characters.
- Increment a counter each time a word is matched.
- Reset the counter when encountering a newline character and print the count.
- Implement the main function to initiate lexical analysis and return 0.

PROGRAM:

```
%{
#include<stdio.h>
#include<string.h>
int i = 0;
%}
/* Rules Section*/
%%
([a-zA-Z0-9])* {i++;} /* Rule for counting
number of words*/
"\n" {printf("%d\n", i); i = 0;}
%%
int yywrap(void){}
int main()
{
// The function that starts the analysis
yylex();
return 0;
}
```

OUTPUT:

```
[root@fedora student]# vi 310ex
[root@fedora student]# lex 310ex
[root@fedora student]# cc lex.yy.c
[root@fedora studenti#./a.out
I am Vinisha
3
```

RESULT:

Ex No: 3
Date:

DEVELOP A LEXICAL ANALYZER TO RECOGNIZE TOKENS USING LEX TOOL

AIM:

To implement the program to identify C keywords, identifiers, operators, end statements like [], {} using LEX tool.

ALGORITHM:

- Define patterns for C keywords, identifiers, operators, and end statements using regular expressions. Use %option noyywrap to disable the default behavior of yywrap.
- Utilize regular expressions to match patterns for C keywords, identifiers, operators, and end statements. Associate each pattern with an action to be executed when matched.
- Define actions to print corresponding token categories for matched patterns. Handle special cases like function declarations, numeric literals, and processor directives separately.
- Open the input file (sample.c in this case) for reading. Start lexical analysis using yylex() to scan the input and apply defined rules.
- Increment a counter (n) each time a newline character is encountered. Print the total number of lines at the end of the program execution.

PROGRAM:

```
%option noyywrap
letter [a-zA-Z]
digit [0-9]
id [_|a-zA-Z]
AO [+|-|/|%|*]
RO  [<|>|<=|>=|==]
pp [#]
%{
int n=0;
%}

%%
"void"                          printf("%s return type\n",yytext);
{letter}*[(][)]                 printf("%s  Function\n",yytext);
"int"|"float"|"if"|"else"       printf("%s keywords\n",yytext);
"printf"                                printf("%s keywords\n",yytext);
{id}({id}|{digit})*             printf("%s Identifier\n",yytext);
{digit}{digit}*                         printf("%d Numbers\n",yytext);
{AO}                                    printf("%s Arithmetic Operators\n",yytext);
{RO}                                    printf("%s Relational Operators\n",yytext);
{pp}{letter}*[<]{letter}*[.]{letter}[>] printf("%s processor
                                                        Directive\n",yytext);
[\n]                                    n++;
```

```
"."|","|"}"|"{"|";"                    printf("%s others\n",yytext);

%%
int main()
{
        yyin=fopen("sample.c","r");
        yylex();
        printf("No of Lines %d\n",n);
}
```

OUTPUT:

```
[root@fedora student]# vi 310ex3
[root@fedora student]# lex 310ex3
[root@fedora student]# cc lex.yy.c
[root@fedora student]#./a.out
#include<stdio.h> void main(){
int a,b;}
#include<stdio.h> processor Directive
void return type
main () Function
{ others
int keywords
a Identifier
, identifier
; others
    } others
```

RESULT:

Ex No: 4
Date:

DESIGN A DESK CALCULATOR USING LEX TOOL

AIM:

To create a calculator that performs addition, subtraction, multiplication and division using lex tool.

ALGORITHM:

- In the headers section declare the variables that is used in the program including header files if necessary.
- In the definitions section assign symbols to the function/computations we use along with REGEX expressions.
- In the rules section assign dig() function to the dig variable declared.
- In the definition section increment the values accordingly to the arithmetic functions respectively.
- In the user defined section convert the string into a number using atof() function.
- Define switch case for different computations.
- Define the main () and yywrap() function.

