**Exp. No. 1**

**Develop a lexical Analyzer to identify identifiers, constants, operators using C program.**

**Program:**

#include<stdio.h>

#include<ctype.h>

#include<string.h>

int main()

{

int i,ic=0,m,cc=0,oc=0,j;

char b[30],operators[30],identifiers[30],constants[30];

printf("enter the string : ");

scanf("%[^\n]s",&b);

for(i=0;i<strlen(b);i++)

{

if(isspace(b[i]))

{

continue;

}

else if(isalpha(b[i]))

{

identifiers[ic] =b[i];

ic++;

}

else if(isdigit(b[i]))

{

m=(b[i]-'0');

i=i+1;

while(isdigit(b[i]))

{

m=m\*10 + (b[i]-'0');

i++;

}

i=i-1;

constants[cc]=m;

cc++;

}

else

{

if(b[i]=='\*')

{

operators[oc]='\*';

oc++;

}

else if(b[i]=='-')

{

operators[oc]='-';

oc++;

}

else if(b[i]=='+')

{

operators[oc]='+';

oc++;

}

else if(b[i]=='=')

{

operators[oc]='=';

oc++;

}

}

}

printf(" identifiers : ");

for(j=0;j<ic;j++)

{

printf("%c ",identifiers[j]);

}

printf("\n constants : ");

for(j=0;j<cc;j++)

{

printf("%d ",constants[j]);

}

printf("\n operators : ");

for(j=0;j<oc;j++)

{

printf("%c ",operators[j]);

}

}

**Output:**

enter the string : a = b + c \* e + 100

identifiers : a b c e

constants : 100

operators : = + \* +

**Exp. No. 2**

**Develop a lexical Analyzer to identify whether a given line is a comment or not using C**

**Program:**

#include<stdio.h>

#include<conio.h>

int main()

{

char com[30];

int i=2,a=0;

printf("\n Enter comment:");

gets(com);

if(com[0]=='/')

{

if(com[1]=='/')

printf("\n It is a comment");

else if(com[1]=='\*')

{

for(i=2;i<=30;i++)

{

if(com[i]=='\*'&&com[i+1]=='/')

{

printf("\n It is a comment");

a=1;

break;

}

else

continue;

}

if(a==0)

printf("\n It is not a comment");

}

else

printf("\n It is not a comment");

}

else

printf("\n It is not a comment");

}

**Output:**

**Input:** Enter comment: //hello

**Output**: It is a comment

**Input:** Enter comment: hello

**Output**: It is not a comment

**Exp. No. 3**

**Design a lexical Analyzer for given language should ignore the redundant spaces, tabs and new lines and ignore comments using C**

**Program:**

#include<stdio.h>

#include<stdlib.h>

#include<string.h>

#include<ctype.h>

int isKeyword(char buffer[]){

char keywords[32][10] = {"main","auto","break","case","char","const","continue","default",

"do","double","else","enum","extern","float","for","goto",

"if","int","long","register","return","short","signed",

"sizeof","static","struct","switch","typedef",

"unsigned","void","printf","while"};

int i, flag = 0;

for(i = 0; i < 32; ++i){

if(strcmp(keywords[i], buffer) == 0){

flag = 1;

break;

}

}

return flag;

}

int main(){

char ch, buffer[15], operators[] = "+-\*/%=";

FILE \*fp;

int i,j=0;

fp = fopen("3lex\_input.txt","r");

if(fp == NULL){

printf("error while opening the file\n");

exit(0);

}

while((ch = fgetc(fp)) != EOF){

for(i = 0; i < 6; ++i){

if(ch == operators[i])

printf("%c is operator\n", ch);

}

if(isalnum(ch)){

buffer[j++] = ch;

}

else if((ch == ' ' || ch == '\n') && (j != 0)){

buffer[j] = '\0';

j = 0;

if(isKeyword(buffer) == 1)

printf("%s is keyword\n", buffer);

else

printf("%s is identifier\n", buffer);

}

}

fclose(fp);

return 0;

}

**Input:** 3lex\_input.txt

main ( )

{

int a, b, c ;

c = b + c;

printf ( "%d" ,c ) ;

}

**Output:**

main is keyword

int is keyword

a is indentifier

b is indentifier

c is indentifier

c is indentifier

= is operator

b is indentifier

+ is operator

c is indentifier

printf is keyword

% is operator

d is indentifier

c is indentifier

**Exp. No. 4**

**Design a lexical Analyzer to validate operators to recognize the operators +,-,\*,/ using regular arithmetic operators using C**

**Program:**

#include<stdio.h>

#include<conio.h>

int main()

{

char s[5];

printf("\n Enter any operator:");

gets(s);

switch(s[0])

{

case'>':

if(s[1]=='=')

printf("\n Greater than or equal");

else

printf("\n Greater than");

break;

case'<':

if(s[1]=='=')

printf("\n Less than or equal");

else

printf("\nLess than");

break;

case'=':

if(s[1]=='=')

printf("\nEqual to");

else

printf("\nAssignment");

break;

case'!':

if(s[1]=='=')

printf("\nNot Equal");

else

printf("\n Bit Not");

break;

case'&':

if(s[1]=='&')

printf("\nLogical AND");

else

printf("\n Bitwise AND");

break;

case'|':

if(s[1]=='|')

printf("\nLogical OR");

else

printf("\nBitwise OR");

break;

case'+':

printf("\n Addition");

break;

case'-':

printf("\nSubstraction");

break;

case'\*':

printf("\nMultiplication");

break;

case'/':

printf("\nDivision");

break;

case'%':

printf("Modulus");

break;

default:

printf("\n Not a operator");

}

}

**Output:**

Enter any operator:<=

Less than or equal

**Exp. No. 5**

**Design a lexical Analyzer to find the number of whitespaces and newline characters using C.**

**Program:**

#include <stdio.h>

int main()

{

char str[100];//input string with size 100

int words=0,newline=0,characters=0; // counter variables

scanf("%[^~]",&str);//scanf formatting

for(int i=0;str[i]!='\0';i++)

{

if(str[i] == ' ')

{

words++;

}

else if(str[i] == '\n')

{

newline++;

words++;//since with every next line new words start. corner case 1

}

else if(str[i] != ' ' && str[i] != '\n'){

characters++;

}

}

if(characters > 0)//Corner case 2,3.

{

words++;

newline++;

}

printf("Total number of words : %d\n",words);

printf("Total number of lines : %d\n",newline);

printf("Total number of characters : %d\n",characters);

return 0;

}

**Output:**

void main()

{

int a;

int b;

a = b + c;

c = d \* e;

}

Total number of words : 18

Total number of lines : 7

**Exp. No. 6**

**Develop a lexical Analyzer to test whether a given identifier is valid or not using C.**

**Program:**

#include<stdio.h>

#include<conio.h>

#include<ctype.h>

int main()

{

char a[10];

int flag, i=1;

printf("\n Enter an identifier:");

gets(a);

if(isalpha(a[0]))

flag=1;

else

printf("\n Not a valid identifier");

while(a[i]!='\0')

{

if(!isdigit(a[i])&&!isalpha(a[i]))

{

flag=0;

break;

} i++;

}

if(flag==1)

printf("\n Valid identifier");

}

**Output:**

Enter an identifier:abc123

Valid identifier

**Exp. No. 7**

**Write a C program to find FIRST( ) - predictive parser for the given grammar**

S → AaAb / BbBa

A → ∈

B → ∈

**Program:**

#include<stdio.h>

#include<ctype.h>

void FIRST(char[],char );

void addToResultSet(char[],char);

int numOfProductions;

char productionSet[10][10];

int main()

{

int i;

char choice;

char c;

char result[20];

printf("How many number of productions ? :");

scanf(" %d",&numOfProductions);

for(i=0;i<numOfProductions;i++)//read production string eg: E=E+T

{

printf("Enter productions Number %d : ",i+1);

scanf(" %s",productionSet[i]);

}

do

{

printf("\n Find the FIRST of :");

scanf(" %c",&c);

FIRST(result,c); //Compute FIRST; Get Answer in 'result' array

printf("\n FIRST(%c)= { ",c);

for(i=0;result[i]!='\0';i++)

printf(" %c ",result[i]); //Display result

printf("}\n");

printf("press 'y' to continue : ");

scanf(" %c",&choice);

}

while(choice=='y'||choice =='Y');

}

/\*

\*Function FIRST:

\*Compute the elements in FIRST(c) and write them

\*in Result Array.

