VISVESVARAYA TECHNOLOGICAL UNIVERSITY

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LAB REPORT

on

COMPILER DESIGN

Submitted by

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Under the Guidance of

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in partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

in

COMPUTER SCIENCE AND ENGINEERING

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Department of Computer Science and Engineering

CERTIFICATE

This is to certify that the Lab work entitled "**Compiler Design**" carried out by **Arvind Ashok (1BM21CS032)** , who is a bonafide student of **B. M. S. College of Engineering.** It is in partial fulfillment for the award of **Bachelor of Engineering in Computer Science and Engineering** of the Visvesvaraya Technological University, Belgaum during the year 2023-24.

The Lab report has been approved as it satisfies the academic requirements in respect of **Compiler Design- (22CS5PCCPD)** work prescribed for the said degree.

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DECLARATION

I, Arvind Ashok (1BM21CS032) student of 5th Semester, B.E, Department of Computer Science and Engineering, B. M. S. College of Engineering, Bangalore, hereby declare that, this lab report entitled "**Compiler Design**" has been carried out by me under the guidance of Prof. Sunayana S, Assistant Professor, Department of CSE, B. M. S. College of Engineering, Bangalore during the academic semester November-2023-February-2024.

I also declare that to the best of my knowledge and belief, the development reported here is not from part of any other report by any other students.

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LAB 1

1.1 Write a program in LEX to recognize different tokens: Keywords, Identifiers, Constants, Operators and Punctuation symbols.

Code:

```
%{
#include<stdio.h>
%}
%%
printf|for|void|main|while|do|switch|case|int|char|float|double|if|else {printf("%s-keyword\n",yytext);
, {printf("%s-separator\n",yytext);}
; {printf("%s-delimiter\n",yytext);}
[a-zA-Z_][a-zA-Z0-9_]* {printf("%s-Identifier\n",yytext);}
">"|"<"|">="|"<="|"==" {printf("%s- Relational operator\n",yytext);}
"=" {printf("%s-assignment operator\n",yytext);}
[0-9]+ {printf("%s-digit\n",yytext);}
%%
void main()
{
printf("Give an input:\n");
yylex();
}
int yywrap()
{
return 1;
}
```

Output:

```
arvind@Vasko:~/coding/Compiler Design/Compiler_Design_Lab$ cd lab1/
arvind@Vasko:~/coding/Compiler Design/Compiler_Design_Lab/lab1$ lex lab1_1.l
arvind@Vasko:~/coding/Compiler Design/Compiler_Design_Lab/lab1$ cc lex.yy.c
arvind@Vasko:~/coding/Compiler Design/Compiler_Design_Lab/lab1$ ./a.out
enter input:int hi

 int is datatype
 hi is identifier
void main

 void is identifier
 main is identifier
hello world 5

 hello is identifier
 world is identifier
 5 is a digit
^C
```

1.2 Write a program in LEX to identify alphabets as characters and numbers as digits in a string.

Code

```
%{
#include<stdio.h>
%}
%%
[a-zA-Z_]* {printf("\n %s is stream of characters",yytext);}
[0-9_]* {printf("\n %s is a stream of digits",yytext);}
. {}
%%
int yywrap()
{
}
int main()
{
printf("enter input:");
yylex();
return 0;
}
```

Output

```
arvind@Vasko:~/coding/Compiler Design/Compiler_Design_Lab/lab1$ lex lab1_3.l
arvind@Vasko:~/coding/Compiler Design/Compiler_Design_Lab/lab1$ cc lex.yy.c
arvind@Vasko:~/coding/Compiler Design/Compiler_Design_Lab/lab1$ ./a.out
enter input:hi 77

 hi is stream of characters
 77 is a stream of digits
agent 47

 agent is stream of characters
 47 is a stream of digits
^C
```

1.3 Write a program in LEX to identify the vowels and consonants in a string.

Code

```
%{
#include<stdio.h>
%}
%%
a|e|i|o|u {printf("\n %s is vowel", yytext);}
[a-zA-Z_] {printf("\n %s is consonant",yytext);}
. {ECHO;}
%%
int yywrap()
{
}
int main()
{
printf("enter input:");
yylex();
return 0;
}
```

Output

```
arvind@Vasko:~/coding/Compiler Design/Compiler_Design_Lab/lab1$ lex lab1_2.l
arvind@Vasko:~/coding/Compiler Design/Compiler_Design_Lab/lab1$ cc lex.yy.c
arvind@Vasko:~/coding/Compiler Design/Compiler_Design_Lab/lab1$ ./a.out
enter input:good night

 g is consonant
 o is vowel
 o is vowel
 d is consonant
 n is consonant
 i is vowel
 g is consonant
 h is consonant
 t is consonant
^C
```

Lab 2

2.1 Write a program in lex to count the number of words in a sentence.

Code

```
%{
#include<stdio.h>
int c=0;
%}
%%
([a-zA-Z0-9])+ {c++;}
\n {printf ("Count is %d", c);}
%%
int yywrap()
{
}
int main()
{
printf("Enter input:");
yylex();
return 0;
}
```

