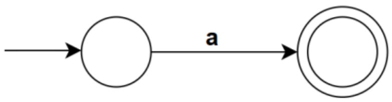
Regular Expression to Finite Automata

What is a Regular Expression?

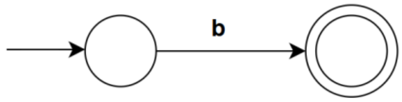
Regular Expression is a way of representing regular languages. The algebraic description for regular languages is done using regular expressions. They can define it in the same language that various forms of finite automata can describe. Regular expressions offer something that finite automata do not, i.e. it is a declarative way to express the strings that we want to accept.

Properties of RE:

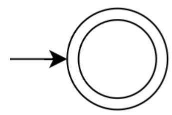
1. RE = a, where a ∈ ∑



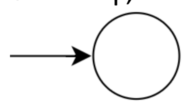
RE = b, where b ∈ ∑



2. RE = ε, where ε ∈ ∑



3. RE = ϕ, where ϕ ∈ ∑



4. R = R_1 U R_2 = R_1 | R_2

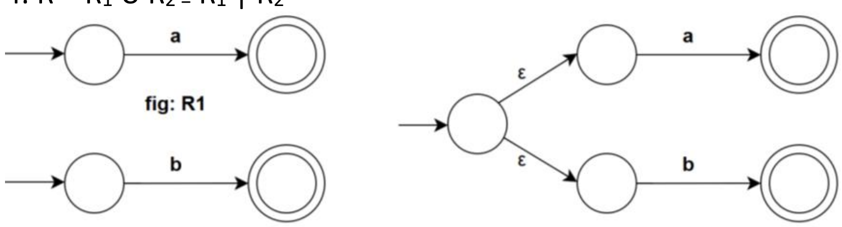


fig: R1

fig: R2

fig: R1 U R2

5. R = R_1 . R_2 = R_1 o R_2

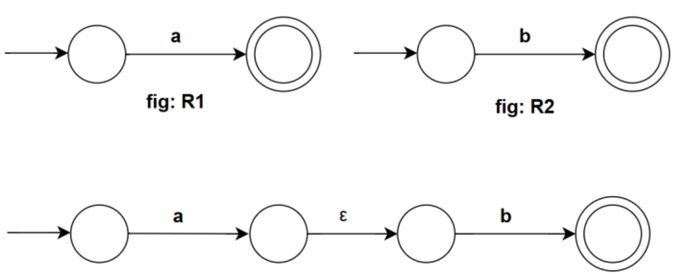


fig: R1

fig: R2

fig: R1 . R2

6. RE = R*

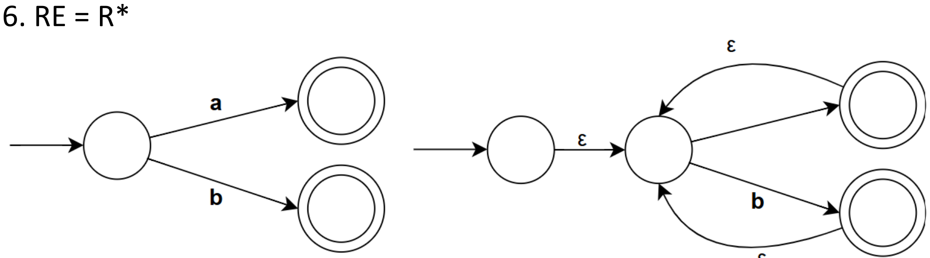
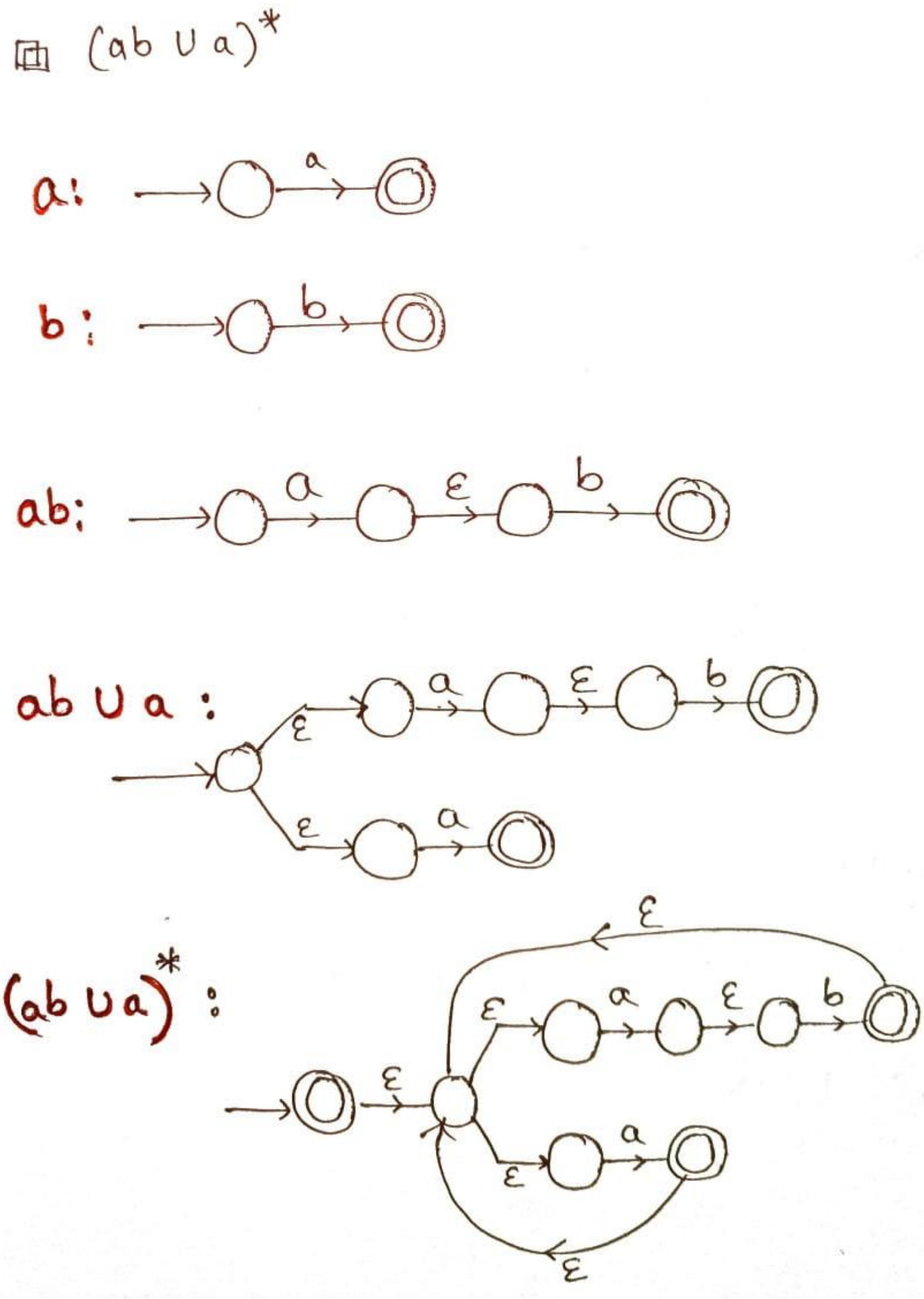


