



Course

VIDYAVARDHAKA COLLEGE OF ENGINEERING

Autonomous Institute, Affiliated to Visvesvaraya Technological University, Belagavi (Approved by AICTE, New Delni & Government of Karnataka) Accredited by NBA | NAAC with 'A' Grade

Department of Computer Science & Engineering

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Activity Based Assessment System Software and Compiler Design (21CS63) Semester / Sec: VI 'A' Branch: CSE

Academic:

Instructor: Dr. Chethana H T Year 2023-24

Team Members

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Activity Description: Students shall design and develop solutions using Lex and Yaac in a team of maximum 4 members. Each team shall come up with solutions for the below problem statements.

- 1) Write a LEX program to recognize valid arithmetic expression. Identifiers in the expression could be only integers and operators could be + and *. Count the identifiers & operators present and print them separately.
- 2) Write YACC program to evaluate arithmetic expression involving operators: +, -, *, and /.
- 3) Develop, Implement and execute a program using YACC tool to recognize all strings ending with b preceded by n a's using the grammar a n b (note: input n value).
- 4) Write a LEX program to eliminate comment lines in a C program and copy the resulting program into a separate file.
- 5) Write YACC program to recognize valid identifier, operators and keywords in the given text (C program) file.
- 6) Write LEX program to count the number of characters, words, spaces and lines in each input file.
- 7) Write a LEX program to recognize whether a given sentence is simple or compound.
- 8) Write a YACC program to recognize a valid variable, which starts with a letter, followed by any number of letters or digits.

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Problem Statement:

1) Write a LEX program to recognize valid arithmetic expression. Identifiers in the expression could be only integers and operators could be + and *. Count the identifiers & operators present and print them separately.

```
%{
#include <stdio.h>
#include <stdlib.h>
#include <ctype.h>
int identifier_count = 0;
int operator_count = 0;
int is valid = 1;
%}
/* Regular expressions for identifiers and operators */
integer [0-9]+
operator [+\*]
%%
{integer} { identifier_count++; }
{operator} { operator_count++; }
[\\t\n] {/* Ignore whitespace */}
      { is_valid = 0; /* Invalid character */}
%%
int main() {
```





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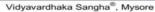


```
printf("Enter an arithmetic expression: ");
  yylex();
  if (is_valid) {
    printf("The expression is valid.\n");
       printf("Identifiers: %d\n", identifier_count);
       printf("Operators: %d\n", operator_count);
  } else {
    printf("The expression is not valid.\n");
  }
  return 0;
}
int yywrap()
  { return 1;
}
Input: a+b*c
Output: The expression is not valid.
Input: 1*2+3
Output: The expression is valid.
Identifiers: 3
Operators: 2
```

Problem Statement:

2) Write YACC program to evaluate arithmetic expression involving operators: +, -, *, and /.

```
%{
       /* Definition section*/
       #include "y.tab.h"
       extern yylval;
```



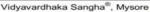


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```
%}
%%
[0-9]+ {
                      yylval = atoi(yytext);
                      return NUMBER;
[a-zA-Z]+ { return ID; }
[ \t]+
               ; /*For skipping whitespaces*/
               { return 0; }
\n
               { return yytext[0]; }
%%
%{
       /* Definition section */
#include <stdio.h>
%}
%token NUMBER ID
// setting the precedence
// and associativity of operators
%left '+' '-'
%left '*' '/'
/* Rule Section */
%%
E : T
        {
```



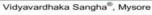


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```
printf("Result = %d\n", $$);
                              return 0;
                       }
T:
       T'+'T{$$ = $1 + $3;}
        | T'-'T{$$ = $1 - $3;}
       | T'*' T { $$ = $1 * $3; }
        | T'/' T { $$ = $1 / $3; }
        | '-' NUMBER { $$ = -$2; }
       | '-' ID { $$ = -$2; }
        | '(' T ')' { $$ = $2; }
        | NUMBER { $$ = $1; }
        | ID { $$ = $1; };
%%
int main() {
       printf("Enter the expression\n");
       yyparse();
}
/* For printing error messages */
int yyerror(char* s) {
       printf("\nExpression is invalid\n");
}
Input: 7*(5-3)/2
Output: 7
Input: 6/((3-2)*(-5+2))
Output: -2
```





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Problem Statement:

3) Develop, Implement and execute a program using YACC tool to recognize all strings ending with b preceded by n a's using the grammar a n b (note: input n value).

```
%{
/* Definition section */
#include "y.tab.h"
%}
/* Rule Section */
%%
[aA] {return A;}
[bB] {return B;}
\n {return NL;}
. {return yytext[0];}
%%
int yywrap()
{
return 1;
}
%{
/* Definition section */
#include<stdio.h>
#include<stdlib.h>
%}
%token A B NL
```





Output: invalid string

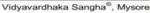
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```
/* Rule Section */
%%
stmt: S NL { printf("valid string\n");
                      exit(0); }
S: A S B |
;
%%
int yyerror(char *msg)
{
printf("invalid string\n");
exit(0);
}
//driver code
main()
{
printf("enter the string\n");
yyparse();
Input: ab
Output: valid string
Input: aba
```





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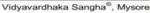
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Problem Statement:

4) Write a LEX program to eliminate comment lines in a C program and copy the resulting program into a separate file.