Output

```
arvind@Vasko:~/coding/Compiler Design/Compiler_Design_Lab/lab1$ lex lab1_5.l
arvind@Vasko:~/coding/Compiler Design/Compiler_Design_Lab/lab1$ cc lex.yy.c
arvind@Vasko:~/coding/Compiler Design/Compiler_Design_Lab/lab1$ ./a.out
Enter input:good night
 Count is 2^C
```

2.2 Write a program in lex to demonstrate regular definition.

Code

```
%{
#include<stdio.h>
%}
alpha [a-zA-Z0-9]
%%
[a-zA-Z]+ {printf("Characters\n");}
[0-9]+ {printf("Digits");}
{alpha}+ {printf("Invalid input!\n");}
%%
void main()
{
printf("Enter a string:\n");
yylex();
}
int yywrap()
{
return 1;
}
```

Output

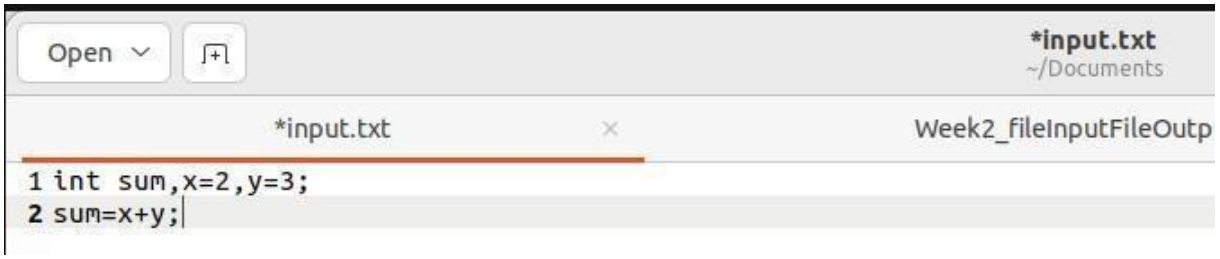
```
Enter a string:
HelloWorld
Characters

1234
Digits
Hello123
Invalid input!
```

2.3 Write a program in lex to identify tokens in a program by taking input from a file and printing the output on the terminal.

Code

```
%{
#include<stdio.h>
%}
%%
char|int|float {printf("%s is a keyword.\n",yytext);}
[a-zA-Z][a-zA-Z0-9]* {printf("%s is an identifier.\n",yytext);}
, {printf("%s is a separator.\n",yytext);}
; {printf("%s is a delimiter.\n",yytext);}
"=" {printf("%s is an assignment operator.\n",yytext);}
"+"|"-"|"*"|"/" {printf("%s is a binary operator.\n",yytext);}
[0-9]+ {printf("%s is/are digit(s).\n",yytext);}
\n ;
%%
void main()
{
yyin=fopen("input.txt","r");
yylex();
fclose(yyin);
}
int yywrap()
{
return 1;
}
```

Output



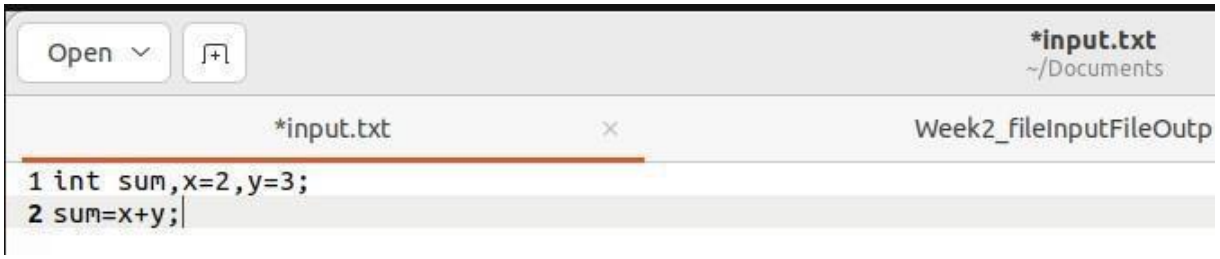

```
int is a keyword.
 sum is an identifier.
, is a separator.
x is an identifier.
= is an assignment operator.
2 is/are digit(s).
, is a separator.
y is an identifier.
= is an assignment operator.
3 is/are digit(s).
; is a delimiter.
sum is an identifier.
= is an assignment operator.
x is an identifier.
+ is a binary operator.
y is an identifier.
; is a delimiter.
```

2.4 Write a program in lex to identify tokens in a program by taking input from a file and printing the output in another file.

