

1.) Symbol :-

Any individual is called symbol eg a, b, 0, 1, ...

2.) Alphabet :- Σ Finite non-empty set of symbols

↓
एक set के बिना
कोई symbol
नहीं

symbols

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

$$\Sigma = \{0, 1\}$$

$$\Sigma = \{0, \dots, 9\}$$

3.) String :-

Sequence of alphabet

$$\Sigma = \{a, b\} = \{a, b, ab, aab, ba, bbb, bba\}$$

Q → How many strings of length 2 is possible

solⁿ 4

aa, ab, ba, bb

Q → How many strings of length n is possible

Ans 2^n

Note!

If $|\Sigma|$ sigma total no. of alphabet presents then possible no. of strings

* length of string! $|\Sigma|^n$ - Number of symbol in string w
eg. $\Sigma = \{a, b\}$
 $w = a_0 a_1 a_2 a_3 \Rightarrow |w| = 5$

4.) Language :-
collection of strings

Concatenation: $(w_1 \cdot w_2)$
 eg. $w_1 = ab$ $w_2 = bb$
 $w_1 \cdot w_2 = abbb$

$|uv| = |u| + |v|$
 ↑ ↑ ↑
 length of uv length of u length of v

$\Sigma = \{a, b\}$
 $L_1 =$ set of all string of length 2
 $\{aa, ab, ba, bb\}$
 \rightarrow finite language

$L_2 =$ set of all string length 3.
 $\{aaa, aab, aba, baa, bab, bba, bbb\}$
 \rightarrow finite language

$L_3 =$ set of all string starting with a
 $\{a, ab, aa, aba, aaa, \dots\}$
 \rightarrow Infinite language

5. Power of Sigma (Σ): -

$\Sigma^0 = \{\epsilon\}$ = set of all string having length zero
 $\Sigma^1 = \{a, b\}$ = set of all string length exactly one

$\Sigma^2 =$ set of all string length exactly 2
 $= \{aa, ab, ba, bb\}$

$\Sigma^* = \Sigma^0 \cup \Sigma^1 \cup \Sigma^2 \cup \dots \cup \Sigma^n$
 $\Sigma^+ = \Sigma^1 \cup \Sigma^2 \cup \dots \cup \Sigma^n$

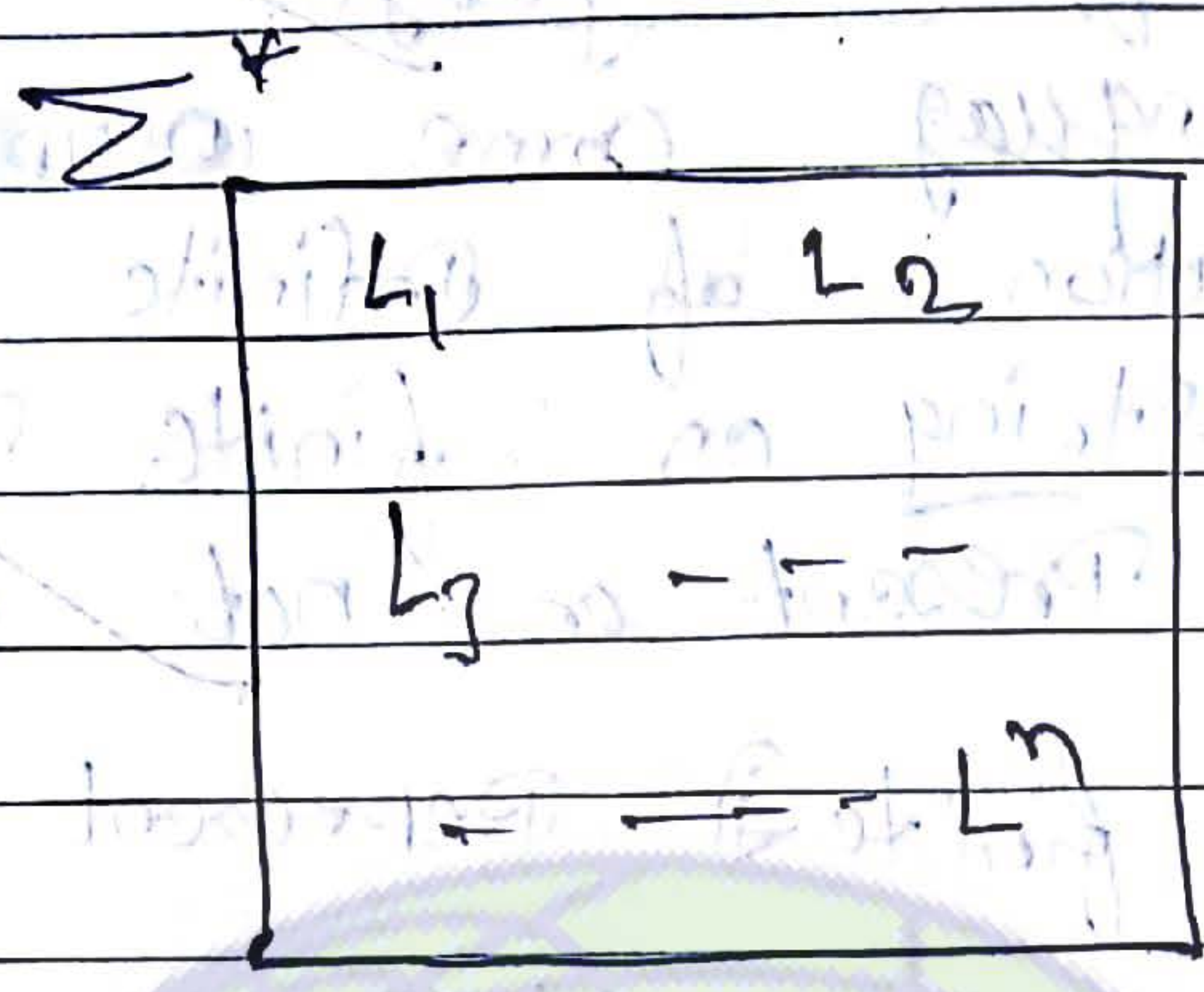
$\Sigma^n =$ set of all string length exactly n.