\*/

void FIRST(char\* Result,char c)

{

int i,j,k;

char subResult[20];

int foundEpsilon;

subResult[0]='\0';

Result[0]='\0';

//If X is terminal, FIRST(X) = {X}.

if(!(isupper(c)))

{

addToResultSet(Result,c);

return ;

}

//If X is non terminal

//Read each production

for(i=0;i<numOfProductions;i++)

{

//Find production with X as LHS

if(productionSet[i][0]==c)

{

//If X → ε is a production, then add ε to FIRST(X).

if(productionSet[i][2]=='$') addToResultSet(Result,'$');

//If X is a non-terminal, and X → Y1 Y2 … Yk

//is a production, then add a to FIRST(X)

//if for some i, a is in FIRST(Yi),

//and ε is in all of FIRST(Y1), …, FIRST(Yi-1).

else

{

j=2;

while(productionSet[i][j]!='\0')

{

foundEpsilon=0;

FIRST(subResult,productionSet[i][j]);

for(k=0;subResult[k]!='\0';k++)

addToResultSet(Result,subResult[k]);

for(k=0;subResult[k]!='\0';k++)

if(subResult[k]=='$')

{

foundEpsilon=1;

break;

}

//No ε found, no need to check next element

if(!foundEpsilon)

break;

j++;

}

}

}

}

return ;

}

/\* addToResultSet adds the computed

\*element to result set.

\*This code avoids multiple inclusion of elements

\*/

void addToResultSet(char Result[],char val)

{

int k;

for(k=0 ;Result[k]!='\0';k++)

if(Result[k]==val)

return;

Result[k]=val;

Result[k+1]='\0';

}

**Output:**

How many number of productions ? :4

Enter productions Number 1 : S=AaAb

Enter productions Number 2 : S=BbBa

Enter productions Number 3 : A=$

Enter productions Number 4 : B=$

Find the FIRST of :S

FIRST(S)= { $ a b }

press 'y' to continue : y

Find the FIRST of :A

FIRST(A)= { $ }

press 'y' to continue : y

Find the FIRST of :B

FIRST(B)= { $ }

press 'y' to continue : n

**Exp. No. 8**

**Write a C program to find FOLLOW( )** **- predictive parser for the given grammar**

S → AaAb / BbBa

A → ∈

B → ∈

**Program:**

#include<stdio.h>

#include<ctype.h>

#include<string.h>

int limit, x = 0;

char production[10][10], array[10];

void find\_first(char ch);

void find\_follow(char ch);

void Array\_Manipulation(char ch);

int main()

{

int count;

char option, ch;

printf("\nEnter Total Number of Productions:\t");

scanf("%d", &limit);

for(count = 0; count < limit; count++)

{

printf("\nValue of Production Number [%d]:\t", count + 1);

scanf("%s", production[count]);

}

do

{

x = 0;

printf("\nEnter production Value to Find Follow:\t");

scanf(" %c", &ch);

find\_follow(ch);

printf("\nFollow Value of %c:\t{ ", ch);

for(count = 0; count < x; count++)

{

printf("%c ", array[count]);

}

printf("}\n");

printf("To Continue, Press Y:\t");

scanf(" %c", &option);

}while(option == 'y' || option == 'Y');

return 0;

}

void find\_follow(char ch)

{

int i, j;

int length = strlen(production[i]);

if(production[0][0] == ch)

{

Array\_Manipulation('$');

}

for(i = 0; i < limit; i++)

{

for(j = 2; j < length; j++)

{

if(production[i][j] == ch)

{

if(production[i][j + 1] != '\0')

{

find\_first(production[i][j + 1]);

}

if(production[i][j + 1] == '\0' && ch != production[i][0])

{

find\_follow(production[i][0]);

}

}

}

}

}

void find\_first(char ch)

{

int i, k;

if(!(isupper(ch)))

{

Array\_Manipulation(ch);

}

for(k = 0; k < limit; k++)

{

if(production[k][0] == ch)

{

if(production[k][2] == '$')

{

find\_follow(production[i][0]);

}

else if(islower(production[k][2]))

{

Array\_Manipulation(production[k][2]);

}

else

{

find\_first(production[k][2]);

}

}

}

}

void Array\_Manipulation(char ch)

{

int count;

for(count = 0; count <= x; count++)

{

if(array[count] == ch)

{

return;

}

}

array[x++] = ch;

}

**Output:**

Enter Total Number of Productions: 4

Value of Production Number [1]: S=AaAb

Value of Production Number [2]: S=BbBa

Value of Production Number [3]: A=$

Value of Production Number [4]: B=$

Enter production Value to Find Follow: S

Follow Value of S: { $ }

To Continue, Press Y: y

Enter production Value to Find Follow: A

Follow Value of A: { a b }

To Continue, Press Y: y

Enter production Value to Find Follow: B

Follow Value of B: { b a }

To Continue, Press Y: n

**Exp. No. 9**

**Implement a C program to eliminate left recursion from a given CFG.**

S → (L) / a

L → L , S / S

**Program:**

#include<stdio.h>

#include<string.h>

#define SIZE 10

int main () {

char non\_terminal;

char beta,alpha;

int num;

char production[10][SIZE];

int index=3; /\* starting of the string following "->" \*/

printf("Enter Number of Production : ");

scanf("%d",&num);

printf("Enter the grammar as E->E-A :\n");

for(int i=0;i<num;i++){

scanf("%s",production[i]);

}

for(int i=0;i<num;i++){

printf("\nGRAMMAR : : : %s",production[i]);

non\_terminal=production[i][0];

if(non\_terminal==production[i][index]) {

alpha=production[i][index+1];

printf(" is left recursive.\n");

while(production[i][index]!=0 && production[i][index]!='|')

index++;

if(production[i][index]!=0) {

beta=production[i][index+1];

printf("Grammar without left recursion:\n");

printf("%c->%c%c\'",non\_terminal,beta,non\_terminal);

printf("\n%c\'->%c%c\'|E\n",non\_terminal,alpha,non\_terminal);

}

else

printf(" can't be reduced\n");

}

else

printf(" is not left recursive.\n");

index=3;

}

}

**Output:**

Enter Number of Production : 2

Enter the grammar as E->E-A :

S->(L)|a

L->L,S|S

GRAMMAR : : : S->(L)|a is not left recursive.

GRAMMAR : : : L->L,S|S is left recursive.

Grammar without left recursion:

L->SL'

L'->,L'|E

**Exp. No. 10**

**Implement a C program to eliminate left factoring from a given CFG.**

S → iEtS / iEtSeS / a

E → b

**Program:**

#include<stdio.h>

#include<string.h>

int main()

{

char gram[20],part1[20],part2[20],modifiedGram[20],newGram[20],tempGram[20];

int i,j=0,k=0,l=0,pos;

printf("Enter Production : S->");

gets(gram);

for(i=0;gram[i]!='|';i++,j++)

part1[j]=gram[i];

part1[j]='\0';

for(j=++i,i=0;gram[j]!='\0';j++,i++)

part2[i]=gram[j];

part2[i]='\0';

for(i=0;i<strlen(part1)||i<strlen(part2);i++)

{

if(part1[i]==part2[i])

{

modifiedGram[k]=part1[i];

k++;

pos=i+1;

}

}

for(i=pos,j=0;part1[i]!='\0';i++,j++){

newGram[j]=part1[i];

}

newGram[j++]='|';

for(i=pos;part2[i]!='\0';i++,j++){

newGram[j]=part2[i];

}

modifiedGram[k]='X';

modifiedGram[++k]='\0';

newGram[j]='\0';

printf("\n S->%s",modifiedGram);

printf("\n X->%s\n",newGram);

}

**Output:**

Enter Production : S->iEtS|iEtSeS|a

S->iEtSX

X->|eS|a

**Exp. No. 11**

Implement a C program to perform symbol table operations.

**Program:**

#include<stdio.h>

#include<stdlib.h>

#include<string.h>

int cnt=0;

struct symtab

{

char label[20];

int addr;

}

sy[50];

void insert();

int search(char \*);

void display();

void modify();

int main()

{

int ch,val;

char lab[10];

do

{

printf("\n1.insert\n2.display\n3.search\n4.modify\n5.exit\n");

scanf("%d",&ch);

switch(ch)

{

case 1:

insert();

break;

case 2:

display();

break;

case 3:

printf("enter the label");

scanf("%s",lab);

val=search(lab);

if(val==1)

printf("label is found");

else

printf("label is not found");

break;

case 4:

modify();

break;

case 5:

exit(0);

break;

}

}while(ch<5);

}

void insert()

{

int val;

char lab[10];

int symbol;

printf("enter the label");

scanf("%s",lab);

val=search(lab);

if(val==1)

printf("duplicate symbol");

else

{

strcpy(sy[cnt].label,lab);

printf("enter the address");

scanf("%d",&sy[cnt].addr);

cnt++;

}

}

int search(char \*s)

{

int flag=0,i; for(i=0;i<cnt;i++)

{

if(strcmp(sy[i].label,s)==0)

flag=1;

}

return flag;

}

void modify()

{

int val,ad,i;

char lab[10];

printf("enter the labe:");

scanf("%s",lab);

val=search(lab);

if(val==0)

printf("no such symbol");

else

{

printf("label is found \n");

printf("enter the address");

scanf("%d",&ad);

for(i=0;i<cnt;i++)

{

if(strcmp(sy[i].label,lab)==0)

sy[i].addr=ad;

}

}

}

void display()

{

int i;

for(i=0;i<cnt;i++)

printf("%s\t%d\n",sy[i].label,sy[i].addr);