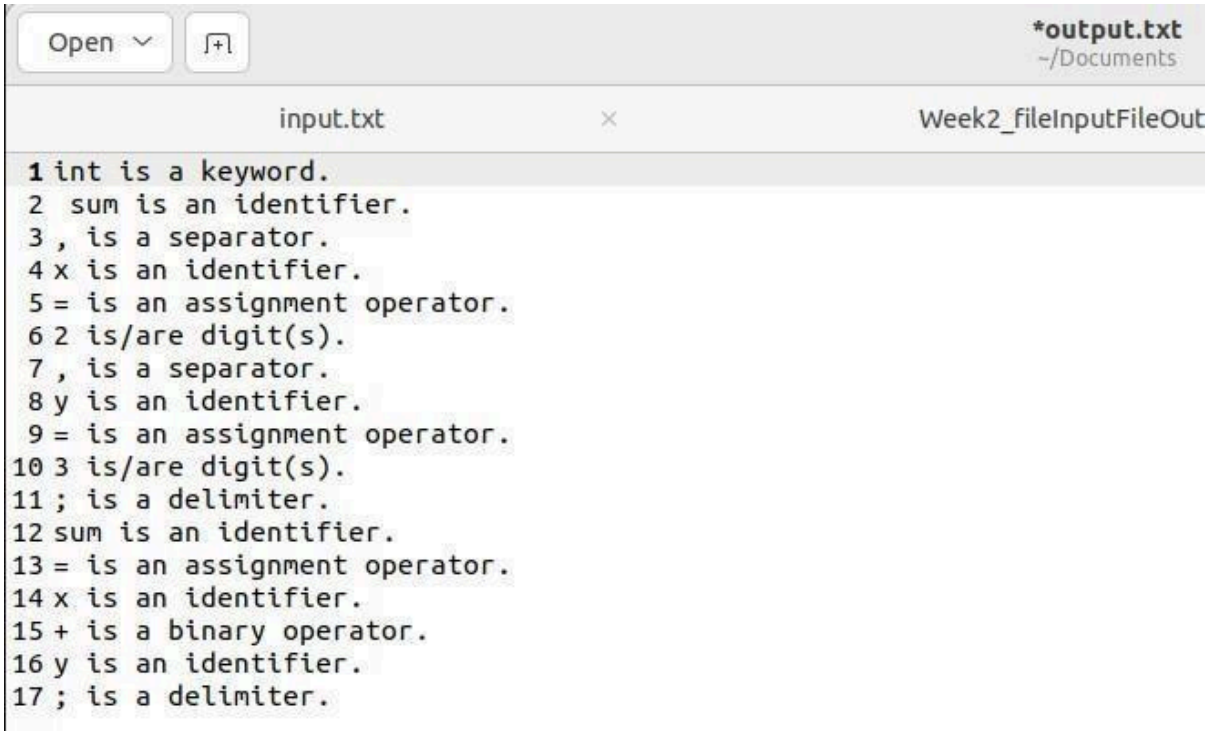
Code

```
%{
#include<stdio.h>
%}
%%
char|int|float {fprintf(yyout,"%s is a keyword.\n",yytext);}
[a-zA-Z][a-zA-Z0-9]* {fprintf(yyout,"%s is an identifier.\n",yytext);}
, {fprintf(yyout,"%s is a separator.\n",yytext);}
; {fprintf(yyout,"%s is a delimiter.\n",yytext);}
"=" {fprintf(yyout,"%s is an assignment operator.\n",yytext);}
"+"|"-"|"*"|"/" {fprintf(yyout,"%s is a binary operator.\n",yytext);}
[0-9]+ {fprintf(yyout,"%s is/are digit(s).\n",yytext);}
\n ;
%%
void main()
{
yyin=fopen("input.txt","r");
yyout=fopen("output.txt","w");
yylex();
printf("Printed in output.txt\n");
fclose(yyin);
fclose(yyout);
}
int yywrap()
{
return 1;
}
```

Output




```
Printed in output.txt
```

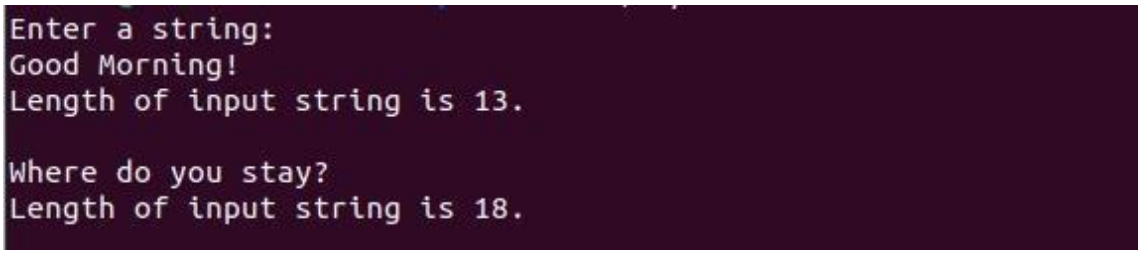


2.5 Write a program in lex to find the length of the input string.

Code

```
%{
#include<stdio.h>
%}
%%
[a-zA-Z0-9.,!? \t]+ {printf("Length of input string is %d.\n",yyleng);}
%%
void main()
{
printf("Enter a string:\n");
yylex();
}
int yywrap()
{
return 1;
}
```