fig: R1*

Regular Expression to Finite Automata

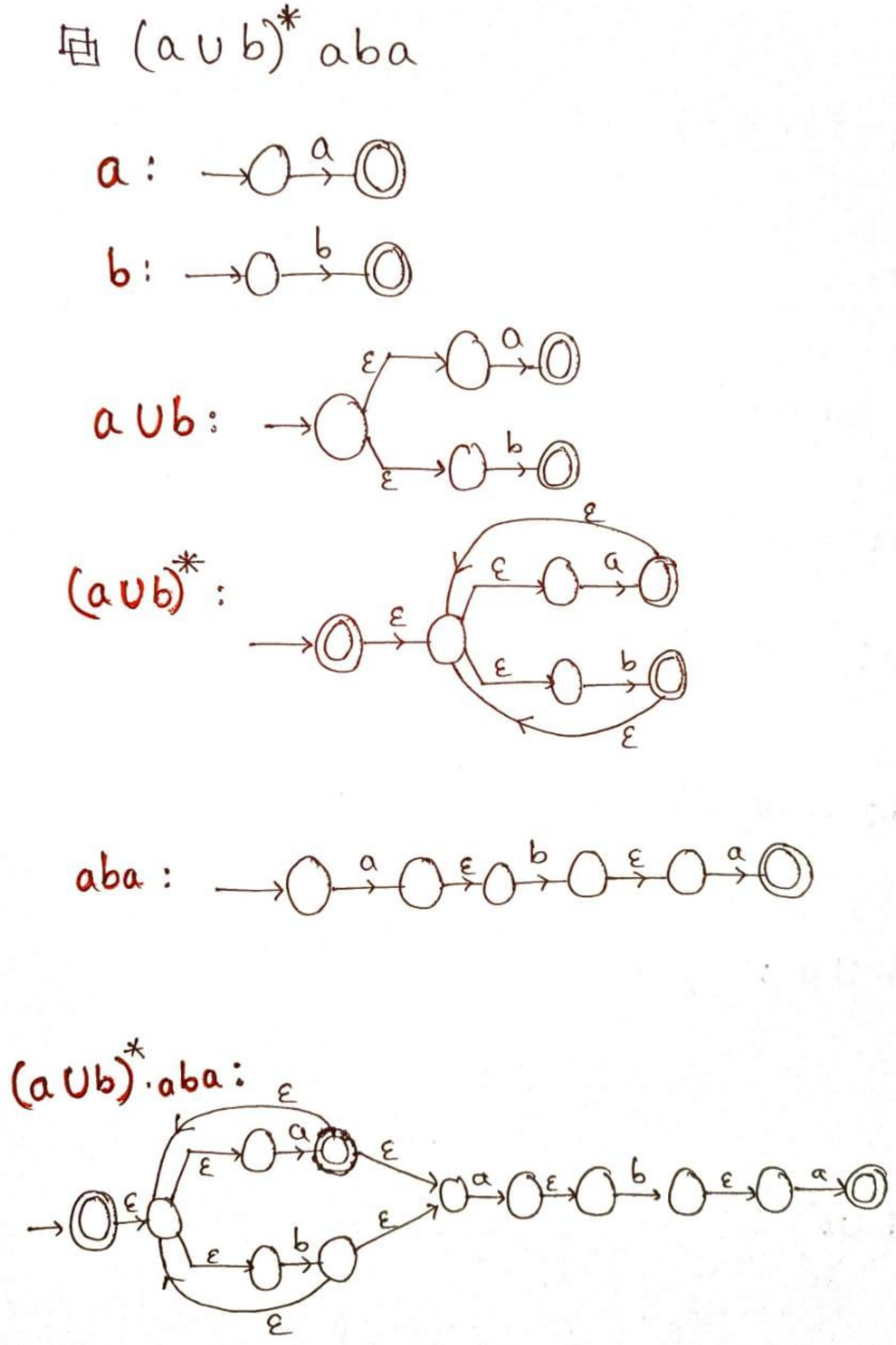
Regular Expression to Finite Automata:

1. (ab U a)*



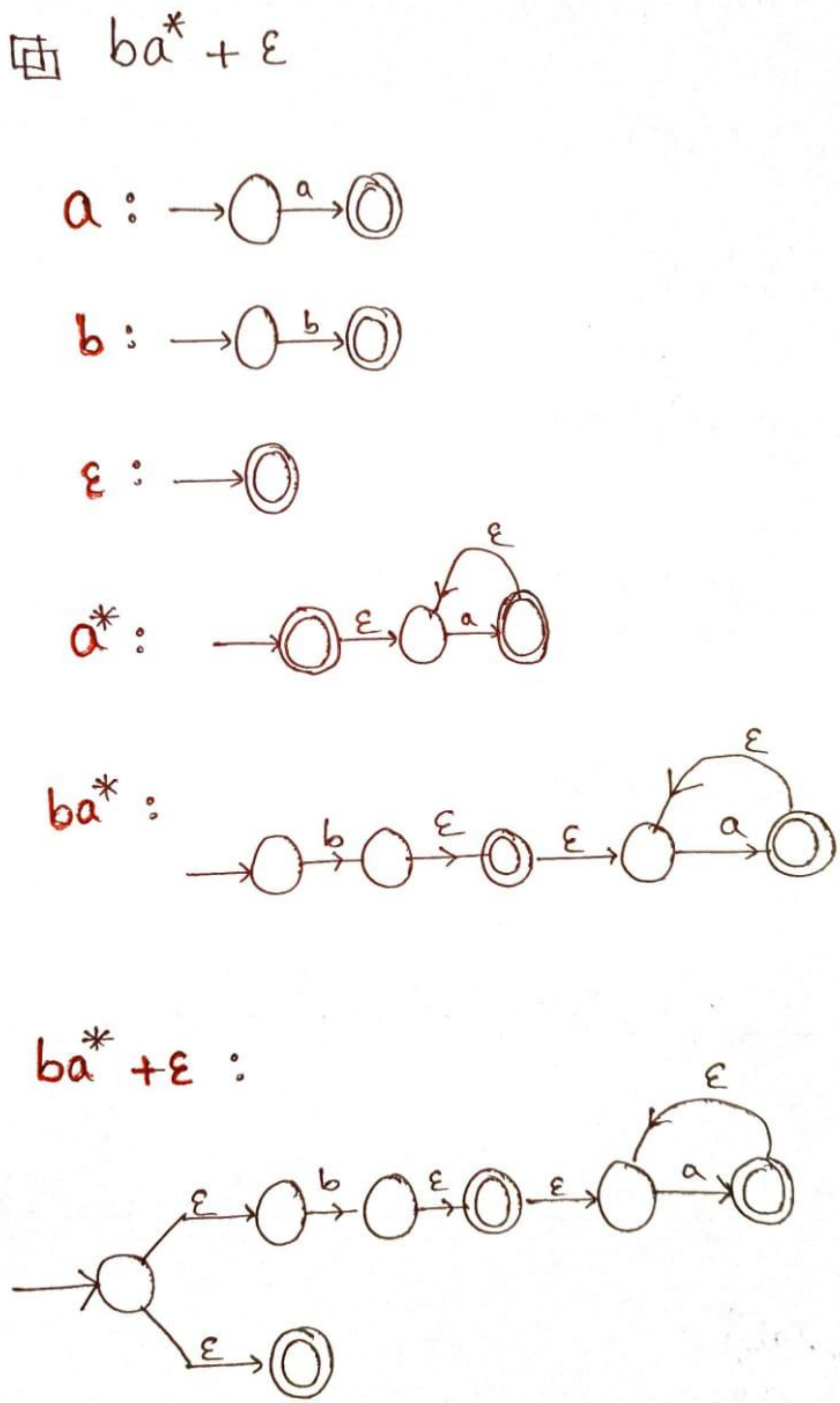
Regular Expression to Finite Automata

2. (a U b)* aba



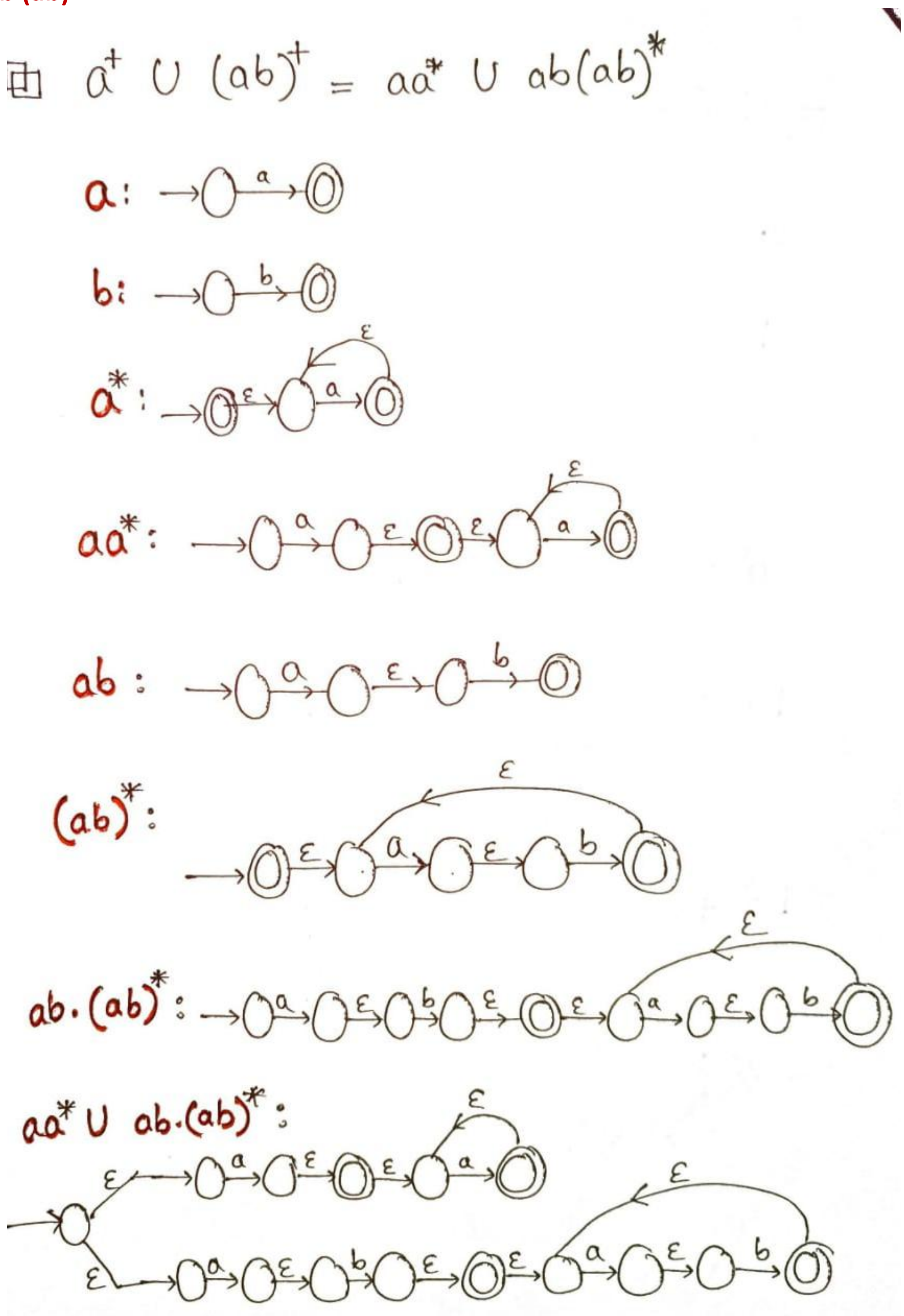
Regular Expression to Finite Automata

3. ba* + ε



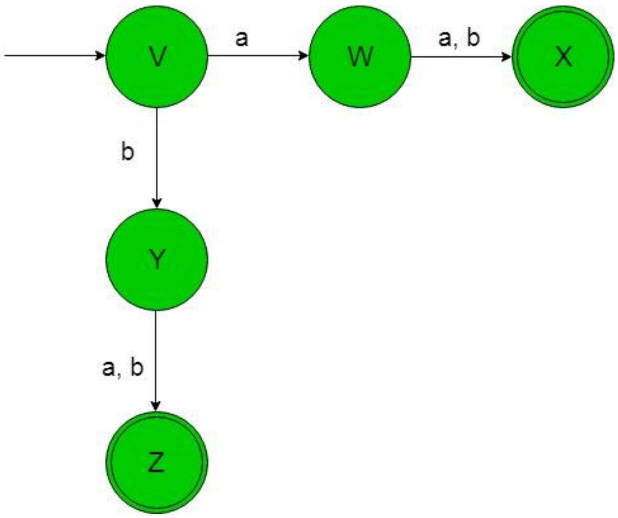
Regular Expression to Finite Automata