```
/% Lex Program to remove comments from C program
and save it in a file %/
/*Definition Section*/
%{
%}
/*Starting character sequence for multiline comment*/
start \/\*
/*Ending character sequence for multiline comment*/
end \*\/
/*Rule Section*/
%%
/*Regular expression for single line comment*/
\/\/(.*);
/*Regular expression for multi line comment*/
{start}.*{end};
%%
/*Driver function*/
int main(int k,char **argcv)
{
yyin=fopen(argcv[1],"r");
yyout=fopen("out.c","w");
/*call the yylex function.*/
```





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yylex();
return 0;
}

Output:
Input :
//testing
#include
int main()
{
 /* multiline comment continue....
 */
 return 0;
}

Output :
#include
int main()

Problem Statement:

return 0;

}

5) Write YACC program to recognize valid identifier, operators and keywords in the given text (C program) file.

```
%{
#include <stdio.h>
#include "y.tab.h"
extern yylval;
%}
%%
[\t];
[+|-|*|/|=|<|>] {printf("operator is %s\n",yytext);return OP;}
```





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```
[0-9]+ {yylval = atoi(yytext); printf("numbers is %d\n",yylval); return DIGIT;}
int|char|bool|float|void|for|do|while|if|else|return|void {printf("keyword
is %s\ n",yytext);return KEY;}
[a-zA-Z0-9]+ {printf("identifier is %s\n",yytext);return ID;}
.;
%%
%{
#include <stdio.h>
#include <stdlib.h>
int id=0, dig=0, key=0, op=0;
%}
%token DIGIT ID KEY OP
%%
input:
DIGIT input { dig++; }
| ID input { id++; }
| KEY input { key++; }
OP input {op++;}
| DIGIT { dig++; }
| ID { id++; }
| KEY { key++; }
| OP { op++;}
%%
#include <stdio.h>
extern int yylex();
extern int yyparse();
extern FILE *yyin;
main()
```





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```
FILE *myfile = fopen("f2.c", "r");
if (!myfile)
{
printf("I can't open f2.c!");
return -1;
}
yyin = myfile;
do{ yyparse(
);
}while (!feof(yyin));
printf("numbers = %d\nKeywords = %d\nIdentifiers = %d\noperators = %d\n",dig, key,id,
op);
}
void yyerror() {
printf("EEK, parse error! Message: ");
exit(-1);
}
Input:
int main()
  \{ int a = 5; \}
  float b = 3.14;
  if (a == b) {
    return 0;
  } else {
     return 1;
  }
}
Output:
Keyword: int
```



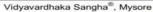
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Identifier: main		
Operator:		
(Operator:)		
Operator:		
{ Keyword: int		
Identifier: a		
Operator: =		
Identifier: 5		
Operator: ;		
Keyword: float		
Identifier: b		
Operator: =		
Identifier: 3.14		
Operator: ;		
Keyword: if		
Operator:		
(Identifier: a		
Operator: ==		
Identifier: b		
Operator:)		
Operator:		
{ Keyword: return		
Identifier: 0		
Operator: ;		
Operator: }		
Keyword: else		
Operator:		
{ Keyword: return		
Identifier: 1		
Operator: ;		





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Problem Statement:

[^\t] { tc++; ch+=yyleng;}

// MAIN FUNCTION

return 0;

}

[^\t\n]+ { wc++; ch+=yyleng;}

6) Write LEX program to count the number of characters, words, spaces and lines in each input file.

```
Solution:

/* DESCRIPTION/DEFINITION SECTION */

%{

#include<stdio.h>
int lc=0,sc=0,tc=0,ch=0,wc=0; // GLOBAL VARIABLES

%}

// RULE SECTION

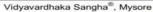
%%

[\n] { lc++; ch+=yyleng;}

[ \t] { sc++; ch+=yyleng;}
```

```
%%
int yywrap(){ return 1; }
/* After inputting press ctrl+d */
```

```
int main(){
    printf("Enter the Sentence : ");
    yylex();
    printf("Number of lines : %d\n",lc);
    printf("Number of spaces : %d\n",sc);
    printf("Number of tabs, words, charc : %d , %d , %d\n",tc,wc,ch);
```





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Input:
Hello

How are you?

Output:

Number of lines : 2 Number of spaces : 8

Number of tabs, words, charc : 0 , 4 , 25

Problem Statement:

7) Write a LEX program to recognize whether a given sentence is simple or compound.

```
Solution:
%{
#include<stdio.h>
int flag=0;
%}
%%
and |
or |
but |
because |
if |
then |
nevertheless {flag = 1;}
.;
\n {return 0; }
%%
int main() {
       printf("Enter the sentence: \n");
```



Hi and Hey

Compound sentence

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yylex(); if(flag == 0) { printf("Simple sentence\n"); } else { printf("Compound sentence\n"); } } int yywrap() { return 1; } **Output:** Enter the sentence: Hi Simple sentence Enter the sentence:

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Problem Statement:

8) Write a YACC program to recognize a valid variable, which starts with a letter, followed by any number of letters or digits.

```
%{
    #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;
}
```

Input: Enter a name to tested for identifier: abc

Output: It's an identifier