System Software and Operating Systems Laboratory

Installation Procedure:

1. **Sudo apt-get update**

To install Lex package:

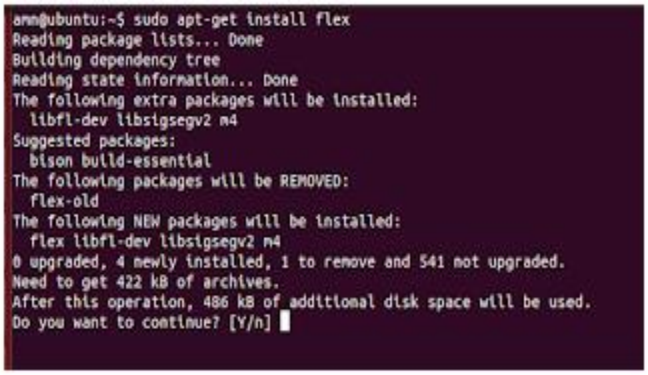
Type the exact command (either of the two)

sudo apt-get install flex

OR

sudo apt-get install flex-old

Type 'y' when it asks for confirmation (see below image)

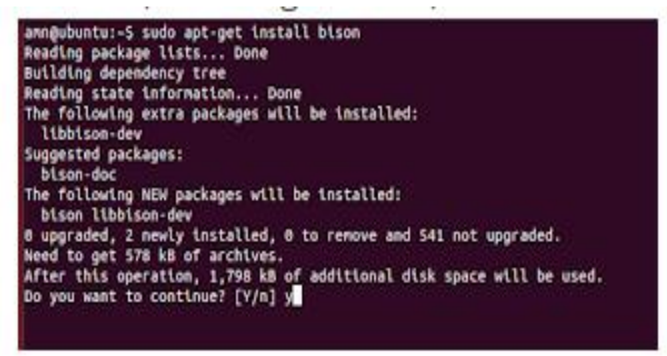


```
amn@ubuntu:~$ sudo apt-get install flex
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following extra packages will be installed:
  libfl-dev libsigsegv2 m4
Suggested packages:
  bison build-essential
The following packages will be REMOVED:
  flex-old
The following NEW packages will be installed:
  flex libfl-dev libsigsegv2 m4
0 upgraded, 4 newly installed, 1 to remove and 541 not upgraded.
Need to get 422 kB of archives.
After this operation, 486 kB of additional disk space will be used.
Do you want to continue? [Y/n]
```

To install Yacc package:

sudo apt-get install bison

Type 'y' when it asks for confirmation (see image below)



```
amn@ubuntu:~$ sudo apt-get install bison
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following extra packages will be installed:
  libbison-dev
Suggested packages:
  bison-doc
The following NEW packages will be installed:
  bison libbison-dev
0 upgraded, 2 newly installed, 0 to remove and 541 not upgraded.
Need to get 578 kB of archives.
After this operation, 1,798 kB of additional disk space will be used.
Do you want to continue? [Y/n] y
```

SAMPLE PROGRAMS

1. lex code to count the number of a's in the input

```
%{
int c=0;            /* Global Variable */
%}
/* Rules Section */

%%
[a]     c++;
.       ;
%%

int main()
{
        yylex();
        printf("The no of a's in the given string  %d\n",c);
}
```

Execution Steps:

Lex <lexfilename.l>

cc lex.yy.c –ll

. /a.out

OUTPUT

aaabna (Press **Cntrl-D**)
The no of a’s in the given string 4

2. lex code to count the number of lines, tabs and spaces used in the input

```
%{
#include<stdio.h>
int lc=0, sc=0, tc=0, ch=0; /*Global variables*/
%}

/*Rule Section*/
%%
\n lc++; //line counter
([ ])+ sc++; //space counter
\t tc++; //tab counter
. ch++;  //characters counter
%%

int main()
{
        // The function that starts the analysis
        yylex();

        printf("\nNo. of lines=%d", lc);
        printf("\nNo. of spaces=%d", sc);
        printf("\nNo. of tabs=%d", tc);
        printf("\nNo. of other characters=%d\n", ch);

}
```

Execution Steps:

```
Lex <lexfilename.l>

cc lex.yy.c –ll

. /a.out
```

OUTPUT

```
Good Morning
No of lines = 1
No of spaces = 1
No of tabs = 0
No of characters = 11
```

3. lex program to count number of words

```
%{
#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;
}
```

<u>Execution Steps:</u>

```
Lex <lexfilename.l>

cc lex.yy.c –ll

. /a.out
```

<u>OUTPUT</u>

```
Hello Good Morning

3
```

LAB PROGRAMS

1 a. 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>

int v=0,op=0,id=0,flag=0;

%}

%%

[a-zA-Z]+[0-9A-Za-z]* {id++;printf("\n Identifier:");ECHO;}

[\+\-\*\/\=] {op++;printf("\n Operartor:");ECHO;}

"(" {v++;}

")" {v--;}

";" {flag=1;}

.|\n {;}

%%

main()

{

printf("Enter the expression");

yylex();

if((op+1) ==id && v==0 && flag==0)

{

printf("\n Expression is Valid\n");

printf("Number of identifiers:%d\n",id);

printf("Number of operators:%d\n",op);

}

else

printf("\n Expression is Invalid\n");

}
```

Execution Steps:

```
Lex <lexfilename.l>

cc lex.yy.c –ll

. /a.out
```

Output:

```
Enter the expression

a+b Identifier: a

Operartor: +

Identifier:b

Number of identifiers is: 2

Number of operators is: 1

Expression is valid
```

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

LEX PART

```
%{

#include"y.tab.h"

extern yylval;

%}

%%

[0-9]+ {yylval=atoi(yytext);return num;}

[\+\-\*\/] {return yytext[0];}

[(] {return yytext[0];}

[)] {return yytext[0];}

. {;}

\n {return 0;}

%%
```

YACC PART

```
%{

#include<stdio.h>
#include<stdlib.h>
%}
%token num
%left '+''-'
%left '*''/'
%%
input:exp{printf("%d\n",$$);exit(0);}
exp:exp'+' exp{$$=$1+$3;}
|exp'-' exp{$$=$1-$3;}
|exp'*' exp{$$=$1*$3;}
|exp'/' exp{if($3==0) {printf("divide by zero\n");
exit(0);}
else
$$=$1/$3;}
|'('exp')' {$$=$2;}
|num {$$=$1;};
%%
int yyerror()
{
printf("error\n");
exit(0);
}
int main()
{
printf("Enter a expression: ");
yyparse();
}
```

Execution Steps:

```
Lex <lexfilename.l>
Yacc -d <yaccfilename.y>
```

```
cc lex.yy.c y.tab.c –ll
. /a.out
```

Output:

```
Enter an expression:
(2+3)*5+9
34
```