Output



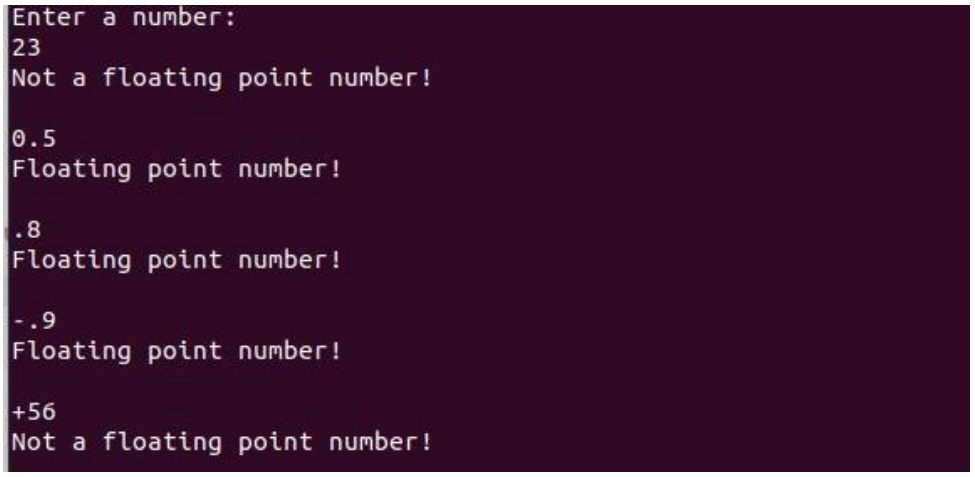
Lab 3

3.1 Write a program in LEX to recognize Floating Point Numbers.

Code

```
%{
#include<stdio.h>
%}
%%
[+-]?[0-9]*[.][0-9][0-9]* {printf("Floating point number!\n");};
[+-]?[0-9][0-9]* {printf("Not a floating point number!\n");};
%%
int yywrap()
{
return 1;
}
void main()
{
printf("Enter a number:\n");
yylex();
}
```

Output



3.2 Read and input sentence, and check if it is compound or simple. If a sentence has the word- and , or ,but ,because ,if ,then ,nevertheless then it is compound else it is simple.

Code

```
%{
#include<stdio.h>
int flag=0;
%}
%%
if|then|but|because|nevertheless|and|or {flag=1;}
. ;
\n {return 0;}
%%
int yywrap()
{
return 1;
}
void main()
{
printf("Enter a sentence:\n");
yylex();
if(flag==1)
printf("Compound sentence!\n");
else
printf("Simple sentence!\n");
}
```

Output

```
Enter a sentence:
This is a car.
Simple sentence!
```

```
Enter a sentence:
She is good at singing and dancing.
Compound sentence!
```

3.3 Write a program to check if the input sentence ends with any of the following punctuation marks (? , fullstop , !)

Code

```
%{
#include<stdio.h>
int flag=0;
%}
%%
.*[?|!|.]$ {flag=1;}
.* {flag=0;}
\n {return 0;}
%%
int yywrap()
{
return 1;
}
void main()
{
printf("Enter a sentence:\n");
yylex();
if(flag==1)
printf("Ends with a punctuation!\n");
else
printf("Does not end with punctuation!\n");
}
```

Output

```
Enter a sentence:
Is this yours?
Ends with a punctuation!
```

```
Enter a sentence:
Amazing!
Ends with a punctuation!
```

```
Enter a sentence:
You are good
Does not end with punctuation!
```

3.4 Write a program to read an input sentence and to check if the sentence begins with English articles (A, a,AN,An,THE and The).

Code

```
%{
#include<stdio.h>
int flag=0;
%}
%%
^(an|An|The|the|A|a)[" "].* {flag=1;}
.* {flag=0;}
\n {return 0;}
%%
int yywrap()
{
return 1;
}
void main()
{
printf("Enter a sentence:\n");
yylex();
if(flag==1)
printf("Starts with an article!\n");
else
printf("Does not start with an article!\n");
}
```

Output

```
Enter a sentence:
This is a good idea.
Does not start with an article!
```

```
Enter a sentence:
Amazing experience!
Does not start with an article!
```

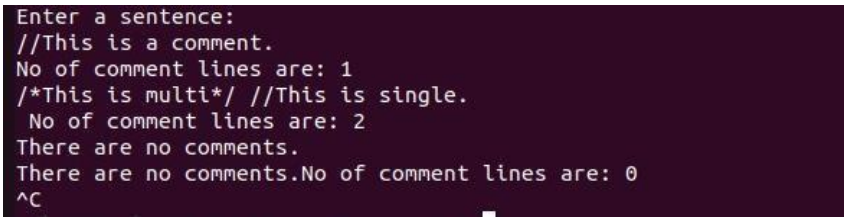
```
Enter a sentence:
The sun rises in the east.
Starts with an article!
```

3.5 Lex program to count the number of comment lines (multi line comments or single line) in a program. Read the input from a file called input.txt and print the count in a file called output.txt.