}

**Output:**

1.insert

2.display

3.search

4.modify

5.exit

1

enter the label a

enter the address 100

1.insert

2.display

3.search

4.modify

5.exit

2

a 100

1.insert

2.display

3.search

4.modify

5.exit

3

enter the label a

label is found

1.insert

2.display

3.search

4.modify

5.exit

4

enter the labe: a

label is found

enter the address 200

1.insert

2.display

3.search

4.modify

5.exit

2

a 200

1.insert

2.display

3.search

4.modify

5.exit

5

**Exp. No. 12**

Write a C program to construct recursive descent parsing for the given grammar

E → TE’

E’ → +TE’ / ∈

T → FT’

T’ → \*FT’ / ∈

F → ( E ) / id

**Program:**

#include<stdio.h>

#include<conio.h>

#include<string.h>

char input[100];

int i,l;

void main()

{

//clrscr();

printf("\nRecursive descent parsing for the following grammar\n"); printf("\nE->TE'\nE'->+TE'/@\nT->FT'\nT'->\*FT'/@\nF->(E)/ID\n"); printf("\nEnter the string to be checked:"); gets(input);

if(E())

{

if(input[i+1]=='\0')

printf("\nString is accepted");

else

printf("\nString is not accepted");

}

else

printf("\nString not accepted");

getch();

}

E()

{

if(T())

{

if(EP())

return(1);

else

return(0);

}

else

return(0);

}

EP()

{

if(input[i]=='+')

{

i++;

if(T())

{

if(EP())

return(1);

else

return(0);

}

else

return(0);

}

else

return(1);

}

T()

{

if(F())

{

if(TP())

return(1);

else

return(0);

}

else

return(0);

}

TP()

{

if(input[i]=='\*')

{

i++;

if(F())

{

if(TP())

return(1);

else

return(0);

}

else

return(0);

}

else

return(1);

}

F()

{

if(input[i]=='(')

{

i++;

if(E())

{

if(input[i]==')')

{

i++;

return(1);

}

else

return(0);

}

else

return(0);

}

else if(input[i]>='a'&&input[i]<='z'||input[i]>='A'&&input[i]<='Z')

{

i++;

return(1);

}

else

return(0);

}

**Output:**

Recursive descent parsing for the following grammar

E->TE'

E'->+TE'/@

T->FT'

T'->\*FT'/@

F->(E)/ID

Enter the string to be checked: (a+b)\*c

String is accepted

Enter the string to be checked: a/c+d

String is not accepted

**Exp. No. 13**

Write a C program to implement either Top Down parsing technique or Bottom Up Parsing technique to check whether the given input string is satisfying the grammar or not.

**Program:**

#include<stdio.h>

#include<conio.h>

#include<string.h>

int main() {

char string[50];

int flag,count=0;

printf("The grammar is: S->aS, S->Sb, S->ab\n");

printf("Enter the string to be checked:\n");

gets(string);

if(string[0]=='a') {

flag=0;

for (count=1;string[count-1]!='\0';count++) {

if(string[count]=='b') {

flag=1;

continue;

} else if((flag==1)&&(string[count]=='a')) {

printf("The string does not belong to the specified grammar");

break;

} else if(string[count]=='a')

continue; else if((flag==1)&&(string[count]='\0')) {

printf("String not accepted…..!!!!");

break;

} else {

printf("String accepted");

}

}

}

}

**Output:**

The grammar is: S->aS, S->Sb, S->ab

Enter the string to be checked:

abb

String accepted

**Exp. No. 14**

Implement the concept of Shift reduce parsing in C Programming.

**Program:**

#include<stdio.h>

#include<stdlib.h>

#include<conio.h>

#include<string.h>

char ip\_sym[15],stack[15]; int ip\_ptr=0,st\_ptr=0,len,i; char temp[2],temp2[2]; char act[15];

void check(); int main()

{

//clrscr();

printf("\n\t\t SHIFT REDUCE PARSER\n"); printf("\n GRAMMER\n");

printf("\n E->E+E\n E->E/E"); printf("\n E->E\*E\n E->a/b"); printf("\n enter the input symbol:\t"); gets(ip\_sym);

printf("\n\t stack implementation table"); printf("\n stack \t\t input symbol\t\t action");

printf("\n \t\t \t\t \n");

printf("\n $\t\t%s$\t\t\t--",ip\_sym); strcpy(act,"shift "); temp[0]=ip\_sym[ip\_ptr]; temp[1]='\0';

strcat(act,temp); len=strlen(ip\_sym); for(i=0;i<=len-1;i++)

{

stack[st\_ptr]=ip\_sym[ip\_ptr];

stack[st\_ptr+1]='\0'; ip\_sym[ip\_ptr]=' '; ip\_ptr++;

printf("\n $%s\t\t%s$\t\t\t%s",stack,ip\_sym,act); strcpy(act,"shift");

temp[0]=ip\_sym[ip\_ptr]; temp[1]='\0'; strcat(act,temp); check();

st\_ptr++;

}

st\_ptr++; check();

}

void check()

{

int flag=0; temp2[0]=stack[st\_ptr]; temp2[1]='\0';

if((!strcmpi(temp2,"a"))||(!strcmpi(temp2,"b")))

{

stack[st\_ptr]='E'; if(!strcmpi(temp2,"a"))

printf("\n $%s\t\t%s$\t\t\tE->a",stack,ip\_sym); else

printf("\n $%s\t\t%s$\t\t\tE->b",stack,ip\_sym); flag=1;

}

if((!strcmpi(temp2,"+"))||(strcmpi(temp2,"\*"))||(!strcmpi(temp2,"/")))

{

flag=1;

}

if((!strcmpi(stack,"E+E"))||(!strcmpi(stack,"E\E"))||(!strcmpi(stack,"E\*E")))

{

strcpy(stack,"E"); st\_ptr=0; if(!strcmpi(stack,"E+E"))

printf("\n $%s\t\t%s$\t\t\tE->E+E",stack,ip\_sym); else

if(!strcmpi(stack,"E\E"))

printf("\n $%s\t\t%s$\t\t\tE->E\E",stack,ip\_sym); else

if(!strcmpi(stack,"E\*E"))

printf("\n $%s\t\t%s$\t\t\tE->E\*E",stack,ip\_sym); else

printf("\n $%s\t\t%s$\t\t\tE->E+E",stack,ip\_sym); flag=1;

}

if(!strcmpi(stack,"E")&&ip\_ptr==len)

{

printf("\n $%s\t\t%s$\t\t\tACCEPT",stack,ip\_sym); getch();

exit(0);

}

if(flag==0)

{

printf("\n%s\t\t\t%s\t\t reject",stack,ip\_sym); exit(0);

}

return;

}

**Output:**

SHIFT REDUCE PARSER

GRAMMER

E->E+E

E->E/E

E->E\*E

E->a/b

enter the input symbol: a+b

stack implementation table

stack input symbol action

$ a+b$ --

$a +b$ shift a

$E +b$ E->a

$E+ b$ shift+

$E+b $ shiftb

$E+E $ E->b

$E $ E->E+E

$E $ ACCEPT

**Exp. No. 15**

Write a C Program to implement the operator precedence parsing.

**Program:**

#include<stdio.h>

#include<string.h>

char \*input;

int i=0;

char lasthandle[6],stack[50],handles[][5]={")E(","E\*E","E+E","i","E^E"};

//(E) becomes )E( when pushed to stack

int top=0,l;

char prec[9][9]={

/\*input\*/

/\*stack + - \* / ^ i ( ) $ \*/

/\* + \*/ '>', '>','<','<','<','<','<','>','>',

/\* - \*/ '>', '>','<','<','<','<','<','>','>',

/\* \* \*/ '>', '>','>','>','<','<','<','>','>',

/\* / \*/ '>', '>','>','>','<','<','<','>','>',

/\* ^ \*/ '>', '>','>','>','<','<','<','>','>',

/\* i \*/ '>', '>','>','>','>','e','e','>','>',

/\* ( \*/ '<', '<','<','<','<','<','<','>','e',

/\* ) \*/ '>', '>','>','>','>','e','e','>','>',

/\* $ \*/ '<', '<','<','<','<','<','<','<','>',

};

int getindex(char c)

{

switch(c)

{

case '+':return 0;

case '-':return 1;

case '\*':return 2;

case '/':return 3;

case '^':return 4;

case 'i':return 5;

case '(':return 6;

case ')':return 7;

case '$':return 8;

}

}

int shift()

{

stack[++top]=\*(input+i++);

stack[top+1]='\0';

}

int reduce()

{

int i,len,found,t;

for(i=0;i<5;i++)//selecting handles

{

len=strlen(handles[i]);

if(stack[top]==handles[i][0]&&top+1>=len)

{

found=1;

for(t=0;t<len;t++)

{

if(stack[top-t]!=handles[i][t])

{

found=0;

break;

}

}

if(found==1)

{

stack[top-t+1]='E';

top=top-t+1;

strcpy(lasthandle,handles[i]);

stack[top+1]='\0';

return 1;//successful reduction

}

}

}

return 0;

}

void dispstack()

{

int j;

for(j=0;j<=top;j++)

printf("%c",stack[j]);

}

void dispinput()

{

int j;

for(j=i;j<l;j++)

printf("%c",\*(input+j));

}

void main()