4. $a^+ \cup (ab)^+$
$= aa^* \cup ab\,(ab)^*$

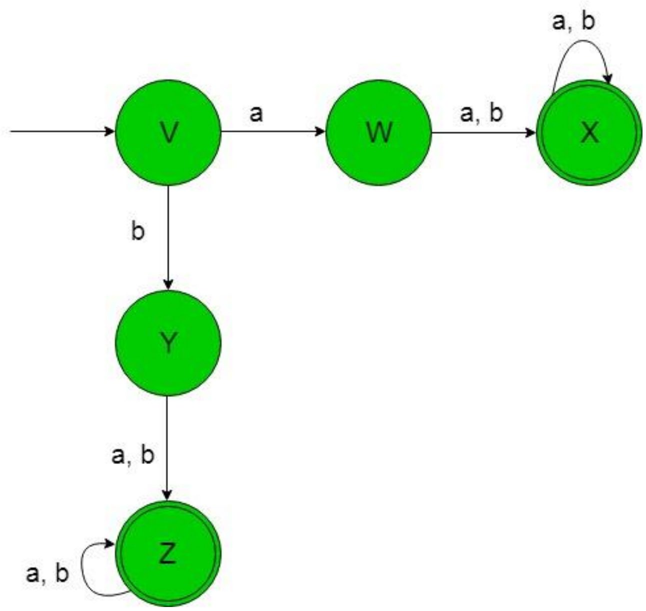


Regular Expression to Finite Automata

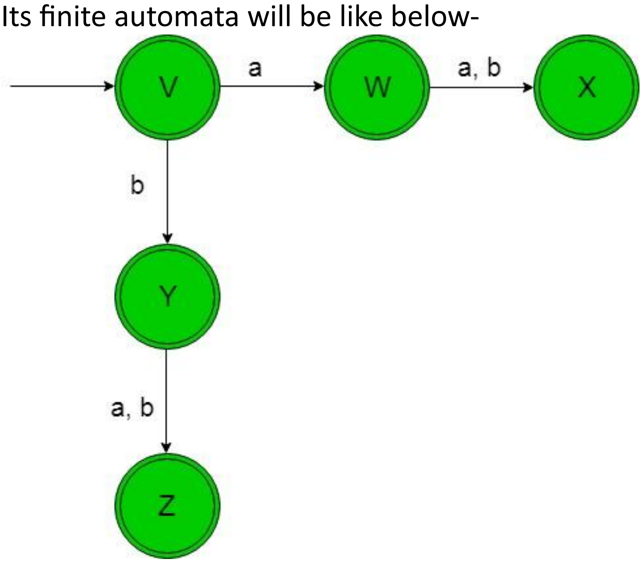
5: Regular language,
L1 = (a+b)(a+b)
The language of the given RE is, {aa, ab, ba, bb}
