text.txt :-

hey
this is the birst lab

↳ 6 4 2

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Lab-1

Aim - WAP to count number of characters, whitespace and line by reading a text file in C.

```
↳ #include <stdio.h>
#include <stdlib.h>
#include <string.h>

int main()
{
    FILE* fileptr;
    char ch;
    int word = 0;
    int whitespace = 0;
    int line = 0;
    fileptr = fopen("text.txt", "r");
    if (fileptr == NULL){
        printf("no file");
    }
    do{
        ch = fgetc(fileptr);
        if(ch == ' '){
            whitespace ++;
            if(fgetc(fileptr)==' ')word--;
        }
        else if(ch=='\n'){
            line ++;
            word ++;
```

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```
        }
    } while (ch != EOF);
    word ++;
    line ++;
     word = word + whitespace;
      fclose (filptr);
      printf ("%d %d %d", word, whitespace,
line);

      return 0;

}
```

//(c11)

text.file :-

hey
this is the first lab.

↳ vowel = 6 consonant = 14 word = 6 whitespace = 4
line = 2

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Aim - WAP to count number of vowels and consonants by reading a text file in C.

↳
```
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

int main(){

    FILE* filptr;
    char ch;
    int word = 0;
    int whitespace = 0;
    int line = 0;
    int vowel = 0;
    int consonant = 0;
    filptr = fopen("text.txt", "r");
    if(filptr == NULL){
        printf("no file");
    }
    do{
        ch = fgetc(filptr);
        if(ch == ' '){
            whitespace ++;
        }
        else if(ch == '\n'){
            line ++;
            word ++;
```

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```
        }
        elseif((ch>='a' && ch<='z')||(ch>=
'A' && ch<='Z')){ if(ch=='a'||ch=='e'||
ch=='i'||ch=='o'||ch=='u'||ch=='A'||
ch=='E'||ch=='I'||ch=='O'||ch=='U'){
            vowel++;
        }
        else{
            consonant++;}
        }
    }while(ch!=EOF);
word++;
line++;
    word = word + whitespace;
    fclose(filepter);
    printf("vowel = %d consonant = %d
word = %d whitespace = %d line = %d", vowel,
consonant, word, whitespace, line);

    return 0;

}
```

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text.txt :-

Hi I'm Saksham Jain
I'm a student in Manipal University

↳ Total Keywords found : 2

Lab-2

Aim - WAP to check whether the given string in a text file is a keyword or not.

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

int isKeyword(char word[]){
    char keywords[2][10] = {
        "Manipal", "Saksham"
    };
    for(int i=0; i<2; ++i){
        if(strcmp(keywords[i], word)==0){
            return 1;
        }
    }
    return 0;
}
int main(){
    char filename[100];
    char word[20];
    int count = 0;

    FILE *file = fopen("text.txt", "r");

    if(file == NULL){
        printf("Error opening file!\n");
```

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```
    return 0;
}
while (fscanf(file, "%s", word) != EOF){
    if(isKeyword(word)) {
        count++;
    }
}
fclose(file);
printf("\n Total keywords found: %d\n",
count);

    return 0;
}
```

output

Enter Production String : X - ABabc

↳ Type - 2 Production

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Lab-3

Aim - WAP to check whether the entered string belongs to a grammar as per Chomsky Hierarchy.

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

int check_type0(char *str){
    for(int i=0; i<strlen(str); i++){
        if(str[i]>='A' && str[i]<='Z'){
            return 1;
        }
    }
    return 0;
}
int check_type1(char *str1, char *str2){
    return strlen(str1) <= strlen(str2);
}
int check_type2(char *str){
    return strlen(str) == 1;
}
int check_type3(char *str){
    int flag=0;
    for(int i=0; i<strlen(str); i++){
        if(str[i]>='A' && str[i]<='Z'){
            flag++;
```

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```
        }
    }
    if (flag == 0){
        return 1;
    }else if (flag == 1){
        if (str[0] < 'A' && str[0] > 'Z')
            return 0;
        }else{
            return 1;
        }
    }
    return 0;
}
int main(){
    char str1[100], str2[100];
    printf("Enter production string : ");
    scanf("%s - %s", str1, str2);

    int t0 = check_type0(str1);
    int t1 = check_type1(str1, str2);
    int t2 = check_type2(str1);
    int t3 = check_type3(str2);

    if (t0 == 1){
        if (t1 == 1){
            if (t2 == 1){
                if (t3 == 1){
```