{

int j;

input=(char\*)malloc(50\*sizeof(char));

printf("\nEnter the string\n");

scanf("%s",input);

input=strcat(input,"$");

l=strlen(input);

strcpy(stack,"$");

printf("\nSTACK\tINPUT\tACTION");

while(i<=l)

{

shift();

printf("\n");

dispstack();

printf("\t");

dispinput();

printf("\tShift");

if(prec[getindex(stack[top])][getindex(input[i])]=='>')

{

while(reduce())

{

printf("\n");

dispstack();

printf("\t");

dispinput();

printf("\tReduced: E->%s",lasthandle);

}

}

}

if(strcmp(stack,"$E$")==0)

printf("\nAccepted;");

else

printf("\nNot Accepted;");

}

**Output:**

Enter the string

i\*(i+i)\*i

STACK INPUT ACTION

$i \*(i+i)\*i$ Shift

$E \*(i+i)\*i$ Reduced: E->i

$E\* (i+i)\*i$ Shift

$E\*( i+i)\*i$ Shift

$E\*(i +i)\*i$ Shift

$E\*(E +i)\*i$ Reduced: E->i

$E\*(E+ i)\*i$ Shift

$E\*(E+i )\*i$ Shift

$E\*(E+E )\*i$ Reduced: E->i

$E\*(E )\*i$ Reduced: E->E+E

$E\*(E) \*i$ Shift

$E\*E \*i$ Reduced: E->)E(

$E \*i$ Reduced: E->E\*E

$E\* i$ Shift

$E\*i $ Shift

$E\*E $ Reduced: E->i

$E $ Reduced: E->E\*E

$E$ Shift

$E$ Shift

Accepted;

**Exp. No. 16**

Write a C Program to Generate the Three address code representation for the given input statement.

**Program:**

#include<stdio.h>

#include<conio.h>

#include<stdlib.h>

#include<string.h>

struct three

{

char data[10],temp[7];

}s[30];

int main()

{

char d1[7],d2[7]="t";

int i=0,j=1,len=0;

FILE \*f1,\*f2;

//clrscr();

f1=fopen("sum.txt","r");

f2=fopen("out.txt","w");

while(fscanf(f1,"%s",s[len].data)!=EOF)

len++;

itoa(j,d1,7);

strcat(d2,d1);

strcpy(s[j].temp,d2);

strcpy(d1,"");

strcpy(d2,"t");

if(!strcmp(s[3].data,"+"))

{

fprintf(f2,"%s=%s+%s",s[j].temp,s[i+2].data,s[i+4].data);

j++;

}

else if(!strcmp(s[3].data,"-"))

{

fprintf(f2,"%s=%s-%s",s[j].temp,s[i+2].data,s[i+4].data);

j++;

}

for(i=4;i<len-2;i+=2)

{

itoa(j,d1,7);

strcat(d2,d1);

strcpy(s[j].temp,d2);

if(!strcmp(s[i+1].data,"+"))

fprintf(f2,"\n%s=%s+%s",s[j].temp,s[j-1].temp,s[i+2].data);

else if(!strcmp(s[i+1].data,"-"))

fprintf(f2,"\n%s=%s-%s",s[j].temp,s[j-1].temp,s[i+2].data);

strcpy(d1,"");

strcpy(d2,"t");

j++;

}

fprintf(f2,"\n%s=%s",s[0].data,s[j-1].temp);

fclose(f1);

fclose(f2);

getch();

}

**Output:**

**Input:** sum.txt

out = in1 + in2 + in3 - in4

**Output:** out.txt

t1=in1+in2

t2=t1+in3

t3=t2-in4

out=t3

**Exp. No. 17**

Write a C program for implementing a Lexical Analyzer to Scan and Count the number of characters, words, and lines in a file.

**Program:**

#include <stdio.h>

int main()

{

char str[100];//input string with size 100

int words=0,newline=0,characters=0; // counter variables

scanf("%[^~]",&str);//scanf formatting

for(int i=0;str[i]!='\0';i++)

{

if(str[i] == ' ')

{

words++;

}

else if(str[i] == '\n')

{

newline++;

words++;//since with every next line new words start. corner case 1

}

else if(str[i] != ' ' && str[i] != '\n'){

characters++;

}

}

if(characters > 0)//Corner case 2,3.

{

words++;

newline++;

}

printf("Total number of words : %d\n",words);

printf("Total number of lines : %d\n",newline);

printf("Total number of characters : %d\n",characters);

return 0;

}

**Output:**

void main()

{

int a;

int b;

a = b + c;

c = d \* e;

}

Total number of words : 18

Total number of lines : 7

**Exp. No. 18**

Write a C program to implement the back end of the compiler.

**Program:**

#include<stdio.h>

#include<conio.h>

#include<string.h>

int main()

{

int n,i,j;

char a[50][50];

printf("enter the no: intermediate code:");

scanf("%d",&n);

for(i=0;i<n;i++)

{

printf("enter the 3 address code:%d:",i+1);

for(j=0;j<6;j++)

{

scanf("%c",&a[i][j]);

}

}

printf("the generated code is:");

for(i=0;i<n;i++)

{

printf("\n mov %c,R%d",a[i][3],i);

if(a[i][4]=='-')

{

printf("\n sub %c,R%d",a[i][5],i);

}

if(a[i][4]=='+')

{

printf("\n add %c,R%d",a[i][5],i);

}

if(a[i][4]=='\*')

{

printf("\n mul %c,R%d",a[i][5],i);

}

if(a[i][4]=='/')

{

printf("\n div %c,R%d",a[i][5],i);

}

printf("\n mov R%d,%c",i,a[i][1]);

printf("\n");

}

return 0;

}

**Output:**

enter the no: intermediate code:2

enter the 3 address code:1:a=b+c

enter the 3 address code:2:d=n\*d

the generated code is:

mov b,R0

add c,R0

mov R0,a

mov n,R1

mul d,R1

mov R1,d

**Exp. No. 19**

Write a C program to compute LEADING( ) – operator precedence parser for the given grammar

E → E + T | T

T → T \* F | F

F → ( E ) | id

**Program:**

#include<conio.h>

#include<stdio.h>

char arr[18][3] ={{'E', '+', 'F'},{'E', '\*', 'F'},{'E', '(', 'F'}, {'E', ')', 'F'},{'E', 'i', 'F'},{'E', '$', 'F'},

{'F', '+', 'F'},{'F', '\*', 'F'},{'F', '(', 'F'},{'F', ')', 'F'},{'F', 'i', 'F'},{'F', '$', 'F'}, {'T', '+', 'F'},

{'T', '\*', 'F'}, {'T', '(', 'F'},{'T', ')', 'F'},{'T', 'i', 'F'},{'T', '$', 'F'}};

char prod[] = "EETTFF";

char res[6][3] ={ {'E', '+', 'T'}, {'T', '\0'}, {'T', '\*', 'F'}, {'F', '\0'}, {'(', 'E', ')'}, {'i', '\0'}};

char stack [5][2];

int top = -1;

void install(char pro, char re) {

int i;

for (i = 0; i < 18; ++i) {

if (arr[i][0] == pro && arr[i][1] == re) {

arr[i][2] = 'T';

break;

}

}

++top;

stack[top][0] = pro;

stack[top][1] = re;

}

int main() {

int i = 0, j;

char pro, re, pri = ' ';

for (i = 0; i < 6; ++i) {

for (j = 0; j < 3 && res[i][j] != '\0'; ++j) {

if (res[i][j] == '+' || res[i][j] == '\*' || res[i][j] == '(' || res[i][j] == ')' || res[i][j] == 'i' || res[i][j] == '$') {

install(prod[i], res[i][j]);

break;

}

}

}

while (top >= 0) {

pro = stack[top][0];

re = stack[top][1];

--top;

for (i = 0; i < 6; ++i) {

if (res[i][0] == pro && res[i][0] != prod[i]) {

install(prod[i], re);

}

}

}

for (i = 0; i < 18; ++i) {

printf("\n\t");

for (j = 0; j < 3; ++j)

printf("%c\t", arr[i][j]);

}

getch();

printf("\n\n");

for (i = 0; i < 18; ++i) {

if (pri != arr[i][0]) {

pri = arr[i][0];

printf("\n\t%c -> ", pri);

}

if (arr[i][2] == 'T')

printf("%c ", arr[i][1]);

}

getch();

}

**Output:**

E + T

E \* T

E ( T

E ) F

E i T

E $ F

F + F

F \* F

F ( T

F ) F

F i T

F $ F

T + F

T \* T

T ( T

T ) F

T i T

T $ F

E -> + \* ( i

F -> ( i

T -> \* ( i

**Exp. No. 20**

Write a C program to compute TRAILING( ) – operator precedence parser for the given grammar

E → E + T | T

T → T \* F | F

F → ( E ) | id

**Program:**

#include<conio.h>

#include<stdio.h>

char arr[18][3] ={{'E', '+', 'F'}, {'E', '\*', 'F'}, {'E', '(', 'F'}, {'E', ')', 'F'}, {'E', 'i', 'F'},