Note! Universal set/mother of all languages of particular Alphabet

$\Sigma^* = \Sigma^0 \cup \Sigma^1 \cup \Sigma^2 \cup \dots \cup \Sigma^n$

$\{\epsilon\} \cup \{a, b\} \cup \{aa, ab, ba, bb\}$

Universal set of all language



6.7 Application:-

↳ C language - set of all "valid" Program/string.

```

void main()
{
    printf("Hello");
}
    
```

L - language

set of all string length 2

$L_1 = \{aa, ab, ba, bb\}$

W = baq

↳ Not match,

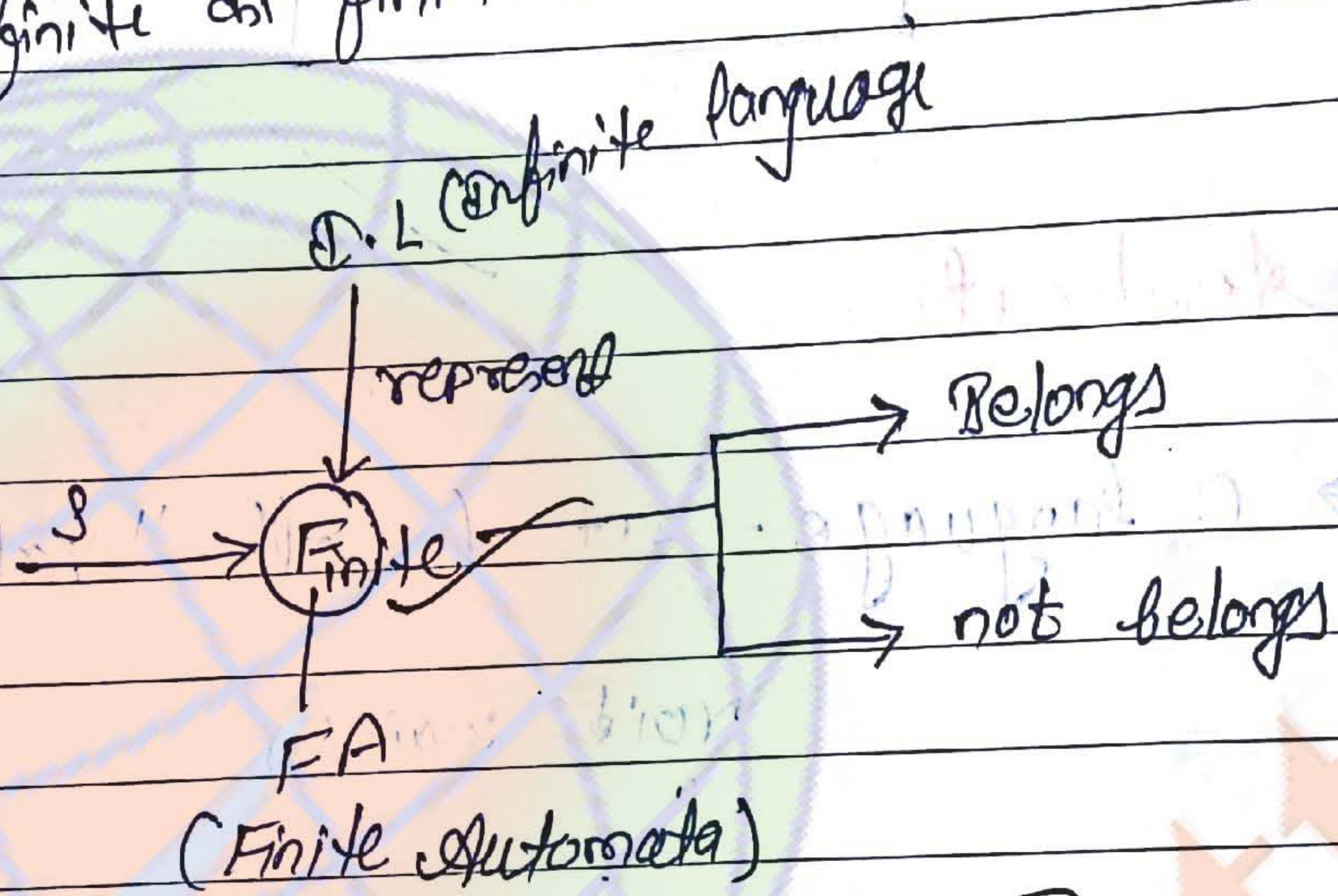
- It is possible to check, if any string "s" belong to any language "L" or not.