Length of string exactly 2.
Its finite automata will be like below-



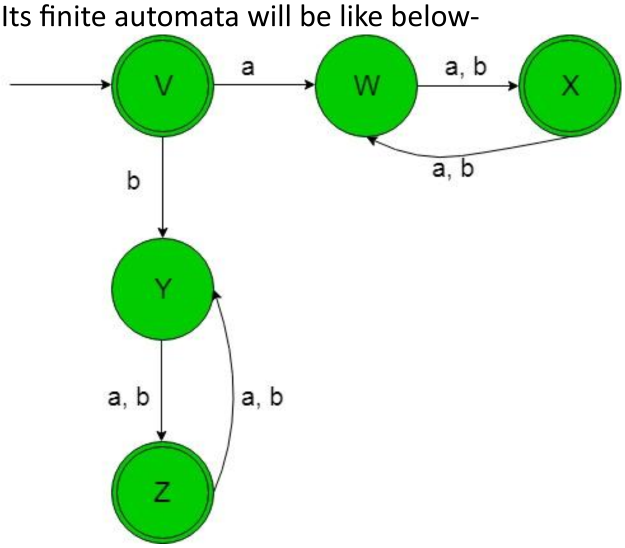
6: Regular language,
L2 = (a+b)(a+b)(a+b)*
The language of the given RE is, {aa, ab, ba, bb, aaa, aab, ...}
Length of string at least 2.
Its finite automata will be like below-