{'E', '$', 'F'}, {'F', '+', 'F'}, {'F', '\*', 'F'}, {'F', '(', 'F'}, {'F', ')', 'F'}, {'F', 'i', 'F'},

{'F', '$', 'F'}, {'T', '+', 'F'}, {'T', '\*', 'F'}, {'T', '(', 'F'}, {'T', ')', 'F'}, {'T', 'i', 'F'},

{'T', '$', 'F'},

};

char prod[6] = "EETTFF";

char res[6][3] ={ {'E', '+', 'T'}, {'T', '\0', '\0'}, {'T', '\*', 'F'}, {'F', '\0', '\0'}, {'(', 'E', ')'}, {'i', '\0', '\0'},};

char stack [5][2];

int top = -1;

void install(char pro, char re) {

int i;

for (i = 0; i < 18; ++i) {

if (arr[i][0] == pro && arr[i][1] == re) {

}

}

++top;

arr[i][2] = 'T';

stack[top][0] = pro;

stack[top][1] = re;

}

int main() {

int i = 0, j;

char pro, re, pri = ' ';

for (i = 0; i < 6; ++i) {

for (j = 2; j >= 0; --j) {

if (res[i][j] == '+' || res[i][j] == '\*' || res[i][j] == '(' || res[i][j] == ')' || res[i][j] == 'i' || res[i][j] == '$') {

install(prod[i], res[i][j]);

break;

} else if (res[i][j] == 'E' || res[i][j] == 'F' || res[i][j] == 'T') {

if (res[i][j - 1] == '+' || res[i][j - 1] == '\*' || res[i][j - 1] == '(' || res[i][j -

1] == ')' || res[i][j - 1] == 'i' || res[i][j - 1] == '$') {

install(prod[i], res[i][j - 1]);

break;

}

}

}

}

while (top >= 0) {

pro = stack[top][0];

re = stack[top][1];

--top;

for (i = 0; i < 6; ++i) {

for (j = 2; j >= 0; --j) {

if (res[i][0] == pro && res[i][0] != prod[i]) {

install(prod[i], re);

break;

} else if (res[i][0] != '\0') break;

}

}

}

for (i = 0; i < 18; ++i) {

printf("\n\t");

for (j = 0; j < 3; ++j)

printf("%c\t", arr[i][j]);

}

printf("\n\n");

for (i = 0; i < 18; ++i) {

if (pri != arr[i][0]) {

pri = arr[i][0];

printf("\n\t%c -> ", pri);

}

if (arr[i][2] == 'T')

printf("%c ", arr[i][1]);}

}

**Output:**

E + F

E \* F

E ( F

E ) F

E i F

E $ F

F + F

F \* F

F ( F

F ) F

F i F

F $ F

T + F

T \* F

T ( F

T ) F

T i F

T $ F

E ->

F ->

T ->

**Exp. No. 21**

Write a LEX specification file to take input C program from a .c file and count tthe number of characters, number of lines & number of words.

**Input Source Program: (sample.c)**

#include <stdio.h>

int main()

{

int number1, number2, sum;

printf("Enter two integers: ");

scanf("%d %d", &number1, &number2);

sum = number1 + number2;

printf("%d + %d = %d", number1, number2, sum);

return 0;

}

**Program: (count\_lines.l)**

%{

int nchar, nword, nline;

%}

%%

\n { nline++; nchar++; }

[^ \t\n]+ { nword++, nchar += yyleng; }

. { nchar++; }

%%

int yywrap(void) {

return 1;

}

int main(int argc, char \*argv[]) {

yyin = fopen(argv[1], "r");

yylex();

printf("Number of characters = %d\n", nchar);

printf("Number of words = %d\n", nword);

printf("Number of lines = %d\n", nline);

fclose(yyin);

}

**Output:**

G:\lex>flex count\_line.l

G:\lex>gcc lex.yy.c

G:\lex>a.exe sample.c

Number of characters = 233

Number of words = 33

Number of lines = 10

G:\lex>

**Exp. No. 22**

Write a LEX program to print all the constants in the given C source program file.

# **Input Source Program: (sample.c)**

#define P 314

#include<stdio.h> #include<conio.h>

void main()

{

int a,b,c = 30;

printf("hello");

}

**Program: (countconstants.l)**

digit [0-9]

%{

int cons=0;

%}

%%

{digit}+ { cons++; printf("%s is a constant\n", yytext); }

.|\n { }

%%

int yywrap(void) {

return 1; }

int main(void)

{

FILE \*f;

char file[10];

printf("Enter File Name : ");

scanf("%s",file);

f = fopen(file,"r");

yyin = f;

yylex();

printf("Number of Constants : %d\n", cons);

fclose(yyin);

}

**Output:**

G:\lex>flex countconstants.l

G:\lex>gcc lex.yy.c

G:\lex>a.exe

Enter File Name : sample.c

314 is a constant

30 is a constant

Number of Constants : 2

G:\lex>

**Exp. No. 23**

Write a LEX program to count the number of Macros defined and header files included in the C program.

# **Input Source Program: (sample.c)**

#define PI 3.14

#include<stdio.h>

#include<conio.h>

void main()

{

int a,b,c = 30;

printf("hello");

}

**Program: (count\_macro.l)**

%{

int nmacro, nheader;

%}

%%

^#define { nmacro++; }

^#include { nheader++; }

.|\n { }

%%

int yywrap(void) {

return 1;

}

int main(int argc, char \*argv[]) {

yyin = fopen(argv[1], "r");

yylex();

printf("Number of macros defined = %d\n", nmacro);

printf("Number of header files included = %d\n", nheader);

fclose(yyin);

}

**Output:**

G:\lex>flex count\_macro.l

G:\lex>gcc lex.yy.c

G:\lex>a.exe sample.c

Number of macros defined = 1

Number of header files included = 2

G:\lex>

**Exp. No. 24**

Write a LEX program to print all HTML tags in the input file.

**Input Source Program: (sample.html)**

<html>

<body>

<h1>My First Heading</h1>

<p>My first paragraph.</p>

</body>

</html>

**Program: (html.l)**

%{

int tags;

%}

%%

"<"[^>]\*> { tags++; printf("%s \n", yytext); }

.|\n { }

%%

int yywrap(void) {

return 1; }

int main(void)

{

FILE \*f;

char file[10];

printf("Enter File Name : ");

scanf("%s",file);

f = fopen(file,"r");

yyin = f;

yylex();

printf("\n Number of html tags: %d",tags);

fclose(yyin);

}

**Output:**

G:\lex>flex html.l

G:\lex>gcc lex.yy.c

G:\lex>a.exe

Enter File Name : sample.html

<html>

<body>

<h1>

</h1>

<p>

</p>

</body>

</html>

Number of html tags: 8

G:\lex>

**Exp. No. 25**

Write a LEX program which adds line numbers to the given C program file and display the same in the standard output.

# **Input Source Program: (sample.c)**

#define PI 3.14

#include<stdio.h>

#include<conio.h>

void main()

{

int a,b,c = 30;

printf("hello");

}

**Program: (addlinenos.l)**

%{

int yylineno;

%}

%%

^(.\*)\n printf("%4d\t%s", ++yylineno, yytext);

%%

int yywrap(void) {

return 1;

}

int main(int argc, char \*argv[]) {

yyin = fopen(argv[1], "r");

yylex();

fclose(yyin);

}

**Output:**

G:\lex>flex addlinenos.l

G:\lex>gcc lex.yy.c

G:\lex>a.exe sample.c

1 #define PI 3.14

2 #include<stdio.h>

3 #include<conio.h>

4 void main()

5 {

6 int a,b,c = 30;

7 printf("hello");

8 }

9

G:\lex>

**Exp. No. 26**

Write a LEX program to count the number of comment lines in a given C program and eliminate them and write into another file.

# **Input Source File: (input.c)**

#include<stdio.h>

int main()

{

int a,b,c; /\*varible declaration\*/ printf(“enter two numbers”); scanf(“%d %d”,&a,&b); c=a+b;//adding two numbers printf(“sum is %d”,c);

return 0;

}

**Program: (comment.l)**

%{

int com=0;

%}

%s COMMENT

%%

"/\*" {BEGIN COMMENT;}

<COMMENT>"\*/" {BEGIN 0; com++;}

<COMMENT>\n {com++;}

<COMMENT>. {;}

\/\/.\* {; com++;}

.|\n {fprintf(yyout,"%s",yytext);}

%%

void main(int argc, char \*argv[])

{

if(argc!=3)

{

printf("usage : a.exe input.c output.c\n");

exit(0);

}

yyin=fopen(argv[1],"r");

yyout=fopen(argv[2],"w");

yylex();

printf("\n number of comments are = %d\n",com);

}

int yywrap()

{

return 1;

}

**Output:**

G:\lex>flex comment.l

G:\lex>gcc lex.yy.c

G:\lex>a.exe input.c

usage : a.exe input.c output.c

G:\lex>a.exe input.c output.c

number of comments are = 2

G:\lex>

# **Output File: (output.c)**

include<stdio.h>

int main()

{

int a,b,c;

printf(“enter two numbers”);

scanf(“%d %d”,&a,&b);

c=a+b;

printf(“sum is %d”,c);

return 0;

}

**Exp. No. 27**

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

**Program: (capital.l)**

%%

[A-Z]+[\t\n ] { printf("%s is a capital word\n",yytext); }

. ;

%%

int main( )

{

printf("Enter String :\n");

yylex();

}

int yywrap( )

{

return 1;

}

**Output:**

G:\lex>flex capital.l

G:\lex>gcc lex.yy.c

G:\lex>a.exe

Enter String :

CAPITAL of INDIA is DELHI

CAPITAL is a capital word

INDIA is a capital word

DELHI

is a capital word

G:\lex>

**Exp. No. 28**

Write a LEX Program to check the email address is valid or not.