Code

```
%{
#include<stdio.h>
int c=0;
%}
%%
"\/\*"[^*]*\*+([^/*][^*]*\*+)*\/ {c++;}
"//".* {c++;}
. ECHO;
%%
int yywrap()
{
return 1;
}
void main()
{
yyin=fopen("input.txt","r");
yyout=fopen("output.txt","w");
yylex();
printf("The number of comments are:%d\n",c);
fclose(yyin);
fclose(yyout);
}
```

Output



3.6 Write a program to read and check if the user entered number is signed or unsigned using appropriate meta character.

Code

```
%{
#include<stdio.h>
%}
%%
[+|-][0-9]+ {printf("Signed number!\n");}
[0-9]+ {printf("Unsigned number!\n");}
%%
int yywrap()
{
return 1;
}
void main()
{
printf("Enter a number:\n");
yylex();
}
```

Output

Lab 4

4.1 Write a LEX program that copies a file, replacing each nonempty sequence of white spaces by a single blank.

Code

```
%{
#include<stdio.h>
%}
%%
[ \t]+ {fprintf(yyout," ");}
.|\n {fprintf(yyout,"%s",yytext);}
%%
void main()
{
yyin=fopen("text.txt","r");
yyout=fopen("print.txt","w");
yylex();
fclose(yyin);
fclose(yyout);
printf("Printed!\n");
}
int yywrap()
{
return 1;
}
```

Output

4.2 Write a LEX program to recognize the following tokens over the alphabets {0,1,..,9}

4.2.1 The set of all strings ending in 00.

Code

```
%{
#include<stdio.h>
int flag=0;
%}
%%
[0-9]+[00] {flag=1;}
. ;
\n {return 0;}
%%
void main()
{
printf("Enter a string:\n");
yylex();
if(flag==1)
printf("Ends with 00.\n");
else
printf("Does not end with 00.\n");
}
int yywrap()
{
return 1;
}
```

Output

```
Enter a string:
12300
Ends with 0.
```

```
Enter a string:
145
Does not end with 0.
```

4.2.2 The set of all strings with three consecutive 222's.

Code

```
%{
#include<stdio.h>
int flag=0;
%}
%%
[0-9]*[2][2][2][0-9]* {flag=1;}
. ;
\n {return 0;}
%%
void main()
{
printf("Enter a string:\n");
yylex();
if(flag==1)
printf("Has 3 consecutive 2's.\n");
else
printf("Does not have 3 consecutive 2's.\n");
}
int yywrap()
{
return 1;
}
```

Output

```
Enter a string:
322221
Has 3 consecutive 2's.
```

4.2.3 The set of all string such that every block of five consecutive symbols contains at least two 5's.

Code

```
%{
#include<stdio.h>
int i,count=0,flag;
%}
%%
.{1,5} {flag=0;
for(i=0;i<5;i++)
      {
       int c=yytext[i]-'0';
       if(c==5)
       {
        count++;
        if(count==2)
        {
         flag=1;
         break;
        }
        }
        }
        count=0;
        printf("yytext:%s,flag(1 if no of 5 is atleast 2):%d\n",yytext,flag);
        if(flag!=1)
        {
         printf("Not a valid string!\n");
        return 0;
       }
       }

\n {return 0;}
%%
void main()
```

```
{
printf("Enter a string:\n");
yylex();
if(flag==1) printf("Valid string.\n");
}
int yywrap()
{
return 1;
}
```

Output

4.2.4 The set of all strings beginning with a 1 which, interpreted as the binary representation of an integer, is congruent to zero modulo 5.

Code

```
%{
#include<stdio.h>
int c,i,flag=1,sum=0,power=1;
%}
%%
^1[01]* {for(i=yyleng-1;i>=0;i--)
        {
         c=yytext[i]-'0';
         sum+=c*power;
         power*=2;
        }
         printf("Decimal representation:%d\n",sum);
         if(sum%5!=0)
         {
         printf("Not congruent to modulo 5.\n");
         sum=0;
         power=1;
         }
         else
         {
         printf("Congruent to modulo 5.\n");
         sum=0;
         power=1;
         }
        }
.* {printf("Not a binary number.\n");}
\n {return 0;}
%%
void main()
{
printf("Enter a string:\n");
```

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

Output

```
Enter a string:
1010
Decimal representation:10
Congruent to modulo 5.
```

```
Enter a string:
101
Decimal representation:5
Congruent to modulo 5.
```

4.2.5 The set of all strings such that the 10th symbol from the right end is 1.

Code

```
%{
#include<stdio.h>
int flag=0;
%}
%%
[0-9]*1[0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9][0-9] {flag=1;}
. ;
\n {return 0;}
%%
void main()
{
printf("Enter a string:\n");
yylex();
if(flag==1)
printf("10th symbol from right is 1.\n");
else
printf("10th symbol from right is not 1.\n");
}
int yywrap()
{
return 1;
}
```

