COUSRE: CSA1445 COMPILER DESIGN FOR POLYMORPHIC FUNCTIONS

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LEX PROGRAMS

1) Write a LEX program to identify the capital words from the given input.

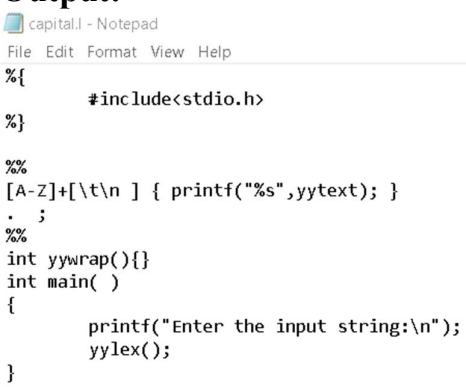
Aim:

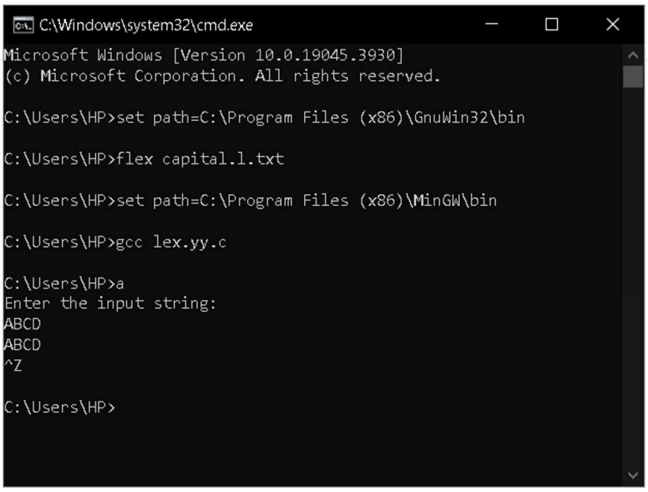
To develop a LEX program that identifies and prints all capital words from the given input.

Code:

```
%{
        #include<stdio.h>
%}
%%
[A-Z]+[\t\n ] { printf("%s",yytext); }
.  ;
%%
Int yywrap(){}
int main( )
{
        printf("Enter the input string:\n");
        yylex();
}
```

Output:





2. Validate Email Address

Aim: To implement a LEX program that checks whether a given email address follows a valid format using pattern matching.

Code:

```
%{
%}
%%
[a-z.0-9_]+@[a-z]+".com"|".in"  { printf("it is valid");}
.+  { printf("it is not valid");}
%%
int yywrap(){}
int main()
{
printf("enter the mail:");
yylex();
}
```

Output:

email.l - Notepad

File Edit Format View Help

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

%%
[A-Za-z0-9._%+-]+@[A-Za-z0-9.-]+\.[A-Za-z]{2,}
.|\n
%%

int main() {
    yylex();
    return 0;
}

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

C:\Windows\system32\cmd.exe - a

```
Microsoft Windows [Version 10.0.19045.3930]
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C:\Users\HP>set path=C:\Program Files (x86)\GnuWin32\bin

C:\Users\HP>flex email.l.txt

C:\Users\HP>set path=C:\Program Files (x86)\MinGW\bin

C:\Users\HP>gcc lex.yy.c

C:\Users\HP>a
vkaushii2005@gmail.com
Valid email: vkaushii2005@gmail.com
```

