Unit : 2 Regular Languages

* Regular Languages :

Regular Languages is a language that can be expressed with a Regular expression.

A Regular Languages is set of string which made up of characters.

Regular Languages is the most restricted types of Languages.

Regular Languages are expected by Finite Automata.

-> Operations of Regular Languages.

(i) Union : If A and B are two regular languages then Union of A ∪ B is also union.

(ii) Intersection : If A and B are two regular languages then intersection of A ∩ B is also follow intersection operation.

(iii) Kleen Closure: If A is a regular language then its kleen closure A* is also be a regular language.

* Regular Expression:

Regular Language accepted by Finite automata can used to described by Regular Expression.

Regular Expression is used to define sequence of pattern of string.

Ex. (a+b)*

Regular Expression = {∧, a, b, ab, aa, bb, ---}

=> Note:

* -> Clean closure which contain null string which is denoted by ∧ or ε

+ → Positive closure which does not contain null string

$a^* = \{\wedge, a, aa, \ldots\}$
$a^+ = \{a, aa, aaa, \ldots\}$

Ex. Example of Regular Expression.

a String having zero or more a

→ Regular Lan. = $\{\wedge, a, aa, \ldots\}$
Regular Exp. = a^*

b String end with a

→ Regular Lan. = $\{a, ba, aa, aaa, \ldots\}$
Regular Exp. = $(a+b)^* a$

c String start with a and End with b

→ R.L = $\{ab, aab, abb, aabb, \ldots\}$
R.E = $a(a+b)^* b$

d String having one or more a

→ R.L = $\{a, aa, aaa, \ldots\}$
R.E = a^+

e Binary String start with 0 and end with 1

→ R.L. = {01, 001, 011, 0011, ...}
R.E = 0(0+1)*1

f String should contain at least 3 One

→ R.L. = {111, 1011, 0111, 1101, ...}
R.E = (0+1)*1(0+1)*1(0+1)*1(0+1)*

g String shoutd have odd Length

→ R.L. = {0, 1, 010, 011, 01101, ...}
R.E. = (0+1)((0+1)(0+1))*

h String end with 1 and not contain 00

→ R.L = {1, 01, 011, 1011, ...}
R.E = (1+01)*

i String of Length 6 or less

→ R.E = (0+1+^)^6

j String Begins or ends with 00 or 11

-> R.L. = {0011, 00011, 00111, ---}
R.E. = (00+11)(0+1)* +
(0+1)*(00+11)

* Indistinguishable string :

Suppose, L is a Regular Language and X and Y is a string which present in L.

Suppose Z is one string.

If Combination of XZ and YZ both are present in L.

So, this string is called Indistinguishable string.

* Distinguishable string :

Suppose, L is a Regular Language and X and Y is a string which present in L.

Suppose Z is one string,

If combination of XZ is present in L and YZ is not present in L.

So, this String is called Distinguishable string.

Ex. Regular Language L = { 0, 1, 00, 11, 01, 10, --- }

-> Take X = 0 and Y = 1
Suppose Z = 1.

For Indistinguishable string,

XZ = 01 ∈ L
YZ = 11 ∈ L

So, this String is Indistinguishable string.

So, this string is not distinguishable string. because both string are present in L.