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```
            printf("Type-3 production\n");
        }else{
            printf("Type-2 production\n");
        }
    }else{
        printf("Type-1 production\n");
    }
}else{
    printf("Type-0 production\n");
}
}else{
    printf("Not a valid production\n");
}
return 0;
}
```

elf/20cl

Enter the String: 00110111101
State : 2
Your String is accepted

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Lab-4

Aim - WAP for creating machine that accepts three consecutive wins

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

int main(){
    char str[100];
    printf("Enter the string:");
    scanf("%s", str);

    char state = 'i';
    for (int i = 0; i < strlen(str); i++){
        char ch = str[i];

        switch (state){
            case 'i':
                if (ch == '0'){
                    state = 'i';
                } else if (ch == '1'){
                    state = '0';
                }
                break;
            case '0':
                if (ch == '0'){
                    state = 'i';
```

```
        }else if(ch=='1'){
            state='1';
        }
        break;
    case '1':
        if(ch=='0'){
            state='1';
        }else if(ch=='1'){
            state='2';
        }
        break;
    case '2':
        if(ch=='0'){
            state='2';
        }else if(ch=='1'){
            state='2';
        }
        break;
    }
}
printf("State: %c\n", state);
if(state=='2'){
    printf("Your string is accepted\n");
}else{
    printf("Your string is Rejected\n");
}
return 0;
}
```

Enter the String: 1100101
State: 2
Your string is accepted

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Aim - WAP for creating a machine that always accepts a string ending with 101.

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

int main(){
    char str[100];
    printf("Enter the string:");
    scanf("%s", str);

    char state = 'i';
    for(int i=0; i<strlen(str); i++){
        char ch = str[i];
        switch(state){
            case 'i':
                if(ch=='0'){
                    state='i';
                }else if(ch=='1'){
                    state='0';
                }
                break;
            case '0':
                if(ch=='0'){
                    state='1';
                }else if(ch=='1'){
                    state='0';
```

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```
            }
            break;
        case '1':
            if (ch == '0') {
                state = 'i';
            } else if (ch == '1') {
                state = '2';
            }
            break;
        case '2':
            if (ch == '0') {
                state = '1';
            } else if (ch == '1') {
                state = '0';
            }
            break;
    }
}
printf("State : %c\n", state);
if (state == '2') {
    printf("Your String is accepted\n");
} else {
    printf("String Rejected\n");
}
return 0;
}
```

Ref

Enter the string : 1110
State : q2
String is Rejected

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Aim - WAP for Mode 3 machine.

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

int main(){
    char str[100];
    printf("Enter the string:");
    scanf("%s", str);

    char state='i';
    for(int i=0; i<strlen(str); i++){
        char ch = str[i];
        switch(state){
            case 'i':
                if(ch=='0'){
                    state='0';
                }else if(ch=='1'){
                    state='1';
                }
                break;
            case '0':
                if(ch=='0'){
                    state='0';
                }else if(ch=='1'){
                    state='1';
                }
```

```
            break;
        case '1':
            if (in == '0'){
                state = '2';
            } else if (in == '1'){
            }   state = '0';

            break;
        case '2':
            if (in == '0'){
                state = '1';
            } else if (in == '1'){
            }   state = '2';

            break
    }
}

printf("State : %c \n", state);
if (state == '0'){
    printf("Your string is accepted \n");
} else {
    printf("Your string is rejected \n");
}

return 0;
}
```

Enter the binary string: 110100

The 1's complement of the binary string is: 001011

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Lab-5

Aim - WAP to find 1's complement of a given binary number.

```
// Mealy machine
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

int main(){
    char str[100];
    printf("Enter the binary string:");
    scanf("%s", str);

    char result[100];
    char state = 'i';
    int j = 0;
    for(int i = 0; i < strlen(str); i++){
        char ch = str[i];
        if(ch == '0'){
            if(state == 'i'){
                result[j] = '1';
                j++;
            }else{
                result[j] = '0';
                j++;
            }
        }else if(ch == '1'){
            if(state == 'i'){
```

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```
            result[j] = '0';
            j++;
        } else {
            result[j] = '1';
            j++;
        }
    }
    printf("The 1's complement of the binary string is: %s\n", result);
    return 0;
}
```

Enter the binary string : 01101

The 1's complement of the binary string is : 10010

```
//Moore machine
#include <stdio.h>
#include <stdlib.h>
#include <string.h>

int main(){
    char str[100];
    printf("Enter the binary string:");
    scanf("%s", str);

    char state = 'q0';
    char result[100];
    int j = 0;
    for(int i=0; i<strlen(str); i++){
        char ch = str[i];
        switch(state){
            case 'q0':
                if(ch=='0'){
                    result[j++] = '1';
                    state = 'q0';
                }else if(ch=='1'){
                    result[j++] = '0';
                    state = 'q1';
                }
                break;
            case 'q1':
                if(ch=='0'){
                    result[j++] = '1';
```