if L is finite,

if L is infinite then it is very difficult.

~~Solution of Infinite language:~~
 for a given language come up with finite representation of infinite language. then check string on finite representation whether string 's' present or not.

(Infinite to finite representation)



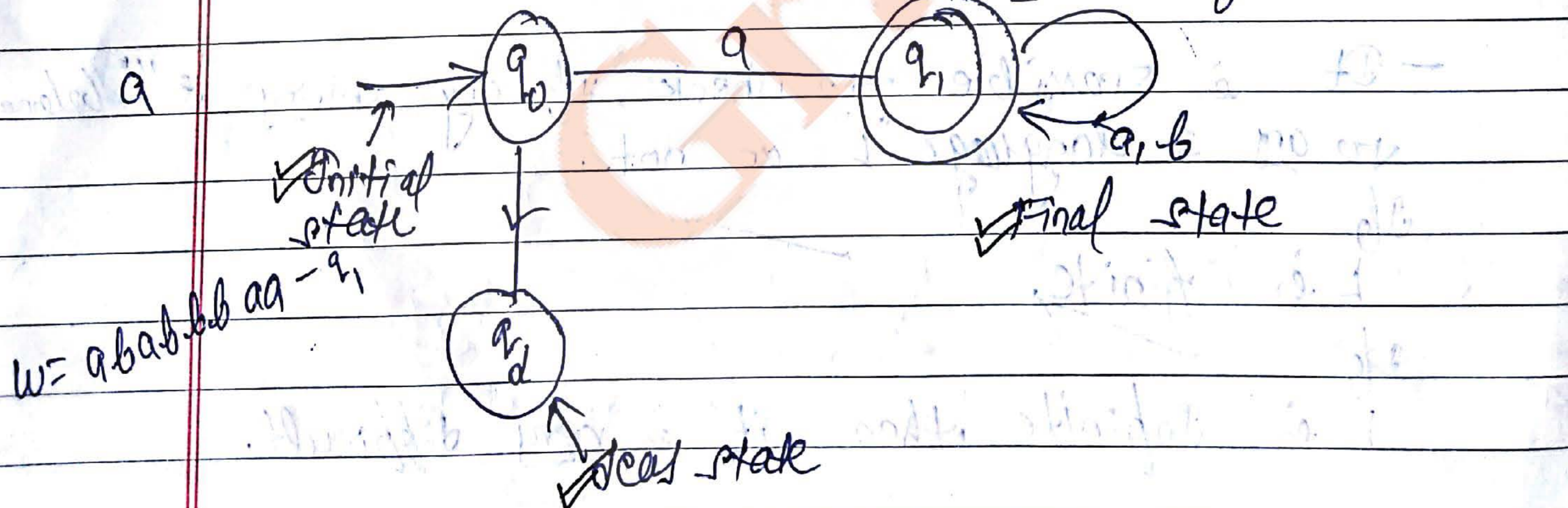
* ~~Construct~~ Finite Automata Diagram -

L_1 = set of all string ~~at string~~ over all alphabet $\{a, b\}$ that starts with a.

