Compiler Design Lab (CS 306L)

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Week 1: Implementation of Language recognizer

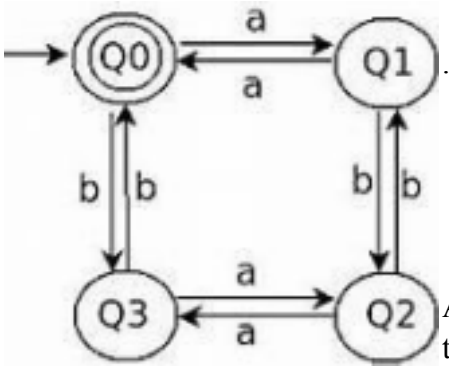
Program 1:

Implement a language recognizer that accepts a set of all strings over the alphabet ∑={a,b} containing an even number of a's and an even number of b's.

Description:

The acceptable strings of the language are ε(Null string), aa, bb, abba, babbab etc.

Deterministic Finite Automata for the given language is given below:



DFA M=(Q,∑,δ,Q_0,F) Where Q=Set of all states ={Q_0,Q_1,Q_2,Q_3} ∑=Input Alphabet={a,b},
Start state is Q_0
F=Set of all final States={ Q_0}

And the transitions are defined in the transition diagram

Output:

Algorithm prints a message

"String accepted": If the input is acceptable by the language,
"String not accepted" otherwise,
"Invalid token": If the input string contains symbols other than input alphabet.

Method:

```
state=0 //initial state
i=0
while((current=input[i++])!='\0'){
switch(state)
case 0: if(current=='a') state=1;
else if(current=='b') state=2;
else
```

```
Print "Invalid token" ; exit;
case 1: if(current=='a') state=0;
else if(current=='b') state=3;
else
        Print "Invalid token" ; exit;
case 2: if(current=='a') state=3;
        else if(current=='b') state=0;
        else
Print "Invalid token" ; exit;
case 3: if(current=='a') state=2;
else if(current=='b') state=1;
else
Print "Invalid token" ; exit;
end switch
end while
//Print output
if(state==0)
 Print ”String accepted”
else
 Print ”String not accepted”
```

Test cases:

Input	Expected Output
aabb	String accepted
abab	String accepted
aaabb	String not accepted
aaa	String not accepted
abcd	Invalid token

C Code

```
#include<stdio.h>
void main(){
 int state=0,i=0;
 char current,input[20];
 printf("Enter input string \t :");
 scanf("%s",input);
```

```
 while((current=input[i++])!='\0'){
switch(state)
 {
 case 0: if(current=='a')
 state=1;
 else if(current=='b')
 state=2;
 else
 {
 printf("Invalid token");  exit(0);
 }
 break;
 case 1: if(current=='a')
 state=0;
 else if(current=='b')
 state=3;
 else
 {
 printf("Invalid token");  exit(0);
 }
 break;
 case 2: if(current=='a')
 state=3;
 else if(current=='b')
 state=0;
 else
 {
 printf("Invalid token");  exit(0);
 }
 break;
 case 3: if(current=='a')
 state=2;
 else if(current=='b')
 state=1;
 else
 {
 printf("Invalid token");
 exit(0);
 }
 break;
 }
 }
 if(state==0)
 printf("\n\nString accepted\n\n");
 else
 printf("\n\nString not accepted\n\n");
 }
```

Test cases:

Input 1	Output
Input 2	Output
Input 3	Output
Input 4	Output

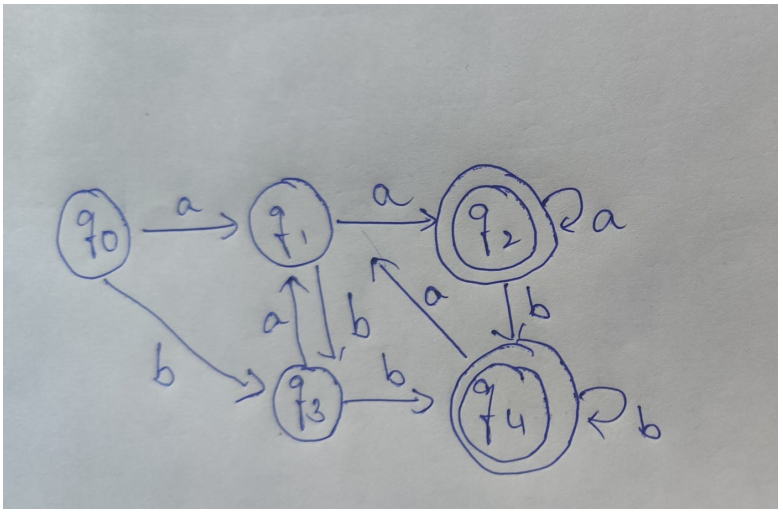
Program 2:

Implementation of Language recognizer for a set of all strings ending with two symbols of the same type.

Description:

The acceptable strings of the language are aa, bb, abbaaa, babbabb etc.

Deterministic Finite Automata for the given language is given below:



DFA M=(Q,∑,δ,Q_0,F) Where Q=Set of all states ={Q0,Q1,Q2,Q3,Q4} ∑=Input Alphabet={a,b},
The start state is Q_0
F=Set of all final States={Q2, Q4}
The transitions are described in the Transition diagram.

Output:

Algorithm prints a message

"String accepted": If the input is acceptable by the language,

"String not accepted" otherwise,

"Invalid token": If the input string contains symbols other than the input alphabet.

Method:

```
state=0 //initial state
i=0
while((current=input[i++])!='\0'){
switch(state)
case 0: if(current=='a') state=1;
else if(current=='b') state=3;
else
Print "Invalid token" ; exit;
case 1: if(current=='a') state=2;
else if(current=='b') state=3;
else
        Print "Invalid token" ; exit;
case 2: if(current=='a') state=2;
        else if(current=='b') state=3;
        else
Print "Invalid token" ; exit;
case 3: if(current=='a') state=1;
else if(current=='b') state=4;
else
Print "Invalid token" ; exit;
case 4: if(current=='a') state=1;
else if(current=='b') state=4;
else
Print "Invalid token" ; exit;
end switch
end while
//Print output
if(state==2||state==4)
Print "String accepted"
else
Print "String not accepted"
```

Test cases:

Input	Expected Output
aabbbbaabb	String accepted

abababba	String not accepted
aaabbbb	String accepted
aaaaaaa	String accepted
abcd	Invalid token

C Code

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

int main()
{
int state=0,i=0;
char current,input[20];
printf("Enter input string \t :");
scanf("%s",input);
while((current=input[i++])!='\0'){
   switch(state)
      case 0:if(current=='a')
             state=1;
             else if(current=='b')
             state=3;
             else

            { {printf("%d",current);
               printf("Invalid token");
            exit(0);
               }
               break;
        case 1:if(current=='a')
             state=2;
             else if(current=='b')
             state=3;
             else
            { printf("Invalid token");
            exit(0);
               }
               break;
        case 2:if(current=='a')
             state=2;
             else if(current=='b')
             state=3;
             else
```

```
                { printf("Invalid token");
                exit(0);
                  }
                  break;
            case 3:if(current=='a')
                state=1;
                else if(current=='b')
                state=4;
                else
                { printf("Invalid token");
                exit(0);
                  }
                  break;
            case 4:if(current=='a')
                state=1;
                else if(current=='b')
                state=4;
                else
                { printf("Invalid token");
                exit(0);
                  }
}
}
if(state==2||state==4)
printf("\n\nString accepted\n\n");
else
printf("\n\nString not accepted\n\n");
}
```

Test cases:

Input 1	Output
Input 2	Output
Input 3	Output
Input 4	Output