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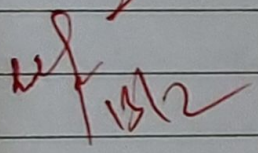
```
            state = 'q0';
        } else if (cn == '1') {
            result[j++] = '0';
            state = 'q1';
        }
        break;
    }
}
printf("The 1's complement is : %s\n", result);
return 0;
}
```



Output:-

Enter the string:

heyyo123
→ vowels: 2
Digits: 3
Consonants: 3

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Lab-6

Aim - Write a LEX program to count no. of ~~strin~~ vowels, consonants and digits in a given string.

```
%{
#include <stdio.h>
int v=0, d=0, c=0;
%}

%%
[AEIOUaeiou] {v=v+1;}
[0-9] {d=d+1;}
[^AEIOUaeiou] {c=c+1;}
%%
int yywrap()
{
    return 1;
}
int main()
{
    printf("Enter the string: \n");
    yylex();
    printf("vowels: %d\n", v);
    printf("Digits: %d\n", d);
    printf("Consonants: %d\n", c);
    return 0;
}
```

Output :-

Saksham
→ Saksham

CD Lab
→ CD Lab

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Aim - Write a LEX program to get the ECHO of a string.

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

%%
. ECHO;
ECHO;
%%
int yywrap()
{
  return 1;
}
int main()
{
    yylex();
    return 0;
}
```

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Output:-

Enter the string:

↳ sak123
it is a identifier
123 sak
it is neither a keyword nor a identifier
hey
This is a keyword

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Lab-7

Aim - Write a LEX program to count and recognise the keywords and identifiers.

```
%{
#include <stdio.h>
int keywords = 0, i = 0;
%}

%%
(hey | saksham | lab | auromata){keywords = keywords + 1;
        printf ("This is a keyword");}
[a-z | A-Z][a-z | A-Z | 0-9]* {i = i + 1; printf("it is
    a identifier");}
. * { printf("it is neither a keyword nor a identifier");}
%%

int yywrap()
{
 return 1;
}

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

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Output :-

Enter the string :
akansha
↳ This starts and ends with a

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Aim - Write a LEX program to find words beginning & ending with 'a'.

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

%%
[a][a-z A-Z 0-9]*[a]{k=k+1; printf("This starts and ends with a");}
.*{printf("This doesn't start or end with a");}
%%

int yywrap()
{
return 1;
}

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

Output :-

```
Enter the string:
a
small letter
2
digit
!
Symbol
capital letters : 0
small letters : 1
Digits : 1
Symbols : 1
```

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Lab-8

Aim - write a LEX program to identify the capital letters, small letters and digits, ~~&~~ special symbols.

```
%{
#include <stdio.h>
int capital = 0, small = 0, digit = 0, sym = 0;
%}

%%
[a-z] { small = small + 1; printf("small letter"); }
[A-Z] { capital = capital + 1; printf("capital letter"); }
[0-9] { digit = digit + 1; printf("Digit"); }
. * { sym = sym + 1; printf("Symbol"); }
%%

int yywrap()
{
return 1;
}
int main()
{
printf("Enter the string: \n");
yylex();
printf("capital letters: %d \n", capital);
printf("small letters: %d \n", small);
printf("Digits: %d \n", digit);
printf("Symbols: %d \n", sym);
return 0;
}
```

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Aim - Write a LEX program to check the valid email.

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

%%
[a-z][_a-z\.0-9]*+@[a-z]+\.[a-z]{printf("valid email! \n");}
.*{printf("invalid email \n");}
%%

int yywrap(){
return 1;
}
int main(){
printf("enter input \n");
yylex();
return 0;
}
```

Output:-

Enter input
abc_123@gmail.com

↳ valid email!

Output :-

Enter a mobile no.
7011183006

↳ valid mobile no.

Enter a mobile no.
↳ 96433 3494

↳ not a valid mobile no.

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Aim - write LEX program to check valid mobile number.

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

%%
[6-9][1][0-9][9]{printf("valid mobile no.");}
.*{printf("not a valid mobile no.");}
%%

int yywrap(){
return 1;
}
int main(){
printf("Enter mobile no:\n");
yylex();
return 0;
}
```

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Output:-

enter a string: aabbab
string accepted

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Lab-9

Aim - Design a PDA which accepts equal no. of 1's and 0's.

```
#include <stdio.h>
#include <stdlib.h>
#define MAX_STACK_SIZE 100

typedef struct{
    char stack[MAX_STACK_SIZE];
    int top;
} Stack;
void push(Stack *s, char c){
    if (s->top >= MAX_STACK_SIZE){
        printf("Stack overflow\n");
        exit(1);
    }
    s->stack[s->top++] = c;
}

char pop(Stack *s){
    if (s->top == 0){
        printf("Stack underflow\n");
        exit(1);
    }
    return s->stack[--s->top];
}
int main(){
    Stack s;
```

```
    s.top = 0;
    char input[100];
    printf("Enter a string:");
    scanf("%s", input);

    int i = 0;
    while(input[i] != '\0'){
        if(input[i] == 'a'){
            push(&s, 'a');
        }else if(input[i] == 'b'){
            if(pop(&s) != 'a'){
                printf("string rejected");
                return 1;
            }
        }else{
            printf("invalid input");
            return 1;
        }
        i++;
    }

    if(s.top == 0){
        printf("string accepted");
    }else{
        printf("string rejected");
    }

    return 0;
}
```

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Output -

Enter the string: aaabbb

string accepted

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Aim - Design a PDA which accepts $a^n b^n$.