~~L infinite language~~

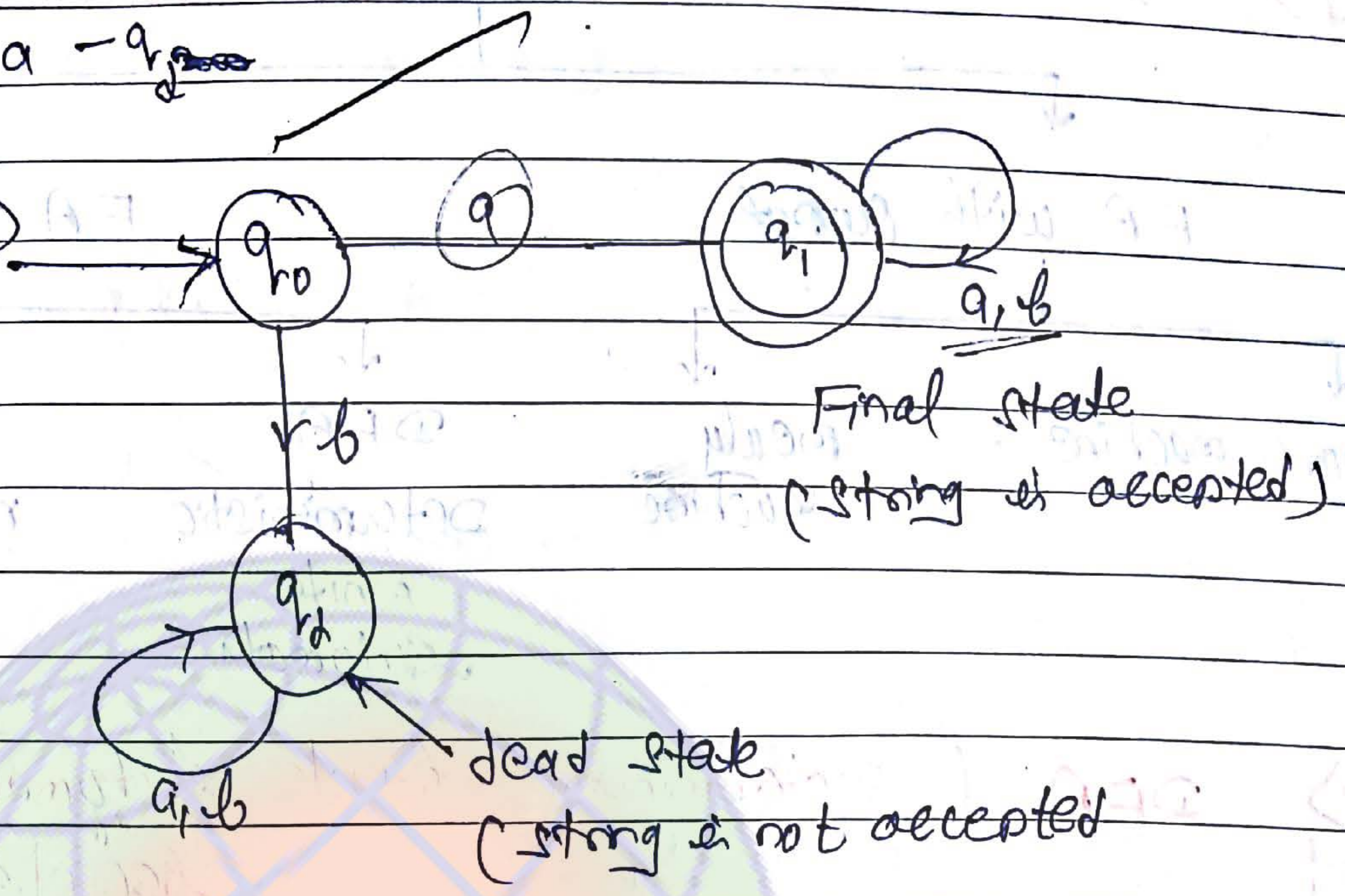
$\Sigma = \{a, b\}$

Double circle means final state



$w = ababbbbaa - q_2$

b at start
not accept
(dead state)



Note:

