# Project 2

## Part 1. introduction

Design a Turing machine M, which is used to determine whether the received string meets the following conditions

$$L = \{a^n b^m a^{(n+m)} \mid n,m \geqslant 1\}$$

## Part 2. Designation

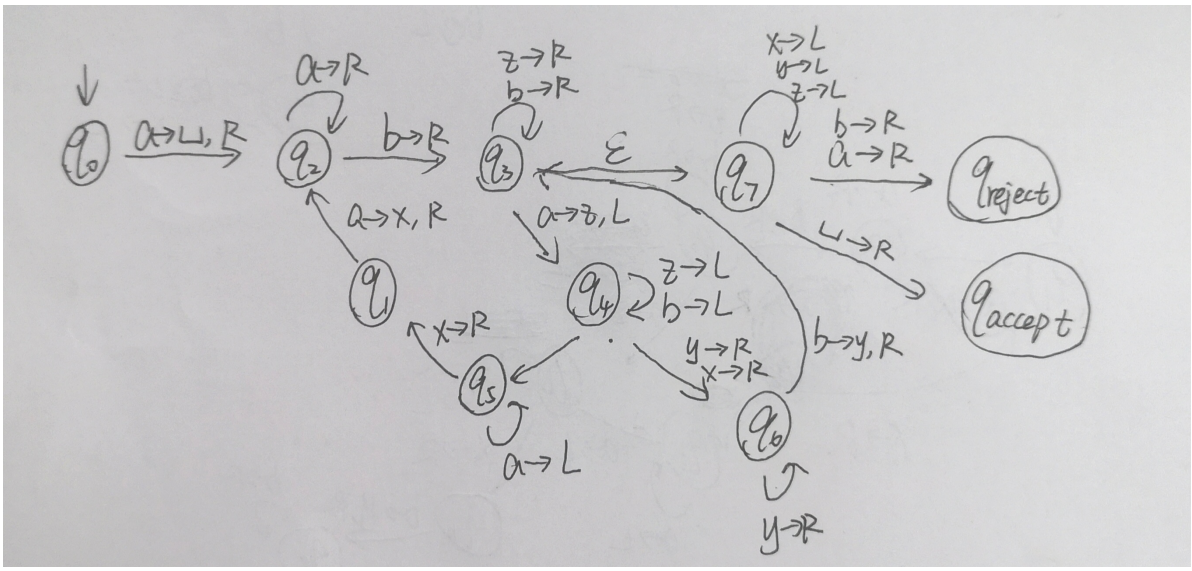
### 2.1 How to design state diagram

the procedure of the state diagram

```
        while there exists $a$ on the left
            1. when we accept one $a$ on the $b$'s left , replace it by one $x$
            2. the pointer move to right till the $a$ on the $b$'s right, we
replace one $a$ with one $z$
            3. the pointer return to the right untill confronted with $x$
        while there exists $b$ or $a$ on the rigth
            4. replace one $b$ by $y$
            5. the pointer move right to one $a$, and replace it by $z$
            6. the pointer return to the left till confronted with a $y$, move
right
        check all of the chars, if there till exist $a,b,c$ ,then reject, if not
exist, then accept
```

in a word, we firstly eliminate an $a$ on the left or a $b$, then we eliminate an $a$ on the right.

### 2.2 the picture of the state diagram



## 2.3 Design Turing machine

from part 2.2 we can describe the Truing machine as:

$$Q = \{q_0, q_1, \dots q_9\}$$

$$\sum = \{a, b\}$$

$$\Gamma = \{a, b, @, x, y, z\}$$

$$\delta = \{f_0, f_1, \dots f_{24}\}$$

$$q_{start} = q_0$$

$$q_{accept} = q_9$$

# Part 3. experiment result

```
input a string to match:aabaaa
ACCEPTED!
input a string to match:aabaa
REJECTED!
input a string to match:abaaa
REJECTED!
input a string to match:abaa
ACCEPTED!
```