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UNIVERSITY OF GLOBAL VILLAGE (UGV), BARISHAL.
THE FIRST SKILL BASED HI-TECH UNIVERSITY IN BANGLADESH

Theory of Computation

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Symbol

Symbol: Is a basic building block of Theory of Computation.

e.g. a,b,….z(Latters)

0,1,….9(Digit)

Alphabet

Alphabet: Is a finite set of symbols.

Σ(Sigma)

e.g. Σ={a,b}

Σ={0,1}

Σ={0,1,….9}

Σ={a,b,c}

This all are finite set

String

String: Is a finite sequence of symbol.

ɯ(String)

e.g. ɯ={0,1}

ɯ=0110

ɯ=1010

Length of String

Length of String: |ɯ|

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

ɯ = ababba = 6

| ɯ | = 6 (length is 6)

Empty String

Empty String: **ε(Epsilon) or λ(Lambda)**

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

0 is a string over the Σ of length 1

10 is a string over the Σ of length 2

101 is a string over the Σ of length 3

e.g. (Ø/{} = Empty Set)

Language

Language: Is collection of strings.

(**It can be finite/ infinite**)

e.g. $\Sigma = \{a, b\}$

L1= Set of all strings over Σ of length 2

={aa,ab,ba,bb} **Finite Set**

L2= Set of all strings over Σ of length 3

={aaa,aab,aba,abb,baa,bab,bba,bbb} **Finite Set**

L3= Set of all strings over Σ where each string starts with ‘a’

={a,aa,ab,aaa,aba,aaaa,…..} **Infinite set**

Power Of Σ

Σ={a,b}

Σ1 = Set of all strings over this Σ of length 1

={a,b}

Σ2 = Set of all strings over this Σ of length 2

={aa,ab,ba,bb}

Σ3 = Set of all strings over this Σ of length 3

={aaa,aab,aba,abb,baa,bab,bba,bbb}

Σ° = Set of all strings over this Σ of length 0

={ε}

Σ*

Σ* = **Set of all possible strings**.

$$\Sigma^* = \Sigma^\circ \cup \Sigma 1 \cup \Sigma 2 \cup \Sigma 3$$

$$=\{\varepsilon\} \cup \{a,b\} \cup \{aa,ab,ba,bb\} \ldots\ldots$$

Previous,

$$L1 \subseteq \Sigma^*$$

$$L2 \subseteq \Sigma^*$$

$$L3 \subseteq \Sigma^*$$

So, all language is subset of **Σ***

e.g. ⊆ = Subset

Set

Set: **is a collection of objects.**

S={a,b,c,h,d}

S={1,2,5,6}

Set

1. Empty set S = ∅/{}
2. Not Empty Set S ≠ ∅

Not Empty Set

1. Finite Set
2. Infinite Set

Finite Automata

- We will use several different models, depending on the features we want to focus on. Begin with the simplest model, called the finite automaton.
- Good models for computer with an extremely limited amount of memory. For example, various household appliances such as dishwashers and electronic thermostats, as well as parts of digital watches and calculators.
- The design of such devices requires keeping the methodology and terminology of finite automata in mind.
- Next we will analyze an example to get an idea.