PROGRAM:

```
%{
int op = 0,i;
float a, b;
%}
dig [0-9]+|([0-9]*)"."([0-9]+)
add "+"
sub "-"
mul "*"
div "/"
pow "^"
ln \n
%%
{dig} {digi();}
{add} {op=1;}
{sub} {op=2;}
{mul} {op=3;}
{div} {op=4;}
{pow} {op=5;}
{ln} {printf("\n The Answer :%f\n\n",a);}
%%
digi(){
if(op==0)
a=atof(yytext);
else{
b=atof(yytext);
switch(op){
```

```
case 1:a=a+b;
break;
case 2:a=a-b;
break;
case 3:a=a*b;
break;
case 4:a=a/b;
break;
case 5:for(i=a;b>1;b--)
a=a*i;
break;
}
op=0; } }
main(int argv,char *argc[])
{
yylex();}
yywrap()
{
return 1;
}
```

OUTPUT:

```
[root@localhost-live 210701310]# vi ex4.1
[root@localhost-live 210701310]# lex ex4.1
[root@localhost-live 210701310]# cc lex-yy-c
[root@localhost-live 210701310]# -/a.out
5*5
The Answer : 25.000000
2+8
8-6
The Answer : 10.000000
The Answer : 2.000000
6/3
The Answer : 2.000000
```

RESULT:

Ex No: 5
Date:

RECOGNIZE AN ARITHMETIC EXPRESSION USING LEX AND YACC

AIM:

To check whether the arithmetic expression using lex and yacc tool.

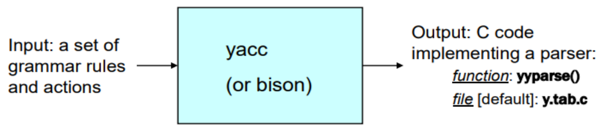
ALGORITHM:

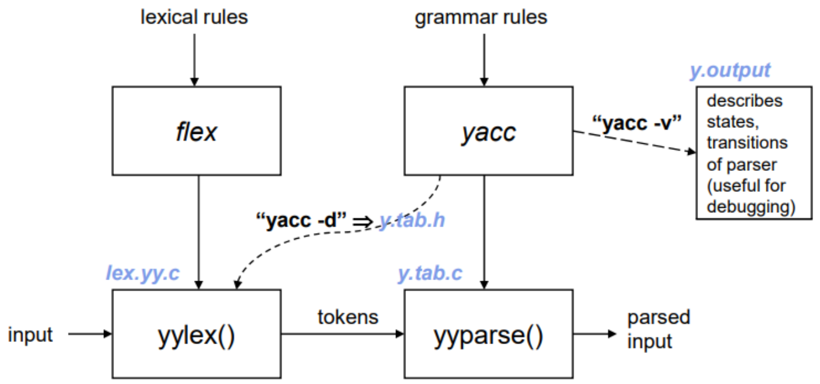
- Using the flex tool, create lex and yacc files.
- In the C include section define the header files required.
- In the rules section define the REGEX expressions along with proper definitions.
- In the user defined section define yywrap() function.
- Declare the yacc file inside it in the C definitions section declare the header files required along with an integer variable valid with value assigned as 1.
- In the Yacc declarations declare the format token num id op.
- In the grammar rules section if the starting string is followed by assigning operator or identifier or number or operator followed by a number or open parenthesis followed by an identifier. The x could be an operator followed by an identifier or operator or no operator then declare that as valid expressions by making the valid stay in 1 itself.
- In the user definition section if the valid is 0 print as Invalid expression in yyerror() and define the main function.

LEX AND YACC WORKING :

Parser generator:

- Takes a specification for a context-free grammar.
- Produces code for a parser.