**Program: (**email\_valid.l)

%{

int flag=0;

%}

%%

[a-z . 0-9]+@[a-z]+".com"|".in" { flag=1; }

%%

int main()

{

yylex();

if(flag==1)

printf("Accepted");

else

printf("Not Accepted");

}

int yywrap()

{ return 1;

}

**Output:**

G:\lex>flex email\_valid.l

G:\lex>gcc lex.yy.c

G:\lex>a.exe

sse123@gmail.com

Accepted

G:\lex>

**Exp. No. 29**

Write a LEX Program to convert the substring abc to ABC from the given input string

**Program: (substring.l)**

%{

int i;

%}

%%

[a-z A-Z]\* { for(i=0;i<=yyleng;i++)

{ if((yytext[i]=='a')&&(yytext[i+1]=='b')&&(yytext[i+2]=='c'))

{ yytext[i]='A';

yytext[i+1]='B';

yytext[i+2]='C';

}

}

printf("%s",yytext);

}

[\t]\* return 1;

.\* {ECHO;}

\n {printf("%s",yytext);}

%%

int main()

{

yylex();

}

int yywrap()

{

return 1;

}

**Output:**

G:\lex>flex substring.l

G:\lex>gcc lex.yy.c

G:\lex>a.exe

abcdefghabcijkla

ABCdefghABCijkla

G:\lex>

**Exp. No. 30**

Implement a LEX program to check whether the mobile number is valid or not.

**Program: (mobile.l)**

%%

[1-9][0-9]{9} {printf("\nMobile Number Valid\n");}

.+ {printf("\nMobile Number Invalid\n");}

%%

int main()

{

printf("\nEnter Mobile Number : ");

yylex();

printf("\n");

return 0;

}

int yywrap()

{ }

**Output:**

G:\lex>flex mobile.l

G:\lex>gcc lex.yy.c

G:\lex>a.exe

Enter Mobile Number : 7856453489

Mobile Number Valid

G:\lex>

**Exp. No. 31**

Implement Lexical Analyzer using FLEX (Fast Lexical Analyzer). The program should separate the tokens in the given C program and display with appropriate caption.

**Input Source Program: (sample.c)**

#include<stdio.h>

void main()

{

int a,b,c = 30;

printf("hello");

}

**Program: (token.l)**

digit [0-9]

letter [A-Za-z]

%{

int count\_id,count\_key;

%}

%%

(stdio.h|conio.h) { printf("%s is a standard library\n",yytext); }

(include|void|main|printf|int) { printf("%s is a keyword\n",yytext); count\_key++; }

{letter}({letter}|{digit})\* { printf("%s is a identifier\n", yytext); count\_id++; }

{digit}+ { printf("%s is a number\n", yytext); }

\"(\\.|[^"\\])\*\" { printf("%s is a string literal\n", yytext); }

.|\n { }

%%

int yywrap(void) {

return 1;

}

int main(int argc, char \*argv[]) {

yyin = fopen(argv[1], "r");

yylex();

printf("number of identifiers = %d\n", count\_id);

printf("number of keywords = %d\n", count\_key);

fclose(yyin);

}

**Output:**

G:\lex>flex token.l

G:\lex>gcc lex.yy.c

G:\lex>a.exe sample.c

include is a keyword

stdio.h is a standard library

void is a keyword

main is a keyword

int is a keyword

a is a identifier

b is a identifier

c is a identifier

30 is a number

printf is a keyword

"hello" is a string literal

number of identifiers = 3

number of keywords = 5

G:\lex>

**Exp. No. 32**

Write a LEX program to count the number of vowels in the given sentence.

**Program: (vowels.l)**

%{

int vow\_count=0;

int const\_count =0;

%}

%%

[aeiouAEIOU] {vow\_count++;}

[a-zA-Z] {const\_count++;}

%%

int yywrap(){}

int main()

{

printf("Enter the string of vowels and consonants:");

yylex();

printf("Number of vowels are: %d\n", vow\_count);

printf("Number of consonants are: %d\n", const\_count);

return 0;

}

**Output:**

G:\lex>flex vowels.l

G:\lex>gcc lex.yy.c

G:\lex>a.exe

Enter the string of vowels and consonants: Vowel sounds allow the air to flow freely, causing the chin to drop noticeably, whilst consonant sounds are produced by restricting the air flow

, ,

Number of vowels are: 42

Number of consonants are: 77

^C

G:\lex>

**Exp. No. 33**

Write a LEX program to count the number of vowels in the given sentence.

**(Refer the program and output of experiment 32, both are same)**

**Exp. No. 34**

Write a LEX program to separate the keywords and identifiers.

**(Refer the program and output of experiment 31, both are same)**

**Exp. No. 35**

Write a LEX program to recognise numbers and words in a statement.

**Program: (numbers\_words.l)**

%%

[\t ]+ ;

[0-9]+|[0-9]\*\.[0-9]+ { printf("\n%s is NUMBER", yytext);}

#.\* { printf("\n%s is COMMENT", yytext);}

[a-zA-Z]+ { printf("\n%s is WORD", yytext);}

\n { ECHO;}

%%

int main()

{

while( yylex());

}

int yywrap( )

{

return 1;

}

**Output:**

G:\lex>flex numbers\_words.l

G:\lex>gcc lex.yy.c

G:\lex>a.exe

Variables A and B contains 10 and 20 respectively

Variables is WORD

A is WORD

and is WORD

B is WORD

contains is WORD

10 is NUMBER

and is WORD

20 is NUMBER

respectively is WORD

G:\lex>

**Exp. No. 36**

Write a LEX program to identify and count positive and negative numbers.

**Program: (positive\_neg\_nums.l)**

%{

int positive\_no = 0, negative\_no = 0;

%}

%%

^[-][0-9]+ {negative\_no++;

printf("negative number = %s\n",

yytext);} // negative number

[0-9]+ {positive\_no++;

printf("positive number = %s\n",

yytext);} // positive number

%%

int yywrap(){}

int main()

{

yylex();

printf ("number of positive numbers = %d,"

"number of negative numbers = %d\n",

positive\_no, negative\_no);

return 0;

}

**Output:**

G:\lex>flex positive\_neg\_nums.l

G:\lex>gcc lex.yy.c

G:\lex>a.exe

-10

negative number = -10

20

positive number = 20

number of positive numbers = 1,number of negative numbers = 1

G:\lex>

**Exp. No. 37**

Write a LEX program to validate the URL.

**Program: (url.l)**

%%

((http)|(ftp))s?:\/\/[a-zA-Z0-9](.[a-z])+(.[a-zA-Z0-9+=?]\*)\* {printf("\nURL Valid\n");}

.+ {printf("\nURL Invalid\n");}

%%

void main()

{

printf("\nEnter URL : ");

yylex();

printf("\n");

}

int yywrap()

{

}

**Output:**

G:\lex>flex url.l

G:\lex>gcc lex.yy.c

G:\lex>a.exe

Enter URL : https:\\www.sse.in

URL Invalid

https://www.sse.in

URL Valid

G:\lex>

**Exp. No. 38**

Write a LEX program to validate DOB of students.

**Program: (dob.l)**

%%

((0[1-9])|([1-2][0-9])|(3[0-1]))\/((0[1-9])|(1[0-2]))\/(19[0-9]{2}|2[0-9]{3}) printf("Valid DoB");

.\* printf("Invalid DoB");

%%

int main()

{

yylex();

return 0;

}

int yywrap()

{}

**Output:**

G:\lex>flex dob.l

G:\lex>gcc lex.yy.c

G:\lex>a.exe

26/07/1995

Valid DoB

13\2\96

Invalid DoB

G:\lex>

**Exp. No. 39**

Write a LEX program to check whether the given input is digit or not.

**Program: (digit\_or\_not.l)**

%%

[0-9]+ {printf("\nValid digit \n");}

.\* printf("\nInvalid digit\n");

%%

int yywrap(){}

int main()

{

yylex();

return 0;

}

**Output:**

G:\lex>flex digit\_or\_not.l

G:\lex>gcc lex.yy.c

G:\lex>a.exe

23

Valid digit

h56

Invalid digit

G:\lex>

**Exp. No. 40**

Write a LEX program to implement basic mathematical operations.

**Program: (cal.l)**

%{

#undef yywrap

#define yywrap() 1

int f1=0,f2=0;

char oper;

float op1=0,op2=0,ans=0;

void eval();

%}

DIGIT [0-9]

NUM {DIGIT}+(\.{DIGIT}+)?

OP [\*/+-]

%%

{NUM} {

if(f1==0)

{

op1=atof(yytext);

f1=1;

}

else if(f2==-1)

{

op2=atof(yytext);

f2=1;

}

if((f1==1) && (f2==1))

{

eval();

f1=0;

f2=0;

}

}

{OP} {

oper=(char) \*yytext;

f2=-1;

}

[\n] {

if(f1==1 && f2==1)

{

eval;

f1=0;

f2=0;

}

}

%%

int main()

{

yylex();

}

void eval()

{

switch(oper)

{

case '+':

ans=op1+op2;

break;

case '-':

ans=op1-op2;

break;

case '\*':

ans=op1\*op2;

break;

case '/':

if(op2==0)

{

printf("ERROR");

return;

}

else

{

ans=op1/op2;

}

break;

default:

printf("operation not available");

break;

}

printf("The answer is = %lf",ans);

}

**Output:**

G:\lex>flex cal.l

G:\lex>gcc lex.yy.c

G:\lex>a.exe

20 + 30

The answer is = 50.000000

25 \* 5

The answer is = 125.000000

G:\lex>

**41)DEVELOP A program to recognize strings under ‘a\*’,’a\*b=,’abb’ using lexical analysis**

**Program**

%{

#include<stdio.h>

#include<string.h>

%}

A [a]+

PLUS\_B "a+b"

ABB "abb"

%%

{A} {

printf("A: %s\n", yytext);

}

{PLUS\_B} {

printf("A+B: %s\n", yytext);

}

{ABB} {

printf("ABB: %s\n", yytext);

}

%%

int main(void) {

yylex();

return 0;

}

**42)write a lex program to regognize and display key words,numbers,words in a statement**

**Program**

%{

#include<stdio.h>

#define NUMBER 400

#define COMMENT 401

#define STRINGS 402

#define IDENTIFIER 403

%}

/\* Rules Section \*/

%%

[\t ]+ ;

[0-9]+ | [0-9]\*\.[0-9]+ { return NUMBER;}

#.\* { return COMMENT;}

\"[^ \"\n]\*\" { return STRINGS;}

[a-zA-Z][a-zA-Z0-9]+ { return IDENTIFIER;}

\n { return '\n';}

%%

/\* User Subroutine section \*/

main( )

{

int val;

while( val = yylex( ))

printf("value is %d\n",val);

}

int yywrap( )

{

return 1;

}

**Program**

%{

#include<stdio.h>

#include<string.h>

%}

DIGIT [0-9]+

KEYWORD "for"|"while"|"do"|"if"|"else"

WORD [a-zA-Z]+

%%

{DIGIT} {

printf("Number: %s\n", yytext);

}

{KEYWORD} {

printf("Keyword: %s\n", yytext);

}

{WORD} {

printf("Word: %s\n", yytext);

}

%%

int main(void) {

yylex();

return 0;

}

**43)lex program for date is valid or not**

**Program**

%{

#include<stdio.h>

int valid=0;

%}

%%

([0-2][0-9]|3[0-1])\/(0[1-9]|1[0-2])\/([1-2][0-9][0-9][0-9]) {valid=1;}

%%

int main()

{

yyin=fopen("input.txt","r");

yylex();

if(valid==1) printf("It is a valid date\n");

else printf("It is not a valid date\n");

}

int yywrap()

{

return 1;

}

//input text file//

16/01/2003

**44)write a c program whether string is a grammer or not**

**Program**

#include<stdio.h>

#include<string.h>

int main() {

char string[50];

int flag,count=0;

printf("The grammar is: S->aS, S->Sb, S->ab\n");

printf("Enter the string to be checked:\n");

gets(string);

if(string[0]=='a') {

flag=0;

for (count=1;string[count-1]!='\0';count++) {

if(string[count]=='b') {

flag=1;

continue;

} else if((flag==1)&&(string[count]=='a')) {

printf("The string does not belong to the specified grammar");

break;

} else if(string[count]=='a')

continue; else if((flag==1)&&(string[count]='\0')) {

printf("String accepted…..!!!!");

break;

} else {

printf("String not accepted");

}

}

}

return 0;

}

**45)write a c program for finding first and follow in predictive parsing**

**Program**

#include<stdio.h>

#include<ctype.h>

#include<string.h>

// Functions to calculate Follow

void followfirst(char, int, int);

void follow(char c);

// Function to calculate First

void findfirst(char, int, int);

int count, n = 0;

// Stores the final result

// of the First Sets

char calc\_first[10][100];

// Stores the final result

// of the Follow Sets

char calc\_follow[10][100];

int m = 0;

// Stores the production rules

char production[10][10];

char f[10], first[10];

int k;

char ck;

int e;

int main(int argc, char \*\*argv)

{

int jm = 0;

int km = 0;

int i, choice;

char c, ch;

count = 8;

// The Input grammar

strcpy(production[0], "E=TR");

strcpy(production[1], "R=+TR");

strcpy(production[2], "R=#");

strcpy(production[3], "T=FY");

strcpy(production[4], "Y=\*FY");

strcpy(production[5], "Y=#");

strcpy(production[6], "F=(E)");

strcpy(production[7], "F=i");

int kay;

char done[count];

int ptr = -1;

// Initializing the calc\_first array

for(k = 0; k < count; k++) {

for(kay = 0; kay < 100; kay++) {

calc\_first[k][kay] = '!';

}

}

int point1 = 0, point2, xxx;

for(k = 0; k < count; k++)

{

c = production[k][0];

point2 = 0;

xxx = 0;

// Checking if First of c has

// already been calculated

for(kay = 0; kay <= ptr; kay++)

if(c == done[kay])

xxx = 1;

if (xxx == 1)

continue;

// Function call

findfirst(c, 0, 0);

ptr += 1;

// Adding c to the calculated list

done[ptr] = c;

printf("\n First(%c) = { ", c);

calc\_first[point1][point2++] = c;

// Printing the First Sets of the grammar

for(i = 0 + jm; i < n; i++) {

int lark = 0, chk = 0;

for(lark = 0; lark < point2; lark++) {

if (first[i] == calc\_first[point1][lark])

{

chk = 1;

break;

}

}

if(chk == 0)

{

printf("%c, ", first[i]);

calc\_first[point1][point2++] = first[i];

}

}

printf("}\n");

jm = n;

point1++;

}

printf("\n");

printf("-----------------------------------------------\n\n");

char donee[count];

ptr = -1;

// Initializing the calc\_follow array

for(k = 0; k < count; k++) {

for(kay = 0; kay < 100; kay++) {

calc\_follow[k][kay] = '!';

}

}

point1 = 0;

int land = 0;

for(e = 0; e < count; e++)

{

ck = production[e][0];

point2 = 0;

xxx = 0;

// Checking if Follow of ck

// has already been calculated

for(kay = 0; kay <= ptr; kay++)

if(ck == donee[kay])

xxx = 1;

if (xxx == 1)

continue;

land += 1;

// Function call

follow(ck);

ptr += 1;

// Adding ck to the calculated list

donee[ptr] = ck;

printf(" Follow(%c) = { ", ck);

calc\_follow[point1][point2++] = ck;

// Printing the Follow Sets of the grammar

for(i = 0 + km; i < m; i++) {

int lark = 0, chk = 0;

for(lark = 0; lark < point2; lark++)

{

if (f[i] == calc\_follow[point1][lark])

{

chk = 1;

break;

}

}

if(chk == 0)

{

printf("%c, ", f[i]);

calc\_follow[point1][point2++] = f[i];

}

}

printf(" }\n\n");

km = m;

point1++;

}

}

void follow(char c)

{

int i, j;

// Adding "$" to the follow

// set of the start symbol

if(production[0][0] == c) {

f[m++] = '$';

}

for(i = 0; i < 10; i++)

{

for(j = 2;j < 10; j++)

{

if(production[i][j] == c)

{

if(production[i][j+1] != '\0')

{

// Calculate the first of the next

// Non-Terminal in the production

followfirst(production[i][j+1], i, (j+2));

}

if(production[i][j+1]=='\0' && c!=production[i][0])

{

// Calculate the follow of the Non-Terminal

// in the L.H.S. of the production

follow(production[i][0]);

}

}

}

}

}

void findfirst(char c, int q1, int q2)

{

int j;

// The case where we

// encounter a Terminal

if(!(isupper(c))) {

first[n++] = c;

}

for(j = 0; j < count; j++)

{

if(production[j][0] == c)

{

if(production[j][2] == '#')

{

if(production[q1][q2] == '\0')

first[n++] = '#';

else if(production[q1][q2] != '\0'

&& (q1 != 0 || q2 != 0))

{

// Recursion to calculate First of New

// Non-Terminal we encounter after epsilon

findfirst(production[q1][q2], q1, (q2+1));

}

else

first[n++] = '#';

}

else if(!isupper(production[j][2]))

{

first[n++] = production[j][2];

}

else

{

// Recursion to calculate First of

// New Non-Terminal we encounter

// at the beginning

findfirst(production[j][2], j, 3);

}

}

}

}

void followfirst(char c, int c1, int c2)

{

int k;

// The case where we encounter

// a Terminal

if(!(isupper(c)))

f[m++] = c;

else

{

int i = 0, j = 1;

for(i = 0; i < count; i++)

{

if(calc\_first[i][0] == c)

break;

}

//Including the First set of the

// Non-Terminal in the Follow of

// the original query

while(calc\_first[i][j] != '!')