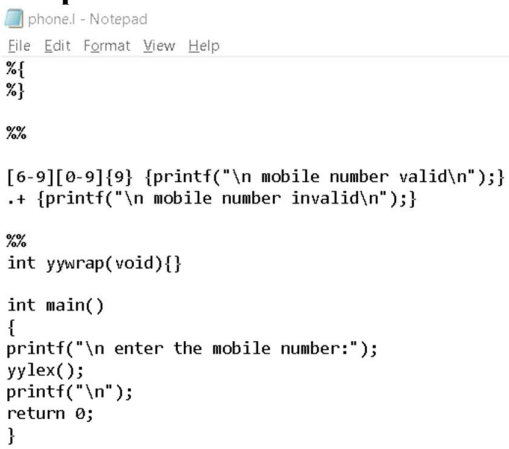
3. Validate Mobile Number

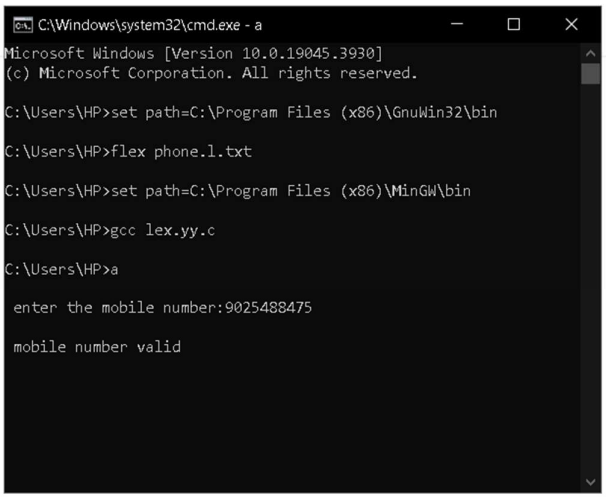
Aim: To create a LEX program that verifies whether a given mobile number is valid based on a specific format (e.g., Indian mobil numbers starting with 7, 8, or 9 and having 10 digits).

Code:

```
%{
#include <stdio.h>
%}
%%
[789][0-9]{9}   { printf("Valid mobile number: %s\n", yytext); }
.|\n            { /* Ignore other characters */ }
%%
int main() {
   yylex();
   return 0;
}
int yywrap() {
   return 1;
}
```

Output:





4. Count the Number of Vowels

Aim: To design a LEX program that scans an input sentence and counts the number of vowels (both uppercase and lowercase).

Code:

```
%{
#include <stdio.h>
int vowel_count = 0;
%}
%%
[aeiouAEIOU] { vowel_count++; }
.|\n        { /* Ignore other characters */ }
%%
int main() {
    yylex();
    printf("Total number of vowels: %d\n", vowel_count);
    return 0;
}
int yywrap() {
    return 1;
}
```

Output:

vowel.l - Notepad

File Edit Format View Help

```
%{
#include <stdio.h>
int vowel_count = 0;
%}

%%
[aeiouAEIOU] { vowel_count++; }
.|\n         { /* Ignore other characters */ }
%%

int main() {
    yylex();
    printf("Total number of vowels: %d\n", vowel_count);
    return 0;
}

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

C:\Windows\system32\cmd.exe

```
Microsoft Windows [Version 10.0.19045.3930]
(c) Microsoft Corporation. All rights reserved.

C:\Users\HP>set path=C:\Program Files (x86)\GnuWin32\bin

C:\Users\HP>flex vowel.l.txt

C:\Users\HP>set path=C:\Program Files (x86)\MinGW\bin

C:\Users\HP>gcc lex.yy.c

C:\Users\HP>a
kaushik
narayanan
^Z
Total number of vowels: 7

C:\Users\HP>
```

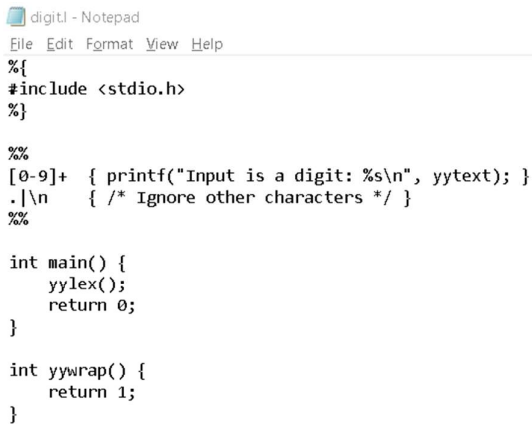
5. Check if Input is a Digit

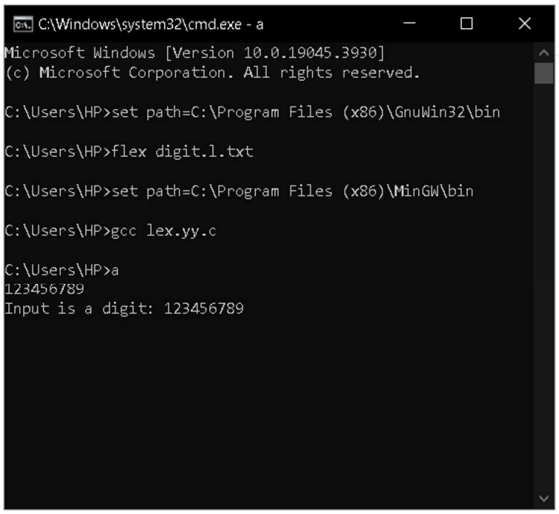
Aim: To write a LEX program that determines whether the given input consists of digits and prints an appropriate message.

Code:

```
%{
#include <stdio.h>
%}
%%
[0-9]+  { printf("Input is a digit: %s\n", yytext); }
.|\n    { /* Ignore other characters */ }
%%
int main() {
   yylex();
   return 0;
}
int yywrap() {
   return 1;
}
```

Output:





6. LEX Program to Count Characters, Words, and Lines in a C File

Aim:

To write a LEX specification file that reads a C program from a .c file and counts the number of characters, words, and lines.

Code:

```
lex
%{
#include <stdio.h>
int char_count = 0, word_count = 0, line_count = 0;
%}
%%
\n { line_count++; char_count++; }
[ \t] { char_count++; }
[a-zA-Z0-9_]+ { word_count++; char_count += yyleng; }
. { char_count++; }
%%
int main(int argc, char *argv[]) {
   if (argc > 1) {
      FILE *file = fopen(argv[1], "r");
      if (!file) {
         printf("Error: Cannot open file %s\n", argv[1]);
         return 1;
      }
      yyin = file;
   }
   yylex();
   printf("Characters: %d\nWords: %d\nLines: %d\n", char_count, word_count,
line_count);
   return 0;
}
```

Output:

count.l - Notepad

File Edit Format View Help

```
%{
int nlines,nwords,nchars;
%}

%%
\n {
        nchars++;nlines++;
        }

[^ \n\t]+ {nwords++, nchars=nchars+yyleng;}
. {nchars++;}

%%

int yywrap(void) {}
int main()
{
 yylex();
 printf("Lines = %d\nChars=%d\nWords=%d",nlines,nchars,nwords);

 return 0;
}
```

C:\Windows\system32\cmd.exe

```
Microsoft Windows [Version 10.0.19045.3930]
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C:\Users\HP>set path=C:\Program Files (x86)\GnuWin32\bin

C:\Users\HP>flex count.l.txt

C:\Users\HP>set path=C:\Program Files (x86)\MinGW\bin

C:\Users\HP>gcc lex.yy.c

C:\Users\HP>a
#include <stdio.h>
int main() {
    printf("Hello, World!");
    return 0;
}

^Z
Lines = 6
Chars=78
Words=10
C:\Users\HP>
```

7. LEX Program to Print All Constants in a Given C File

Aim:

To write a LEX specification file that prints all numeric and string constants in a given C program.

Code:

```
%{
%}

%%
<INITIAL>[0-9]+ {printf("Integer\n");}
<INITIAL>[0-9]+[.][0-9]+ {printf("Float\n");}
<INITIAL>[A-Za-z0-9_]* {printf("Identifier\n");}
<INITIAL>[^\n] {printf("Invalid\n");}
%%
int yywrap(){}
int main()
{
printf("Enter String\n");
yylex();
return 0;
}
```

Output:

printcon.l - Notepad

File Edit Format View Help

```
%{
%}

%%
<INITIAL>[0-9]+ {printf("Integer\n");}
<INITIAL>[0-9]+[.][0-9]+ {printf("Float\n");}
<INITIAL>[A-Za-z0-9_]* {printf("Identifier\n");}
<INITIAL>[^\n] {printf("Invalid\n");}

%%

int yywrap(){}

int main()
{
printf("Enter String\n");
yylex();
return 0;
}
```

C:\Windows\system32\cmd.exe - a

```
Microsoft Windows [Version 10.0.19045.3930]
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C:\Users\HP>set path=C:\Program Files (x86)\GnuWin32\bin

C:\Users\HP>flex printcon.l.txt

C:\Users\HP>set path=C:\Program Files (x86)\MinGW\bin

C:\Users\HP>gcc lex.yy.c

C:\Users\HP>a
Enter String
int a = 100;
Identifier
Invalid
Identifier
Invalid
Invalid
Invalid
Integer
Invalid

float b = 3.14;
Identifier
Invalid
Identifier
Invalid
Invalid
Invalid
```

8. LEX Program to Count Macros and Header Files in a C Program

Aim:

To write a LEX specification file that counts the number of macros (#define) and header files (#include) in a C program.

Code:

```
%{
int nmacro, nheader;
%}
%%
^#define { nmacro++; }
^#include { nheader++; }
%%
int yywrap(void) {
return 1;
}
int main() {
yylex();
printf("Number of macros defined = %d\n", nmacro);
printf("Number of header files included = %d\n", nheader);
}
```

Output:

countmacros.l - Notepad

File Edit Format View Help

```
%{
int nmacro, nheader;
%}
%%
^#define { nmacro++; }
^#include { nheader++; }
%%
int yywrap(void) {
return 1;
}
int main() {
yylex();
printf("Number of macros defined = %d\n", nmacro);
printf("Number of header files included = %d\n", nheader);
}
```

C:\Windows\system32\cmd.exe

```
Microsoft Windows [Version 10.0.19045.3930]
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C:\Users\HP>set path=C:\Program Files (x86)\GnuWin32\bin

C:\Users\HP>flex countmacros.l.txt

C:\Users\HP>set path=C:\Program Files (x86)\MinGW\bin

C:\Users\HP>gcc lex.yy.c

C:\Users\HP>a
#include <stdio.h>
 <stdio.h>
#include <math.h>
 <math.h>
#define PI 3.14
 PI 3.14
#define MAX 100
 MAX 100
^Z
Number of macros defined = 2
Number of header files included = 2

C:\Users\HP>
```

9. LEX Program to Print All HTML Tags in an Input File

Aim:
To write a LEX specification file that prints all HTML tags in an input file.

Code:

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

%%
<[^>]+> { printf("Tag: %s\n", yytext); }
%%
int main() {
   yylex();
   return 0;
}
```

Output:

printhtml.l - Notepad

File Edit Format View Help

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

%%
\<[^>]*\> fprintf(yyout,"%s\n",yytext);
.|\n;

%%

int yywrap()
{
return 1;
}

int main()
{
yyin=fopen("sample.html","r");
yyout=fopen("output.txt","w");
yylex();
return 0;
}
```

C:\Windows\system32\cmd.exe

```
C:\Users\HP>a
<html>
<head>
<title>Sample Page</title>
</head>
<body>
<p>Hello, World!</p>
</body>
</html>

^Z

C:\Users\HP><html>
The syntax of the command is incorrect.

C:\Users\HP><head>
The syntax of the command is incorrect.

C:\Users\HP><title>Sample Page</title>
```

10. LEX Program to Add Line Numbers to a C Program

Aim:
To write a LEX specification file that adds line numbers to a C program and displays the modified output.

Code:

```
%{
#include <stdio.h>
int line_no = 1;
%}
%%
^.* { printf("%d %s\n", line_no++, yytext); }
%%
int main() {
    yylex();
    return 0;
}
```

Output:

addline.l - Notepad

File Edit Format View Help

```
%{
#include<stdio.h>
int ln=0;
%}

%%

.* {ln++; fprintf(yyout,"\n%d:%s",ln,yytext);}
%%
int yywrap(){}

int main()
{
yyin=fopen("simple.txt","r");
yyout=fopen("out.txt","w");
yylex();
return 0;
}
```

C:\Windows\system32\cmd.exe

```
Microsoft Windows [Version 10.0.19045.3930]
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C:\Users\HP>set path=C:\Program Files (x86)\GnuWin32\bin

C:\Users\HP>flex addline.l.txt

C:\Users\HP>set path=C:\Program Files (x86)\MinGW\bin

C:\Users\HP>gcc lex.yy.c

C:\Users\HP>a
#include <stdio.h>
int main() {
    printf("Hello, World!");
    return 0;
}

^Z

C:\Users\HP>
```

11. LEX Program to Count and Remove Comments in a C File

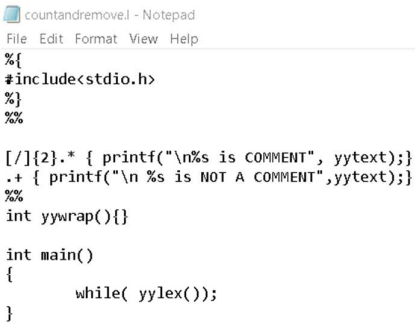
Aim:

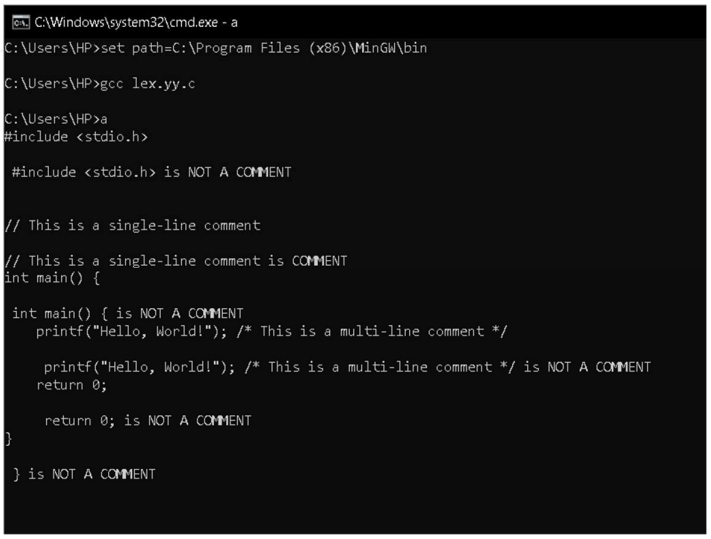
To write a LEX specification file that counts the number of comment lines and removes them from a given C program.

Code:

```
%{
#include <stdio.h>
int comment_count = 0;
%}
%%
"//".* { comment_count++; }
"/*"([^*]|\*+[^*/])*\*+"/" { comment_count++; }
.|\n { printf("%s", yytext); }
%%
int main() {
   yylex();
   printf("\nNumber of Comments Removed: %d\n", comment_count);
   return 0;
}
```

Output:





12. LEX Program to Convert "abc" to "ABC" in an Input String

Aim:
To write a LEX program that replaces every occurrence of the substring "abc" with "ABC" in the given input.

Code:

```
%{
#include <stdio.h>
%}
%%
abc { printf("ABC"); }
.|\n { printf("%s", yytext); }  // Print other characters as they are
%%

int main() {
   yylex();
   return 0;
}
```

Output:

abc.l - Notepad

File Edit Format View Help

```
%{
%}
%%

[a-z] {printf("%c",yytext[0]-32);}
. {}

%%
int yywrap(void){}

int main()
{
printf("\nenter the string : ");
yylex();
}
```

C:\Windows\system32\cmd.exe - a

```
Microsoft Windows [Version 10.0.19045.3930]
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C:\Users\HP>set path=C:\Program Files (x86)\GnuWin32\bin

C:\Users\HP>flex abc.l.txt

C:\Users\HP>set path=C:\Program Files (x86)\MinGW\bin

C:\Users\HP>gcc lex.yy.c

C:\Users\HP>a

enter the string : kaushik
KAUSHIK
```

13. Implementing a Lexical Analyzer using FLEX

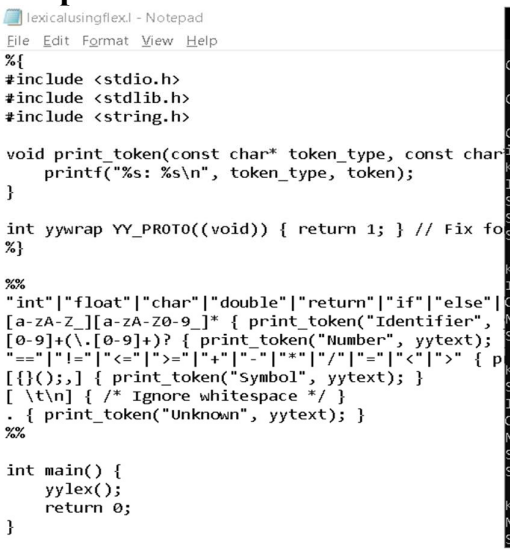
Aim:

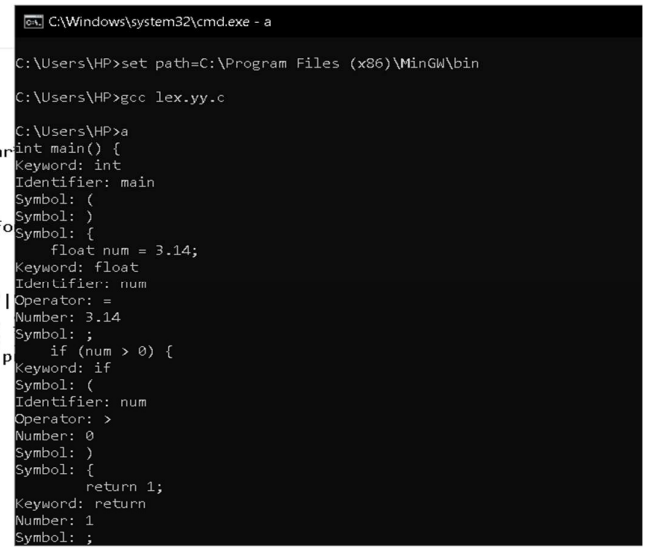
To write a FLEX program that tokenizes a given C program by identifying keywords, identifiers, operators, numbers, and symbols.

Code :

```
%{
#include <stdio.h>
#include <string.h>
void print_token(const char* token_type, const char* token) {
   printf("%s: %s\n", token_type, token);
}
%}
%%
"int"|"float"|"char"|"double"|"return"|"if"|"else"|"while"|"for"|"void" {
print_token("Keyword", yytext); }
[a-zA-Z_][a-zA-Z0-9_]* { print_token("Identifier", yytext); }
[0-9]+(\.[0-9]+)? { print_token("Number", yytext); }
"=="|"!="|"<="|">="|"+"|"-"|"*"|"/"|"="|"<"|">" { print_token("Operator",
yytext); }
[{}();,] { print_token("Symbol", yytext); }
[ \t\n] { /* Ignore whitespace */ }
.
{ print_token("Unknown", yytext); }
%%
int main() {
   yylex();
   return 0;
}
```

Output:





14. LEX Program to Separate Keywords and Identifiers

Aim:

To write a LEX program that separates keywords and identifiers from an inputC program.

Code:

```
%{
#include <stdio.h>
%}
%%
"int"|"float"|"char"|"double"|"return"|"if"|"else"|"while"|"for"|"void" {
printf("Keyword: %s\n", yytext); }
[a-zA-Z_][a-zA-Z0-9_]* { printf("Identifier: %s\n", yytext); }
[ \t\n] { /* Ignore whitespace */ }
. { /* Ignore other characters */ }
%%
int main() {
   yylex();
   return 0;
}
```

Output:

keyword.l - Notepad

File Edit Format View Help

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

%%

if|else|while|int|switch|for|char { printf("its a keyword");}
[a-zA-Z0-9]+ { printf("\n%s is IDENTIFIER", yytext);}

%%
int yywrap( ){}
int main()
{
        while( yylex());
}
```

C:\Windows\system32\cmd.exe - a

```
C:\Users\HP>set path=C:\Program Files (x86)\GnuWin32\bin

C:\Users\HP>flex keyword.l.txt

C:\Users\HP>set path=C:\Program Files (x86)\MinGW\bin

C:\Users\HP>gcc lex.yy.c

C:\Users\HP>a
int x = 10;
its a keyword
x is IDENTIFIER =
10 is IDENTIFIER;
float y = 20.5;

float is IDENTIFIER
y is IDENTIFIER =
20 is IDENTIFIER.
5 is IDENTIFIER;
if (x > y) {
its a keyword (
x is IDENTIFIER >
y is IDENTIFIER) {
    return;

return is IDENTIFIER;
}
}
```

15. LEX Program to Recognize Numbers and Words in a Statement

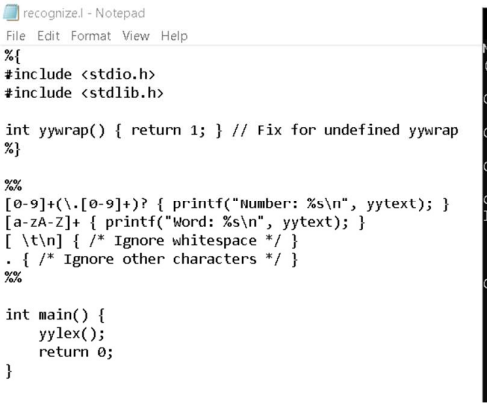
Aim:

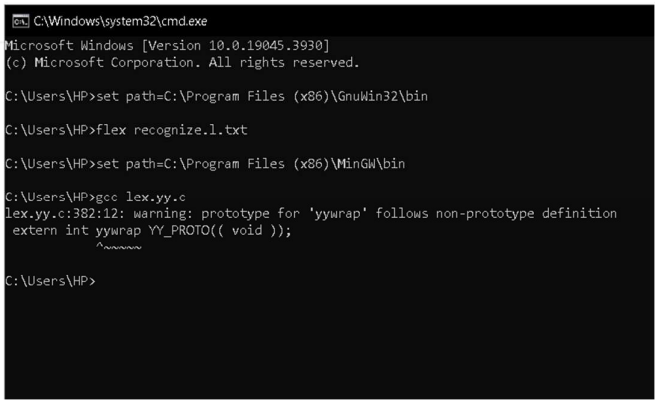
To write a LEX program that identifies numbers and words from a given statement.