PROGRAM:

validexp.l:

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

%%
[a-zA-Z]+ return VARIABLE;
[0-9]+ return NUMBER;
[\t] ;
[\n] return 0;
. return yytext[0];
%%
int yywrap()
{
return 1;
}
```

validexp.y:

```
 %{
   #include<stdio.h>
%}
%token NUMBER
%token VARIABLE

%left '+' '-'
%left '*' '/' '%'
%left '(' ')'

%%

S: VARIABLE'='E {
       printf("\nEntered arithmetic expression is Valid\n\n");
       return 0;
     }
E:E'+'E
 |E'-'E
 |E'*'E
 |E'/'E
 |E'%'E
 |'('E')'
 | NUMBER
 | VARIABLE
;
```

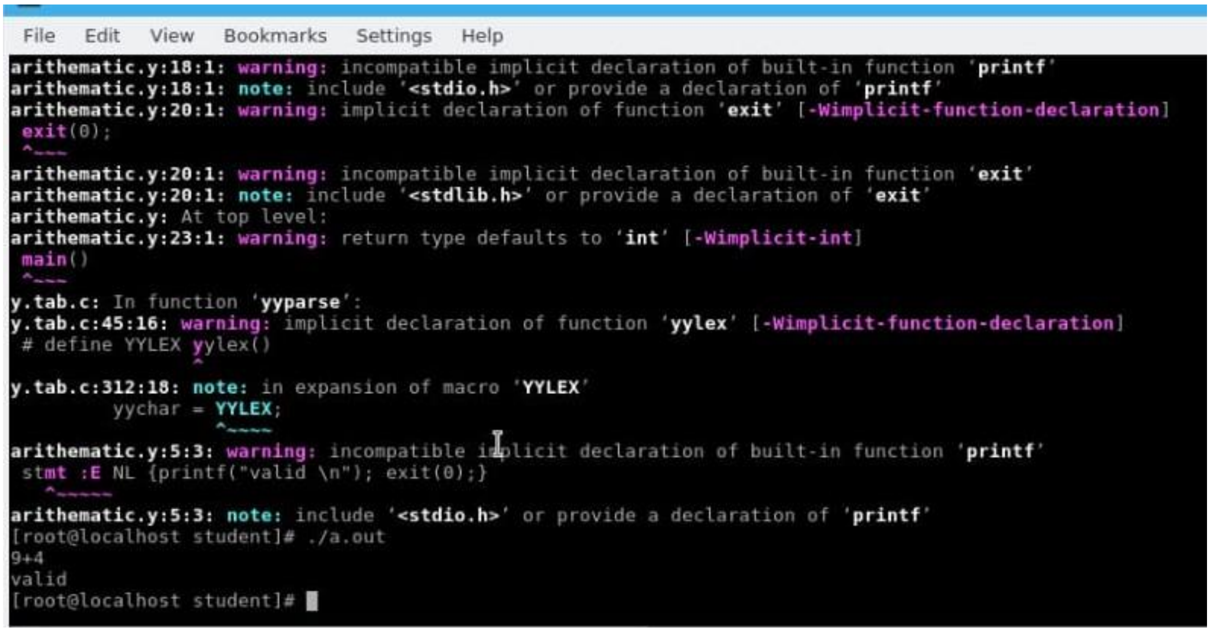
```
%%

void main()
{
  printf("\nEnter Any Arithmetic Expression which can have operations Addition,
Subtraction, Multiplication, Divison, Modulus and Round brackets:\n");
  yyparse();
}

void yyerror()
{
  printf("\nEntered arithmetic expression is Invalid\n\n");

}
```

OUTPUT:



RESULT:

Ex No: 6

Date:

RECOGNIZE A VALID VARIABLE WITH LETTERS AND DIGITS USING LEX AND YACC

AIM:

To recognize a valid variable which starts with a letter followed by any number of letters or digits.

ALGORITHM:

- Define lexical rules in variable.l with regex to match valid variables: start with a letter, followed by letters or digits. Tokenize input, distinguishing letters and digits.
- Use lexer (variable.l) to tokenize input into meaningful units like letters and digits.
- Implement grammar rules in parser (variable.y) for recognizing valid variable names using context-free grammar. Incorporate lexer tokens into parsing.
- In parser, implement error handling to detect invalid variable names. Set a flag (e.g., valid) to mark invalid identifiers.
- Check validity post-parsing; if flag remains true, indicate valid identifier. Otherwise, display message for invalid input.

PROGRAM:

variable.l:

```
%{
   #include "y.tab.h"
%}
%%
[a-zA-Z_][a-zA-Z_0-9]* return letter;
[0-9]                      return digit;
.                      return yytext[0];
\n                     return 0;
%%
int yywrap()
{
return 1;
}
```

variable.y:

```
%{
   #include<stdio.h>
   int valid=1;
%}
%token digit letter
```

```
%%
start : letter s
s :     letter s
      | digit s |;

%%
int yyerror()
{
   printf("\nIts not a identifier!\n");
   valid=0;
   return 0;
}
int main() {
   printf("\nEnter a name to test for an identifier: ");
   yyparse();
   if(valid) {
      printf("\nIt is a identifier!\n");
   } }
```

OUTPUT:

```
[root@localhost-live Liveuser]# vi 310ex6.l
[root@localhost-live Liveuser]# vi 310ex6.y
[root@localhost-live liveuser]# lex 310ex6.l
[root@localhost-live Liveuser]# yacc -d 310ex6.y
[root@localhost-live liveuser]# cc lex-yy-c y.tab.c
[root@localhost-live Liveuser]# ./a.out

Enter a name to test for an identifier: var

It is a identifier!
[rootaLocalhost-LiveLiveuser] #./a.out
```

RESULT:

Ex No: 7

Date:

EVALUATE EXPRESSION THAT TAKES DIGITS, *, + USING LEX AND YACC

AIM:

To perform arithmetic operations that takes digits,*, + using lex and yacc.

ALGORITHM:

- Define rules in evaluate.l to recognize digits and ignore whitespace, returning tokens for numbers. Utilize yylval to pass token values to parser.
- Break down input into tokens (numbers) in evaluate.l, associating each with its respective value.
- Use parser (evaluate.y) to implement grammar rules for arithmetic expressions, considering precedence and associativity of operators. Generate a result for each expression.
- Implement error handling in evaluate.y to detect invalid expressions. Set a flag if errors occur during parsing.
- After parsing, check if the flag remains unset. If so, indicate that the arithmetic expression is valid; otherwise, display an error message.

PROGRAM:

evaluate.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;
}
```

evaluate.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;
}
```

OUTPUT:

```
[root@localhost-live Liveuser]# vi 310ex7 l
[root@localhost-live liveuser]# vi 310ex7.y
iroot@localhost-live liveuser]# lex 310ex7.l
froot@localhost-live liveuser]# yacc -d 310ex7 y
[root@localhost-live liveuser]# cc lex.yy. y. tab.c
[root@localhost-live liveuser]#./a.out
Enter Any Arithmetic Expression which can have operations Addition, Subtraction, Multiplication, Divison, Modulus and Round brackets:
2+7
Result=9
Entered arithmetic expression is Valid
[root@localhost-live liveuser]#./a.out
Enter Any Arithmetic Expression which can have operations Addition, Subtraction, Multiplication, Divison, Modulus and Round brackets:
4*2
Result=8
Entered
arithmetic expression is Valid
```

RESULT:

Ex No: 8
Date:

GENERATE THREE ADDRESS CODES

AIM:

To generate three address code using C program.

ALGORITHM:

- Get address code sequence.
- Determine current location of 3 using address (for 1st operand).
- If the current location does not already exist, generate move (B, O).
- Update address of A (for 2nd operand).
- If the current value of B and () is null, exist.
- If they generate operator () A, 3 ADPR.
- Store the move instruction in memory.

PROGRAM:

```
#include<stdio.h>
#include<string.h>
#include<ctype.h>
 typedef struct
{
char var[10]; int alive;
}
regist;
regist preg[10];
void substring(char exp[],int st,int end)
{
int i,j=0;
char dup[10]="";
for(i=st;i<end;i++)
dup[j++]=exp[i];
dup[j]='0';

strcpy(exp,dup);
}

int getregister(char var[])
{
int i; for(i=0;i<10;i++)
{
if(preg[i].alive==0)
```