7: Regular language,
L3 = (a+b+ε)(a+b+ε)
The language of the given RE is,
{ε, a, b, aa, ab, ba, bb}
Length of string at most 2.
Its finite automata will be like below-

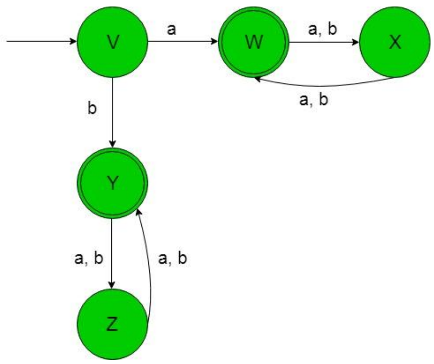


8: Regular language,
L4 = ((a+b)(a+b))*
The language of the given RE is,
L4 = {ε, aa, ab, ba, bb, aaaa, ...}
Language of even length string.
Its finite automata will be like below-

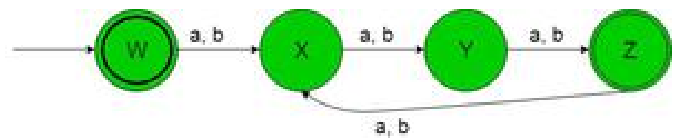


Regular Expression to Finite Automata

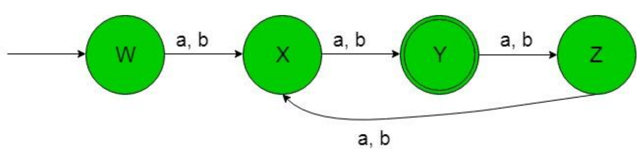
9: Regular language,
L5 = ((a+b)(a+b))*(a+b)
The language of the given RE is
{a, b, aaa, bbb, abb, bab, bba, ...}
Language of odd length string.
Its finite automata will be like below-



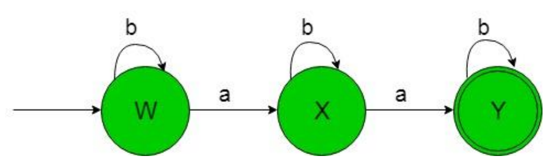
10: Regular language,
L1 = ((a+b)(a+b)(a+b))*
The language of the given RE is,
{aaa, aba, baa, bba, aab, abb, bab, bbb,...}
Length of the string is divisible by 3 ((length of string) mod 3 = 0).
Its finite automata will be like below-



11: Regular language,
L2 = (a+b)(a+b).((a+b)(a+b)(a+b))*
The language of the given RE is,
{aa, ab, ba, bb, aaaaa, aabab, ...}
Length of string mod 3 = 2
Its finite automata will be like below-

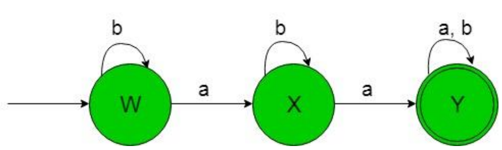


12: Regular language,
L3 = b*ab*ab*
The language of the given RE is,
{baa, babab, bbabbabb, ...}
Number of 'a' exactly 2.
Its finite automata will be like below-



13: Regular language,

L4 = b*ab*a(a+b)*
The language of the given RE is,
{baa, babab, bbabbaabb, ...}
Number of 'a' atleast 2.
Its finite automata will be like below-



14: Regular language,
L5 = b*(ε+a)b*(ε+a)b*
The language of the given RE is,
{b, bb, bbb, bab, baab, babab, bbab, ...}
Number of 'a' at most 2.
Its finite automata will be like below-