Code:

```
%{
#include <stdio.h>
%}
%%
[0-9]+(\.[0-9]+)? { printf("Number: %s\n", yytext); }
[a-zA-Z]+ { printf("Word: %s\n", yytext); }
[ \t\n] { /* Ignore whitespace */ }
. { /* Ignore other characters */ }
%%
int main() {
    yylex();
    return 0;
}
```

Output:





16. LEX Program to Identify and Count Positive and Negative Numbers

Aim:

To write a LEX program that identifies and counts positive and negative numbers in the input.

Code:

```
%{
#include <stdio.h>
int positive_count = 0, negative_count = 0;
%}
%%
"-"[0-9]+ { printf("Negative Number: %s\n", yytext); negative_count++; }
[0-9]+ { printf("Positive Number: %s\n", yytext); positive_count++; }
[ \t\n] { /* Ignore whitespace */ }
. { /* Ignore other characters */ }
%%
int main() {
   yylex();
   printf("\nTotal Positive Numbers: %d\nTotal Negative Numbers: %d\n",
positive_count, negative_count);
   return 0;
}
```

Output:

posandneg.l - Notepad

File Edit Format View Help

```
%{
int positive_no = 0, negative_no = 0;
%}

%%
^[-][0-9]+ {negative_no++;
                        printf("negative number = %s\n",yytext);}

[0-9]+ {positive_no++;
                printf("positive number = %s\n",yytext);}

%%

int yywrap(){}
int main()
{

yylex();
printf ("number of positive numbers = %d,"
                "number of negative numbers = %d\n",
                                positive_no, negative_no);

return 0;
}
```

C:\Windows\system32\cmd.exe - a

```
Microsoft Windows [Version 10.0.19045.3930]
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C:\Users\HP>set path=C:\Program Files (x86)\GnuWin32\bin

C:\Users\HP>flex posandneg.l.txt

C:\Users\HP>set path=C:\Program Files (x86)\MinGW\bin

C:\Users\HP>gcc lex.yy.c

C:\Users\HP>a
23 -45 67 -89 100
positive number = 23
 -positive number = 45
 positive number = 67
 -positive number = 89
 positive number = 100
```

17. LEX Program to Validate a URL

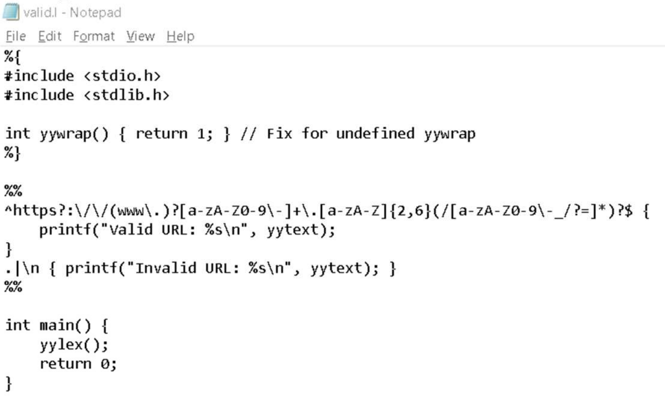
Aim:

To write a LEX program that validates whether an input string is a valid URL.

Code:

```
%{
#include <stdio.h>
%}
%%
^https?:\/\/(www\.)?[a-zA-Z0-9\-]+\.[a-zA-Z]{2,6}(/[a-zA-Z0-9\-_/?=]*)?$ {
    printf("Valid URL: %s\n", yytext);
}
.|\n { printf("Invalid URL: %s\n", yytext); }
%%
int main() {
    yylex();
    return 0;
}
```

Output:

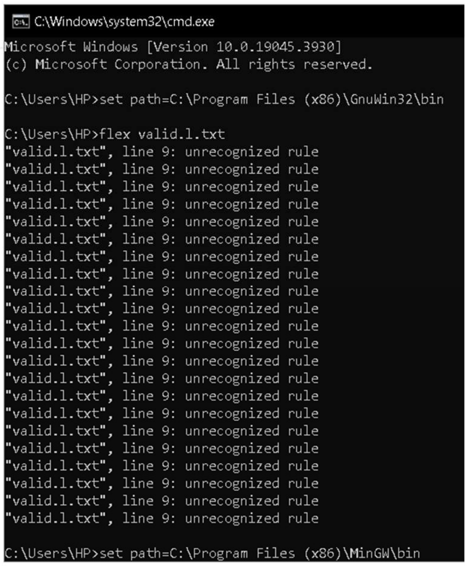


```
%{
#include <stdio.h>
#include <stdlib.h>

int yywrap() { return 1; } // Fix for undefined yywrap
%}

%%
^https?:\/\/(www\.)?[a-zA-Z0-9\-]+\.[a-zA-Z]{2,6}(/[a-zA-Z0-9\-_/?=]*)?$ {
    printf("Valid URL: %s\n", yytext);
}
.|\n { printf("Invalid URL: %s\n", yytext); }
%%

int main() {
    yylex();
    return 0;
}
```



```
Microsoft Windows [Version 10.0.19045.3930]
(c) Microsoft Corporation. All rights reserved.

C:\Users\HP>set path=C:\Program Files (x86)\GnuWin32\bin

C:\Users\HP>flex valid.l.txt
"valid.l.txt", line 9: unrecognized rule
"valid.l.txt", line 9: unrecognized rule
"valid.l.txt", line 9: unrecognized rule
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"valid.l.txt", line 9: unrecognized rule

C:\Users\HP>set path=C:\Program Files (x86)\MinGW\bin
```

18. LEX Program to Validate Student DOB (Format: DD/MM/YYYY)

Aim:

To write a LEX program that validates the Date of Birth (DOB) format as DD/MM/YYYY.

Code:

```
%{
#include <stdio.h>
%}
%%
[0-3][0-9]/[0-1][0-9]/[0-9]{4} { printf("Valid DOB: %s\n", yytext); }
.|\n { printf("Invalid DOB: %s\n", yytext); }
%%
int main() {
    yylex();
    return 0;
}
```

Output:

dob.l - Notepad

File Edit Format View Help

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

%%

[0-9][0-9]\/[0-1][0-9]\/[1-2][0-9]{3} { printf("valid");}
.+ { printf("invalid");}
%%

int yywrap(){}

int main()
{
yylex();
}
```

C:\Windows\system32\cmd.exe - a

```
Microsoft Windows [Version 10.0.19045.3930]
(c) Microsoft Corporation. All rights reserved.

C:\Users\HP>set path=C:\Program Files (x86)\GnuWin32\bin

C:\Users\HP>flex dob.l.txt

C:\Users\HP>set path=C:\Program Files (x86)\MinGW\bin

C:\Users\HP>gcc lex.yy.c

C:\Users\HP>a
31-08-2005
invalid
31/08/2005
valid
```

19. LEX Program to Implement Basic Mathematical Operations

Aim:

To write a LEX program that performs basic mathematical operations (+, -, *, /).

Code:

```
%{
#include <stdio.h>
int result = 0, num1 = 0, num2 = 0;
char op;
%}
%%
[0-9]+ {
   if (num1 == 0)
      num1 = atoi(yytext);
   else
      num2 = atoi(yytext);
}
[+\-*/] { op = yytext[0]; }
\n {
   switch(op) {
      case '+': result = num1 + num2; break;
      case '-': result = num1 - num2; break;
      case '*': result = num1 * num2; break;
      case '/': result = (num2 != 0) ? num1 / num2 : 0; break;
      default: result = 0;
   }
   printf("Result: %d %c %d = %d\n", num1, op, num2, result);
   num1 = num2 = 0; // Reset
}
%%
int main() {
   yylex();
   return 0;
}
```

Output:

math.l - Notepad

File Edit Format View Help

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

"="|"+"|"-"|"/"|"*" { printf("valid");}
.+  {printf("invalid");}
%%
int yywrap(){}
int main()
{
printf("enter the input:");
yylex();
return 0;
}
```

Select C:\Windows\system32\cmd.exe

```
C:\Users\HP>set path=C:\Program Files (x86)\GnuWin32\bin

C:\Users\HP>flex math.l.txt

C:\Users\HP>set path=C:\Program Files (x86)\MinGW\bin

C:\Users\HP>gcc lex.yy.c

C:\Users\HP>a
enter the input:12 + 5
invalid
8 * 3
invalid
20 - 7
invalid
15 / 3
invalid
```