Output

```
Enter a string:
23123456123
10th symbol from right is not 1.
```

4.2.6 The set of all four digits numbers whose sum is 9.

Code

```
%{
#include<stdio.h>
int sum=0,i,flag=0;
%}
%%
[0-9][0-9][0-9][0-9] {for(i=0;i<yyleng;i++)
 {
 sum+=yytext[i]-'0';
 }
 if(sum==9)
 {
 flag=1;
 sum=0;
 }
 else
 {
 flag=0;
 sum=0;
 }
 }
\n {return 0;}
%%
void main()
{
printf("Enter a string:\n");
yylex();
if(flag==1)
printf("The sum of digits is 9.\n");
else
printf("The sum of digits is not 9.\n");
}
int yywrap()
```

{

return 1;

}

Output

4.2.7 The set of all four digital numbers, whose individual digits are in ascending order from left to right.

Code

```
%{
 #include <stdio.h>
int c,i,flag=1;
 %}
%%
[0-9][0-9][0-9][0-9] {for(i=0;i<yyleng-1;i++)
                        {
                            if(yytext[i]>=yytext[i+1])
                            {
                                    flag=0; break;
                            }
                        }
                        }
\n {return 0;}
 %%
void main()
{
printf("Enter a string:\n");
yylex();
if(flag==1)
printf("The digits are in ascending order.\n");
else
printf("The digits are not in ascending order.\n");
}
int yywrap()
{
return 1;
}
```

Output

```
Enter a string:
1235
The digits are in ascending order.
```

```
Enter a string:
1243
The digits are not in ascending order.
```

Lab 5

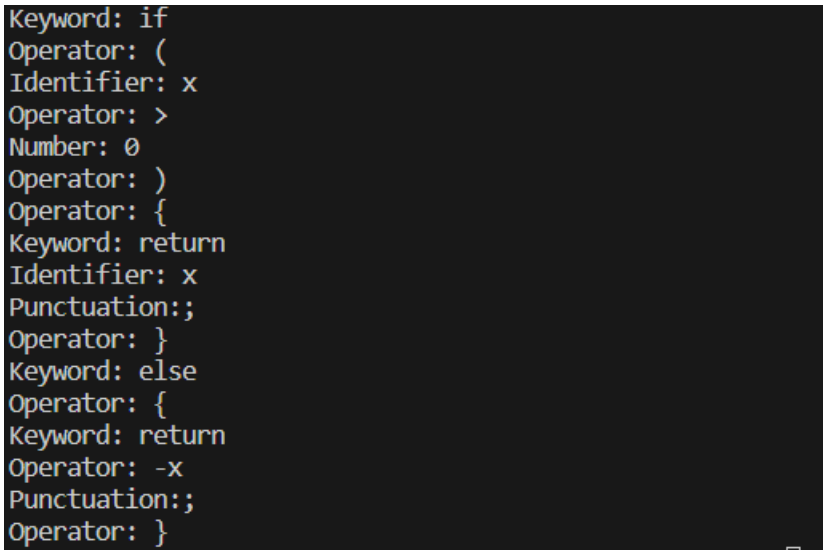
Write a C program to design lexical analysis to recognize any five keywords, identifiers, numbers, operators and punctuations.

Code

```
#include <stdio.h>
#include <string.h>
#include <ctype.h>

void lexicalAnalyzer(char input_code[]) {
char *keywords[] = {"if", "else", "while", "for", "return"};
char *operators[] = {"+", "-", "*", "/", "=", "==", "<", ">", "<=", ">="};
char *punctuations[] = {",", ";", "(", ")", "{", "}"};
char *token = strtok(input_code, " \t\n");

while (token != NULL)
{
if (isdigit(token[0]))
{
printf("Number: %s\n", token);
}
else if (isalpha(token[0]) || token[0] == '_')
{
int isKeyword = 0;
for (int i = 0; i < sizeof(keywords) / sizeof(keywords[0]); i++)
{
if (strcmp(token, keywords[i]) == 0)
{
printf("Keyword: %s\n", token);
isKeyword = 1;
break;
}
}
if (!isKeyword)
{
```

```
printf("Identifier: %s\n", token);
}
}
else if (strchr("+-*/=<>(){}[]", token[0]) != NULL)
{
printf("Operator: %s\n", token);
}
else if(strchr(",;", token[0]) != NULL)
{
printf("Punctuation:%s\n",token);
}
token = strtok(NULL, " \t\n");
}
}
int main() {
char input_code[] = "if ( x > 0 ) { return x ; } else { return -x ; }"; lexicalAnalyzer(input_code);
return 0;
}
```

Output



Lab 6

Write a program to perform recursive descent parsing on the following grammar:

S->cAd

A->ab | a

Code

```
#include <stdio.h>
#include<stdlib.h>
char input[100];
int ind = 0;
void match(char expected)
{
   if (input[ind] == expected)
   {
      ind++;
   }
}
void A();
void S()
{
   match('c');
   A();
   match('d');
}
void A()
{
   if (input[ind] == 'a')
   {
      printf("Hello\n");
      match('a');
      match('b');
   } /*else if (input[ind] == 'a')
   {
      printf("Hi!\n");
```

```
        match('a');
    }*/
    else
    {
        printf("Parsing failed.\n", ind);
        exit(1);
    }
}
int main() {
    printf("Enter the input string:\n");
    scanf("%s", input);

    S();

    if (input[ind] == '$') {
        printf("Parsing successful.\n");
    } else {
        printf("Parsing failed. Extra characters found.\n");
    }

    return 0;
}
```

Output

Lab 7

7.1 Write a program in YACC to design a suitable grammar for evaluation of arithmetic expression having +, -, * and /.

Code

LEX

```
%{
#include<stdio.h>
#include<stdlib.h>
#include "y.tab.h"
extern int yylval;
%}
%%
[0-9]+ {yylval=atoi(yytext);return num;}
[\t ] ;
\n {return 0;}
. {return yytext[0];}
%%
int yywrap()
{
return 1;
}
```

YACC

```
%{
#include<stdio.h>
#include<stdlib.h>
int yyerror(const char *s);
int yylex(void);
%}
%token num;
%left '+' '-'
%left '*' '/'
%left ')'
%left '('
```

```
%%
s:e {printf("Valid expression!\n");
     printf("Result:%d\n",$$);
     exit(0);
    }
;
e:e'+'e {$$=$1+$3;}
|e'-'e {$$=$1-$3;}
|e'*'e {$$=$1*$3;}
|e'/'e {$$=$1/$3;}
|'('e')' {$$=$2;}
|num {$$=$1;}
;
%%
void main()
{
printf("Enter an arithmetic expression:\n");
yyparse();
}
int yyerror(const char *s)
{
printf("Invalid expression!\n");
return 0;
}
```

Output

```
Enter an arithmetic expression:
2+3*4
Valid expression!
Result:14
```

7.2 Write a program in YACC to recognize strings of the form {(a^n)b , n>=5}.

Code

LEX

```
%{
#include<stdio.h>
#include<stdlib.h>
#include "y.tab.h"
extern int yylval;
%}
%%
[aA] {yylval=yytext[0];return A;}
[bB] {yylval=yytext[0];return B;}
\n {return NL;}
. {return yytext[0];}
%%
int yywrap()
{
return 1;
}
```

YACC

```
%{
#include<stdio.h>
#include<stdlib.h>
int yyerror(char *s);
int yylex(void);
%}
%token A
%token B
%token NL
%%
smtr:A A A A A S B NL {printf("Parsed using the rule (a^n)b, n>=5.\nValid String!\n");}
;
S:S A
|
```

```
;
%%
void main()
{
printf("Enter a string!\n");
yyparse();
}
int yyerror(char *s)
{
printf("Invalid String!\n");
return 0;
}
```

Output

```
Enter a string!
aaaaaaab
Parsed using the rule (a^n)b, n>=5.
Valid String!
ab
Invalid String!
```

7.3 Write a program in YACC to generate syntax tree for a given arithmetic expression.

Code

LEX

```
%{
#include<stdio.h>
#include<stdlib.h>
#include "y.tab.h"
extern int yylval;
%}
%%
[0-9]+ {yylval=atoi(yytext);return digit;}
[\t] ;
[\n] return 0;
. return yytext[0];
%%
int yywrap()
{
return 1;
}
```

