

**Theory of Automata**  
Fall 2020

**Momina Atif Dar**  
**P18-0030**  
Section B

**Assignment 01**

**Descriptive Definitions**

**1.**

$S = \{a, b\}$

$L = \{a, ab, abb, abbb, abbbb, abbbbbb, abbbbbbb, abbbbbbbb, abbbbbbbbbb, abbbbbbbbbb...\}$

Descriptive Definition:

Any number of b's starting with a.

**2.**

$S = \{a, b\}$

$L = \{b, ab, aab, aaab, aaaab, aaaaab, aaaaaab, aaaaaaab, aaaaaaab, aaaaaaab...\}$

Descriptive Definition:

Any number of a's ending with b.

**3.**

$S = \{a, b\}$

$L = \{\wedge, a, b, aa, ab, ba, bb\}$

Descriptive Definition:

Strings with length equal to or less than 2.

**4.**

$S = \{a, b\}$

$L = \{\wedge, a, b, aa, ab, ba, aaa, aab, aba, aaaa, aaab, aaba, aaaaa...\}$

Descriptive Definition:

Strings that do not contain double b.

**5.**

$S = \{a, b\}$

$L = \{a, aa, ab, ba, aaa, aab, aba, abb, aaaa, aaab, aaba, aabb, \dots\}$

Descriptive Language:

Strings that contain at least one a.

**6.**

$S = \{a, b\}$

$L = \{ab, bb, aaab, aabb, aaaaab, aaaabb, aaaaaaab, aaaaaabb, aaaaaaaab, aaaaaaabb, \dots\}$

Descriptive Definition:

Strings of even length ending with b.

**7.**

$S = \{a, b\}$

$L = \{a, aaa, aba, aaaaa, aaaba, aaaaaaa, aaaaaba, aaaaaaaaa, aaaaaaaba, aaaaaaaaaa, \dots\}$

Descriptive Definition:

Strings of odd length ending with a.

**8.**

$S = \{a, b\}$

$L = \{ab, ba, aab, aba, abb, aaab, aaba, aabb, aaaab, aaaba, \dots\}$

Descriptive Definition:

Strings having at least one a and one b.

**9.**

$S = \{a, b\}$

$L = \{a, b, aa, bb, aaa, bbb, aaaa, bbbb, aaaaa, bbbbbb, \dots\}$

Descriptive Definition:

Strings having either all a's or all b's.

**10.**

$S = \{a, b\}$

$L = \{a, aa, aaa, aaaa, aaaaa, aaaaaa, aaaaaaa, aaaaaaaa, aaaaaaaaa, aaaaaaaaaa, \dots\}$

Descriptive Definition:  
Anything starting with a.

### **Recursive Definitions:**

**1.**

$S = \{a, b\}$

Language of strings starting with a and ending with b.

$L = \{ab, aab, abb, aaab, aabb, aaaab, aaabb, aaaaab, aaaabb, aaaaaab, \dots\}$

Step 1:

ab is in L.

Step 2:

(a)s(b) also in L, where s belongs to  $S^*$ .

Step 3:

No strings except those constructed in above step are allowed to be in L.

**2.**

$S = \{a, b\}$

Language of strings which start with a.

$L = \{a, aa, ab, aaa, aab, aba, abb, aaaa, aaab, aaba, \dots\}$

Step 1:

a is in L.

Step 2:

(a)s is also in L, where s belongs to  $S^*$ .

Step 3:

No strings except those constructed in above step are allowed to be in L.

**3.**

$S = \{a, b\}$

Language of strings that contain double b.

$L = \{bb, abb, aabb, aaabb, aaaabb, aaaaabb, aaaaaabb, aaaaaaabb, aaaaaaaabb, aaaaaaaaabb, \dots\}$

Step 1:

bb is in L.

Step 2:

s(bb)s is also in L, where s belongs to  $S^*$ .

Step 3:

No strings except those constructed in above step are allowed to be in L.

4.

$S = \{a, b\}$

Language of strings containing ab.

$L = \{ab, aab, aba, abb, aaab, aaba, aabb, aaaab, aaaba, aaabb, \dots\}$

Step 1:

ab is in L.

Step 2:

$s(ab)s$  or  $(ab)s$  or  $s(ab)$  are also in L, where s belongs to  $S^*$

Step 3:

No strings except those constructed in above step are allowed to be in L.

5.

$S = \{a, b\}$

Language of strings having at least one a.

$L = \{a, aa, ab, ba, aaa, aab, aba, abb, aaaa, aaab, \dots\}$

Step 1:

a is in L.

Step 2:

$(a)s$  or  $s(a)$  or  $s(a)s$  are also in L, where s belongs to  $S^*$ .

Step 3:

No strings except those constructed in above step are allowed to be in L.

-----