→
```
#include <stdio.h>
#include <stdlib.h>
#define MAX 100

char stack[MAX];
int top = -1;
void push(char c){
    if (top < MAX-1){
        stack[++top] = c;
    }else{
        printf("Stack overflow\n");
        exit(1);
    }
}

char pop(){
    if (top >= 0){
        return stack[top--];
    }else{
        printf("Stack overflow\n");
        exit(1);
    }
}
int isStackEmpty(){
    return top == -1;
}
```

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```
int validateString(char *s){
    int i=0;
    while(s[i]=='a'){
        push(s[i]);
        i++;
    }
    while(s[i]=='b'){
        if(isStackEmpty()){
            return 0;
        }
        pop();
        i++;
    }
    return isStackEmpty() && s[i]=='\0';
}
int main(){
    char s[MAX];
    printf("Enter the string:");
    scanf("%s",s);
    if(validateString(s)){
        printf("string accepted.\n");
    }else{
        printf("string rejected\n");
    }
    return 0;
}
```

Output :-

Enter a string of parenthesis : (( ))( )

The string is well-formed.

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Aim - Design a PDA that accepts the well-formed parenthesis.

```
#include <stdio.h>
#include <stdlib.h>
#define MAX 100

typedef struct{
    int top;
    char arr[MAX];
}stack;
void init(stack *s){
    s->top = -1;
}
void push(stack *s, char x){
    s->arr[++(s->top)] = x;
}
void pop(stack *s){
    if(s->top != -1){
        s->top--;
    }
}
int isEmpty(stack *s){
    return (s->top == -1);
}
int isWellFormed(char *str){
    stack s;
    init(&s);
```

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```
    while (*str != '\0'){
        if (*str == '('){
            push(&s, *str);
        } else if (*str == ')'){
            if(isEmpty(&s)){
                return 0;
            }
            pop(&s);
        }
        str++;
    }
    return isEmpty(&s);
}
int main(){
    char str[MAX];
    printf("Enter a string of parenthesis:");
    scanf("%s", str);
    if (isWellFormed(str)){
        printf("The string is well-formed.\n");
    }else{
        printf("not well-formed.\n");
    }
    return 0;
}
```

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Output:-

AAAAAAAAAAAAAAAAAAA
Enter the string: 11C111
AAAAA11C111AAAAAAAAA
↳ AAAAAAAA11111AAAAAAA

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Lab-10

Aim - WAP to add two unary numbers using Turing machine.

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

int main(){
    int i=0;
    char array[20];
    while(i<20){
        array[i]='A';
        i++;
    }
    array[i]='1';
    i=0;
    while(i<20){
        printf("%c",array[i]);
        i++;
    }
    printf("\n");
    i=5;

    char s[20];
    printf("Enter the string:");
    scanf("%s",s);
    i=5;
```

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```
int j = 0;
while (s[j] != '\0'){
    array[i++] = s[j++];
}
i = 0;
while (i < 20){
    printf("%c", array[i]);
    i++;
}
printf("\n");
char state = '0';
i = 5;
while(1){
    if (state == '$5'){
        break;
    }
    if (state == '0' && array[i] == '1'){
        array[i] = 'A';
        state = '1';
        i++;
    }
    if (state == '0' && array[i] == 'C'){
        array[i] = 'A';
        state = '$5';
    }
    if while (state == '1'){
        if (array[i] == '1'){
            state = '1';
            i++;
```

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```
} else if (array[i] == 'c'){
        state = '2';
        i++;
    }
}
while (state == '2'){
    if (array[i] == '1'){
        state = '2';
        i++;
    }
    if (array[i] == 'A'){
        state = '3';
        array[i] = '1';
        i--;
    }
}
while (state == '3'){
    if (array[i] == '1'){
        state = '3';
        i--;
    }
    if (array[i] == 'c'){
        state = '4';
        i--;
    }
}
while (state == '4'){
    if (array[i] == '1'){
        state = '4';
```

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```
        }  i++;
    }
}
i = 0;
while (i < 20){
    printf("%c", array[i]);
    i++;
}
return 0;
}
```

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