FORMAL LANGUAGES AND AUTOMATA

Example problems of Regular Expressions I

1. Set of all strings $\Sigma = \{a, b\}$ with exactly one a

   $$b^*ab^*$$

2. Set of all strings $\Sigma = \{a, b\}$ with prefix ab

   $$ab(a + b)^*$$

3. The language of all strings over $\Sigma = \{a, b\}$ that begin with "aba" and end with "bb"

   Here L includes $\{ababb, ababb, ababbb, ababbababb.....\}$
   Examples of strings not in the language: ϵ, aba, $abab$, abb

   $$aba(a + b)^*bb \text{ or } (aba(a|b)^*bb)$$

4. Write the regular expression for the language accepting all the string which are starting with 1 and ending with 0, over $\Sigma = \{0, 1\}$

   $$1(0 + 1)^*0$$

Example problems of Regular Expressions II

5. The language starting and ending with a and having any combination of b's in between

$$a(b^*|a)^*a$$

6. Write the regular expression for the language starting with a but not having consecutive b's

$$L = \{a, aba, aab, aba, aaa, abab, ...\}$$

$$a + ab^*$$

7. Describe the language denoted by the regular expression $(b^*(aaa)^*b^*)^*$

   RE = (any combination of b's) $(aaa)^*$ (any combination of b's)
   L = { The language consists of the string in which a's appear triples, there is no restriction on the number of b's }

Example problems of Regular Expressions III

8. $\Sigma = \{0, 1\}$, all the strings do not contain the substring 01

   $L = \{\epsilon, 0, 1, 00, 11, 10, 100, ...\}$

   $(0^* + 1^*)^*$ or $(0^*|1^*)^*$

9. Write the regular expression for the language containing the string in which every 0 is immediately followed by 11

   $(011+ 1)^*$

10. Strings consisting of even number of a's followed by odd number of b's

    $(aa)^*(bb)^*b$

11. Language with string 1 or 0 followed by any number of 1's

    $(1 + 0)1^*$

12. Strings of 0's and 1's without any consecutive 1's

    $(10 + 0)^*(1 + \lambda)$

Example problems of Regular Expressions IV

13. All strings with number of 0's even for $\Sigma = \{0, 1\}$

    $$(1^*01^*01^*)^* + 1^*$$

14. Strings of a's and b's ending with either a or bb

    $(a + b)^*(a + bb)$

15. Strings of a's and b's having substring aa

    $(a + b)^*aa(a + b)^*$ or $(a + b)^*(aa)^+(a + b)^*$