```
{
strcpy(preg[i].var,var);
break;
}
}
return(i);
}
void getvar(char exp[],char v[])
{
int i,j=0;
char var[10]="";
for(i=0;exp[i]!='\0';i++)
if(isalpha(exp[i]))
var[j++]=exp[i];
else
break;
strcpy(v,var);
}
void main()
{
char basic[10][10],var[10][10],fstr[10],op;
int i,j,k,reg,vc,flag=0;
printf("\nEnter the Three Address Code:\n");

for(i=0;;i++)
{
gets(basic[i]);
if(strcmp(basic[i],"exit")==0)
break;
}
printf("\nThe Equivalent Assembly Code is:\n");
for(j=0;j<i;j++)
{
getvar(basic[j],var[vc++]);
strcpy(fstr,var[vc-1]);
substring(basic[j],strlen(var[vc-1])+1,strlen(basic[j]));
getvar(basic[j],var[vc++]);
reg=getregister(var[vc-1]);
if(preg[reg].alive==0)
{
printf("\nMov R%d,%s",reg,var[vc-1]);
```

```
preg[reg].alive=1;
}
op=basic[j][strlen(var[vc-1])];
substring(basic[j],strlen(var[vc-1])+1,strlen(basic[j]));
getvar(basic[j],var[vc++]);
switch(op)
{
case '+':
printf("\nAdd");
break; case '-':
printf("\nSub");
break;
case '*':
printf("\nMul");
break;
case '/':
printf("\nDiv");
break;
}

flag=1;
for(k=0;k<=reg;k++)
{
if(strcmp(preg[k].var,var[vc-1])==0)
{
printf("R%d, R%d",k,reg);
preg[k].alive=0;
flag=0;
break;
}
}
if(flag)
{
printf(" %s,R%d",var[vc-1],reg);
printf("\nMov %s,R%d",fstr,reg);
}
strcpy(preg[reg].var,var[vc-3]);
}
}
```

OUTPUT:

```
vimal@KBVIMAL: ~
vimal@KBVIMAL:~$ vi 310.c
vimal@KBVIMAL:~$ gcc 310.c
310.c: In function ‘main’:
310.c:49:1: warning: implicit declaration of function ‘gets’; did you mean ‘fgets’? [-Wimplicit-function-declaration]
   49 | gets(basic[i]);
      | ^~~~
      | fgets
/usr/bin/ld: /tmp/ccANmy88.o: in function `main':
310.c:(.text+0x24d): warning: the `gets' function is dangerous and should not be used.
vimal@KBVIMAL:~$ ./a.out

Enter the Three Address Code:
a=o+v
exit

The Equivalent Assembly Code is:

Mov R0,o
Add v,R0
Mov a,R0vimal@KBVIMAL:~$
```

RESULT:

Ex No: 9
Date:

IMPLEMENT CODE OPTIMIZATION TECHNIQUES CONSTANT FOLDING

AIM:

To write a C program to implement Constant Folding (Code optimization Technique).

ALGORITHM:

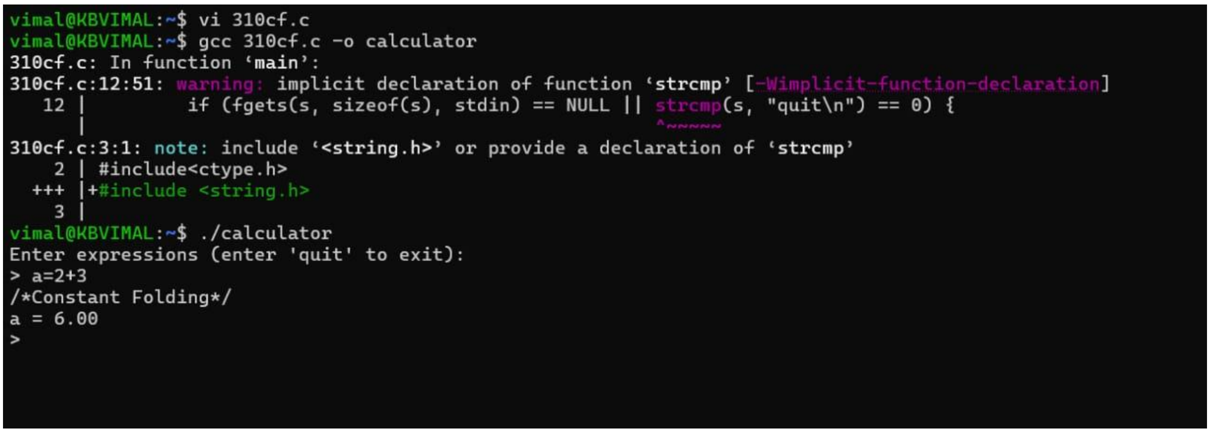
- The desired header files are declared.
- The two file pointers are initialized one for reading the C program from the file and one for writing the converted program with constant folding.
- The file is read and checked if there are any digits or operands present.
- If there is, then the evaluations are to be computed in switch case and stored.
- Copy the stored data to another file.
- Print the copied data file.

PROGRAM:

```
#include<stdio.h>
#include<string.h>
void main() {
        char s[20];
        char flag[20]="//Constant";
        char result,equal,operator;
        double op1,op2,interrslt;
        int a,flag2=0;
        FILE *fp1,*fp2;
        fp1 = fopen("input.txt","r");
        fp2 = fopen("output.txt","w");
        fscanf(fp1,"%s",s);
        while(!feof(fp1)) {
                if(strcmp(s,flag)==0) {
                        flag2 = 1;
                }
                if(flag2==1) {
                        fscanf(fp1,"%s",s);
                        result=s[0];
                        equal=s[1];
                        if(isdigit(s[2])&& isdigit(s[4])) {
                                if(s[3]=='+'||'-'||'*'||'/') {
                                        operator=s[3];
                                        switch(operator) {
                                                case '+':
                                                        interrslt=(s[2]-48)+(s[4]-48);
                                                        break;
                                                case '-':
                                                        interrslt=(s[2]-48)-(s[4]-48);
```

```
                        break;
                case '*':
                        interrslt=(s[2]-48)*(s[4]-48);
                        break;
                case '/':
                        interrslt=(s[2]-48)/(s[4]-48);
                        break;
                default:
                        interrslt = 0;
                        break; }
            fprintf(fp2,"/*Constant Folding*/\n");
            fprintf(fp2,"%c = %lf\n",result,interrslt);
            flag2 = 0;
        }
    } else {
        fprintf(fp2,"Not Optimized\n");
        fprintf(fp2,"%s\n",s);
    }
  } else {
    fprintf(fp2,"%s\n",s);
  }
  fscanf(fp1,"%s",s);
 }
 fclose(fp1);
 fclose(fp2);
}
```

OUTPUT:



```
vimal@KBVIMAL:~$ vi 310cf.c
vimal@KBVIMAL:~$ gcc 310cf.c -o calculator
310cf.c: In function ‘main’:
310cf.c:12:51: warning: implicit declaration of function ‘strcmp’ [-Wimplicit-function-declaration]
   12 |         if (fgets(s, sizeof(s), stdin) == NULL || strcmp(s, "quit\n") == 0) {
      |                                                   ^~~~~~
310cf.c:3:1: note: include ‘<string.h>’ or provide a declaration of ‘strcmp’
    2 | #include<ctype.h>
  +++ |+#include <string.h>
    3 |
vimal@KBVIMAL:~$ ./calculator
Enter expressions (enter 'quit' to exit):
> a=2+3
/*Constant Folding*/
a = 6.00
>
```

RESULT:

Ex No: 10

Date:

IMPLEMENT CODE OPTIMIZATION TECHNIQUES
DEAD CODE AND COMMON SUB EXPRESSION ELIMINATION

AIM:

To write a C program to implement the dead code elimination and common sub expression elimination (code optimization) techniques.

ALGORITHM:

- Start
- Create the input file which contains three address code.
- Open the file in read mode.
- If the file pointer returns NULL, exit the program else go to 5.
- Scan the input symbol from left to right.
- Store the first expression in a string.
- Compare the string with the other expressions in the file.
- If there is a match, remove the expression from the input file.
- Perform these steps 5-8 for all the input symbols in the file.
- Scan the input symbol from the file from left to right.
- Get the operand before the operator from the three address code.
- Check whether the operand is used in any other expression in the three address code.
- If the operand is not used, then eliminate the complete expression from the three-address code else go to 14.
- Perform steps 11 to 13 for all the operands in the three address code till end of the file is reached.
- Stop.

PROGRAM:

```
#include<stdio.h>

#include<conio.h>

#include<string.h>

 struct op
{
    char l;
    char r[20];
  }
op[10], pr[10];

void main()
{
  int a, i, k, j, n, z = 0, m, q;
```

```
  char * p, * l;
  char temp, t;
  char * tem;
  clrscr();
  printf("enter no of values");
  scanf("%d", & n);
  for (i = 0; i < n; i++)
{
    printf("\tleft\t");
    op[i].l = getche();
    printf("\tright:\t");
    scanf("%s", op[i].r);
  }
  printf("intermediate Code\n");
  for (i = 0; i < n; i++)
{
    printf("%c=", op[i].l);
    printf("%s\n", op[i].r);
  }
  for (i = 0; i < n - 1; i++)
{
    temp = op[i].l;
    for (j = 0; j < n; j++)
{
      p = strchr(op[j].r, temp);
      if (p)
{
        pr[z].l = op[i].l;
        strcpy(pr[z].r, op[i].r);
        z++;

      }
    }
  }
  pr[z].l = op[n - 1].l;
  strcpy(pr[z].r, op[n - 1].r);
  z++;
  printf("\nafter dead code elimination\n");
  for (k = 0; k < z; k++)
   {
    printf("%c\t=", pr[k].l);
    printf("%s\n", pr[k].r);
  }

  //sub expression elimination
  for (m = 0; m < z; m++)
{
    tem = pr[m].r;
    for (j = m + 1; j < z; j++)
{
```

```
    p = strstr(tem, pr[j].r);
    if (p)
  {
      t = pr[j].l;
      pr[j].l = pr[m].l;
      for (i = 0; i < z; i++)
 {
        l = strchr(pr[i].r, t);
        if (l) {
          a = l - pr[i].r;
          //printf("pos: %d",a);
          pr[i].r[a] = pr[m].l;
        }
      }
    }
   }
  }
  printf("eliminate common expression\n");
  for (i = 0; i < z; i++) {
    printf("%c\t=", pr[i].l);
    printf("%s\n", pr[i].r);
  }
  // duplicate production elimination

  for (i = 0; i < z; i++)
  {
    for (j = i + 1; j < z; j++)
  {
      q = strcmp(pr[i].r, pr[j].r);
      if ((pr[i].l == pr[j].l) && !q)

      {
        pr[i].l = '\0';
        strcpy(pr[i].r, '\0');
      }
    }
  }
  printf("optimized code");
  for (i = 0; i < z; i++)
 {
    if (pr[i].l != '\0') {
      printf("%c=", pr[i].l);
      printf("%s\n", pr[i].r);
    }    }   getch();
 }
```

OUTPUT:

```
vimal@KBVIMAL:~$ vi 310dc.c
vimal@KBVIMAL:~$ gcc 310dc.c
vimal@KBVIMAL:~$ ./a.out
Enter number of values: 3
Enter left and right values:
        left: f
        right: e
        left: h
        right: u
        left: v
        right: c
Intermediate Code:
f=e
h=u
v=c

After dead code elimination:
v=c
Optimized Code:
v=c
vimal@KBVIMAL:~$
```

RESULT:

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