{

if(calc\_first[i][j] != '#')

{

f[m++] = calc\_first[i][j];

}

else

{

if(production[c1][c2] == '\0')

{

// Case where we reach the

// end of a production

follow(production[c1][0]);

}

else

{

// Recursion to the next symbol

// in case we encounter a "#"

followfirst(production[c1][c2], c1, c2+1);

}

}

j++;

}

}

}

/\*

First(E)= { (, i, }

First(R)= { +, #, }

First(T)= { (, i, }

First(Y)= { \*, #, }

First(F)= { (, i, }

-----------------------------------------------

Follow(E) = { $, ), }

Follow(R) = { $, ), }

Follow(T) = { +, $, ), }

Follow(Y) = { +, $, ), }

Follow(F) = { \*, +, $, ), }

\*/

**46)** **Write a C program for constructing of LL(1) parsing**

**Program**

#include<stdio.h>

char s[20],stack[20];

int main()

{

char m[5][6][3]={"tb"," "," ","tb"," "," "," ","+tb"," "," ","n","n","fc"," "," ","fc"," "," "," ","n","\*fc"," a ","n","n","i"," "," ","(e)"," "," "};

int size[5][6]={2,0,0,2,0,0,0,3,0,0,1,1,2,0,0,2,0,0,0,1,3,0,1,1,1,0,0,3,0,0};

int i,j,k,n,str1,str2;

// clrscr();

printf("\n Enter the input string: ");

scanf("%s",s);

strcat(s,"$");

n=strlen(s);

stack[0]='$';

stack[1]='e';

i=1;

j=0;

printf("\nStack Input\n");

printf("\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\n");

while((stack[i]!='$')&&(s[j]!='$'))

{

if(stack[i]==s[j])

{

i--;

j++;

}

switch(stack[i])

{

case 'e':

str1=0;

break;

case 'b':

str1=1;

break;

case 't':

str1=2;

break;

case 'c':

str1=3;

break;

case 'f':

str1=4;

break;

}

switch(s[j])

{ case 'i':

str2=0;

break;

case '+':

str2=1;

break;

case '\*': str2=2;

break;

case '(': str2=3;

break;

case ')': str2=4;

break;

case '$': str2=5;

break;

}

if(m[str1][str2][0]=='\0')

{

printf("\nERROR");

exit(0);

}

else if(m[str1][str2][0]=='n')

i--;

else if(m[str1][str2][0]=='i')

stack[i]='i';

else

{

for(k=size[str1][str2]-1;k>=0;k--)

{

stack[i]=m[str1][str2][k];

i++;

}

i--;

}

for(k=0;k<=i;k++)

printf(" %c",stack[k]);

printf(" ");

for(k=j;k<=n;k++)

printf("%c",s[k]);

printf(" \n ");

}

printf("\n SUCCESS");

return 0;

}

**47)** **Write a C program to implement Predictive parser.**

**Program**

#include <stdio.h>

#include <string.h>

char prol[7][10] = { "S", "A", "A", "B", "B", "C", "C" };

char pror[7][10] = { "A", "Bb", "Cd", "aB", "@", "Cc", "@" };

char prod[7][10] = { "S->A", "A->Bb", "A->Cd", "B->aB", "B->@", "C->Cc", "C->@" };

char first[7][10] = { "abcd", "ab", "cd", "a@", "@", "c@", "@" };

char follow[7][10] = { "$", "$", "$", "a$", "b$", "c$", "d$" };

char table[5][6][10];

int numr(char c)

{

switch (c)

{

case 'S':

return 0;

case 'A':

return 1;

case 'B':

return 2;

case 'C':

return 3;

case 'a':

return 0;

case 'b':

return 1;

case 'c':

return 2;

case 'd':

return 3;

case '$':

return 4;

}

return (2);

}

int main()

{

int i, j, k;

for (i = 0; i < 5; i++)

for (j = 0; j < 6; j++)

strcpy(table[i][j], " ");

printf("The following grammar is used for Parsing Table:\n");

for (i = 0; i < 7; i++)

printf("%s\n", prod[i]);

printf("\nPredictive parsing table:\n");

fflush(stdin);

for (i = 0; i < 7; i++)

{

k = strlen(first[i]);

for (j = 0; j < 10; j++)

if (first[i][j] != '@')

strcpy(table[numr(prol[i][0]) + 1][numr(first[i][j]) + 1], prod[i]);

}

for (i = 0; i < 7; i++)

{

if (strlen(pror[i]) == 1)

{

if (pror[i][0] == '@')

{

k = strlen(follow[i]);

for (j = 0; j < k; j++)

strcpy(table[numr(prol[i][0]) + 1][numr(follow[i][j]) + 1], prod[i]);

}

}

}

strcpy(table[0][0], " ");

strcpy(table[0][1], "a");

strcpy(table[0][2], "b");

strcpy(table[0][3], "c");

strcpy(table[0][4], "d");

strcpy(table[0][5], "$");

strcpy(table[1][0], "S");

strcpy(table[2][0], "A");

strcpy(table[3][0], "B");

strcpy(table[4][0], "C");

printf("\n--------------------------------------------------------\n");

for (i = 0; i < 5; i++)

for (j = 0; j < 6; j++)

{

printf("%-10s", table[i][j]);

if (j == 5)

printf("\n--------------------------------------------------------\n");

}

}

/\*

The following grammar is used for Parsing Table:

S->A

A->Bb

A->Cd

B->aB

B->@

C->Cc

C->@

Predictive parsing table:

--------------------------------------------------------

a b c d $

--------------------------------------------------------

S S->A S->A S->A S->A

--------------------------------------------------------

A A->Bb A->Bb A->Cd A->Cd

--------------------------------------------------------

B B->aB B->@ B->@ B->@

--------------------------------------------------------

C C->@ C->@ C->@

--------------------------------------------------------

\*/

**48)** **Write a C program to generate three address code for assignment, arithmetic and relational expressions.**

**Program**

#include<stdio.h>

#include<string.h>

void pm();

void plus();

void div();

int i,ch,j,l,addr=100;

char ex[10], exp[10] ,exp1[10],exp2[10],id1[5],op[5],id2[5];

void main()

{

clrscr();

while(1)

{

printf("\n1.assignment\n2.arithmetic\n3.relational\n4.Exit\nEnter the choice:");

scanf("%d",&ch);

switch(ch)

{

case 1:

printf("\nEnter the expression with assignment operator:");

scanf("%s",exp);

l=strlen(exp);

exp2[0]='\0';

i=0;

while(exp[i]!='=')

{

i++;

}

strncat(exp2,exp,i);

strrev(exp);

exp1[0]='\0';

strncat(exp1,exp,l-(i+1));

strrev(exp1);

printf("Three address code:\ntemp=%s\n%s=temp\n",exp1,exp2);

break;

case 2:

printf("\nEnter the expression with arithmetic operator:");

scanf("%s",ex);

strcpy(exp,ex);

l=strlen(exp);

exp1[0]='\0';

for(i=0;i<l;i++)

{

if(exp[i]=='+'||exp[i]=='-')

{

if(exp[i+2]=='/'||exp[i+2]=='\*')

{

pm();

break;

}

else

{

plus();

break;

}

}

else if(exp[i]=='/'||exp[i]=='\*')

{

div();

break;

}

}

break;

case 3:

printf("Enter the expression with relational operator");

scanf("%s%s%s",&id1,&op,&id2);

if(((strcmp(op,"<")==0)||(strcmp(op,">")==0)||(strcmp(op,"<=")==0)||(strcmp(op,">=")==0)||(strcmp(op,"==")==0)||(strcmp(op,"!=")==0))==0)

printf("Expression is error");

else

{

printf("\n%d\tif %s%s%s goto %d",addr,id1,op,id2,addr+3);

addr++;

printf("\n%d\t T:=0",addr);

addr++;

printf("\n%d\t goto %d",addr,addr+2);

addr++;

printf("\n%d\t T:=1",addr);

}

break;

case 4:

exit(0);

}

}

}

void pm()

{

strrev(exp);

j=l-i-1;

strncat(exp1,exp,j);

strrev(exp1);

printf("Three address code:\ntemp=%s\ntemp1=%c%ctemp\n",exp1,exp[j+1],exp[j]);

}

void div()

{

strncat(exp1,exp,i+2);

printf("Three address code:\ntemp=%s\ntemp1=temp%c%c\n",exp1,exp[i+2],exp[i+3]);

}

void plus()

{

strncat(exp1,exp,i+2);

printf("Three address code:\ntemp=%s\ntemp1=temp%c%c\n",exp1,exp[i+2],exp[i+3]);

}

/\*

OUTPUT:

1. assignment

2. arithmetic

3. relational

4. Exit

Enter the choice:1

Enter the expression with assignment operator:

a=b

Three address code:

temp=b

a=temp

\*/