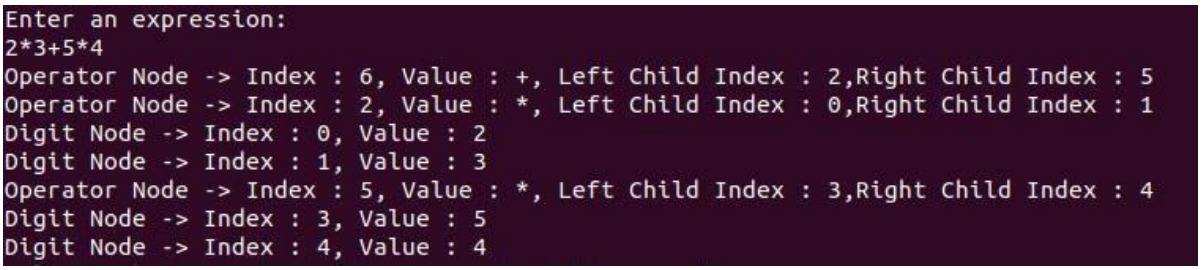
YACC

```
%{
#include <math.h>
#include<ctype.h>
#include<stdio.h>
#include<stdlib.h>
#include<string.h>
int yyerror(char *s);
int yylex(void);
struct tree_node
{
char val[10];
int lc;
int rc;
};
```

```
int ind;
struct tree_node syn_tree[100];
void my_print_tree(int cur_ind);
int mknode(int lc,int rc,char *val);
%}
%token digit
%%
S:E {my_print_tree($1);}
;
E:E'+'T {$$=mknode($1,$3,"+");}
|T {$$=$1;}
;
T:T'*'F {$$= mknode($1,$3,"*");}
|F {$$=$1;}
;
F:'('E')' {$$=$2;}
|digit {char buf[10];sprintf(buf,"%d", yylval);$$ = mknode(-1,-1,buf);}
;
%%
int main()
{
ind=0;
printf("Enter an expression:\n");
yyparse();
return 0;
}
int yyerror(char *s)
{
printf("NITW Error\n");
return 0;
}
int mknode(int lc,int rc,char val[10])
{
strcpy(syn_tree[ind].val,val);
```

```
syn_tree[ind].lc = lc;

syn_tree[ind].rc = rc;

ind++;

return ind-1;

}

/*my_print_tree function to print the syntax tree in DLR fashion*/

void my_print_tree(int cur_ind)

{

if(cur_ind==-1) return;

if(syn_tree[cur_ind].lc==-1&&syn_tree[cur_ind].rc==-1)

printf("Digit Node -> Index : %d, Value : %s\n",cur_ind,syn_tree[cur_ind].val);

else

printf("Operator Node -> Index : %d, Value : %s, Left Child Index : %d,Right Child Index :
%d\n",cur_ind,syn_tree[cur_ind].val, syn_tree[cur_ind].lc,syn_tree[cur_ind].rc);

my_print_tree(syn_tree[cur_ind].lc);

my_print_tree(syn_tree[cur_ind].rc);

}
```

Output



Lab 8

8.1 Write a program in YACC to convert infix to postfix expression.

Code

LEX

```
%{
#include<stdio.h>
#include<stdlib.h>
#include "y.tab.h"
extern int yylval;
%}
%%
[0-9]+ {yylval=atoi(yytext);return num;}
[\t ] ;
\n {return 0;}
. {return yytext[0];}
%%
int yywrap()
{
}
```

YACC

```
%{
#include<stdio.h>
#include<stdlib.h>
int yyerror(const char *s);
int yylex(void);
%}
%token num
%left '+' '-'
%left '*' '/'
%left ')'
%left '('
%right '^'
%%
```

```
s:e {printf("\n");}
;
e:e'+'t {printf("+");}
|e'-'t {printf("-");}
|t
;
t:t'*'h {printf("*");}
|t'/'h {printf("/");}
|h
;
h:f'^'h {printf("^");}
|f
;
f:'('e')'
|num {printf("%d",$1);}
;
%%
void main()
{
printf("Enter an infix expression:\n");
yyparse();
}
int yyerror(const char *s)
{
printf("Invalid infix expression!\n");
return 0;
}
```

Output

Lab 9

9.1Write a program in YACC to generate three address code for a given expression.

Code

LEX

```
%{
#include<stdio.h>
#include<stdlib.h>
#include"y.tab.h"
extern int yylval;
extern char iden[20];
%}
d [0-9]+
a [a-zA-Z]+
%%
{d} { yylval=atoi(yytext); return digit; }
{a} { strcpy(iden,yytext); yylval=1; return id;}
[ \t] {;}
\n return 0;
. return yytext[0];
%%
int yywrap()
{
return 1;
}
```

YACC

```
%{
#include <math.h>
#include<ctype.h>
#include<stdio.h>
int yyerror(char *s);
int yylex(void);
int var_cnt=0;
char iden[20];
```

```
%}
%token id
%token digit
%%
S:id '=' E {printf("%s=t%d\n",iden,var_cnt-1);}
E:E '+' T {$$=var_cnt; var_cnt++; printf("t%d = t%d + t%d;\n", $$, $1, $3 );}
|E '-' T { $$=var_cnt; var_cnt++; printf("t%d = t%d - t%d;\n", $$, $1, $3 );}
|T {$$=$1;}
;
T:T '*' F {$$=var_cnt; var_cnt++; printf("t%d = t%d * t%d;\n", $$, $1, $3 );}
|T '/' F {$$=var_cnt; var_cnt++; printf("t%d = t%d / t%d;\n", $$, $1, $3 );}
|F {$$=$1;}
;
F:P '^' F {$$=var_cnt; var_cnt++; printf("t%d = t%d ^ t%d;\n", $$, $1, $3 );}
|P {$$ = $1;}
;
P: '(' E ')' {$$=$2;}
|digit {$$=var_cnt; var_cnt++; printf("t%d = %d;\n",$$,$1);}
;
%%
int main()
{
var_cnt=0;
printf("Enter an expression:\n");
yyparse();
return 0;
}
int yyerror(char *s)
{
printf("Invalid expression!");
return 0;
}
```

Output


Enter an expression:
a=2*3/6-4
t0 = 2;
t1 = 3;
t2 = t0 * t1;
t3 = 6;
t4 = t2 / t3;
t5 = 4;
t6 = t4 - t5;
a=t6