Assignment #5

(I) Define a regular expression.

(II) Write a regular expression over Σ={a,b} that generates the following language L={w|w has exactly 2 occurrences of a}. (Note the two occurrences of *a* can be anywhere in the string)

  (i) Give four different examples of strings of length six that belong to the above language.

(III) Assume the alphabet Σ = {a,b) .

Give the set all strings over Σ of length less than or equal to 2 including the null string.

For each of the following languages, which of the above strings are in the language defined by the following regular expressions. (Show your work clearly).

(i) a*b*
(ii) a(ba)*b
(iii) a* + b*
(iv) (aaa)*
(v) (a+b)*a(a+b)*b(a+b)*a(a+b)*
(vi) aba + bab
(vii) (λ + a)b
(viii) (a + ba + bb)(a+b)*

(IV) Give regular expressions for the following: $L = \{a^n b^m \mid n \geq 2, m < 4\}$

  (i) Give two strings that are in the language.
  (ii) Give the regular expression for the complement of the above language.

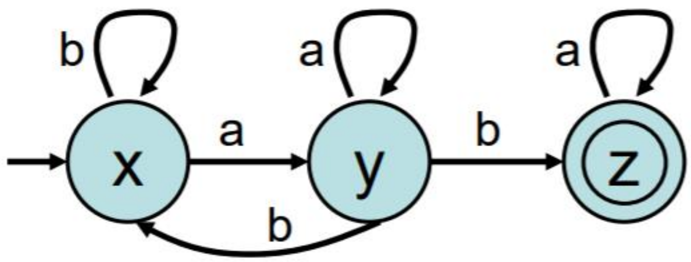
(V) Use the construction in Theorem 3.1 and find an NFA recognizing the languages

  (i) (01 + 001 + 010)*
  (ii) (0 + 1)*010
  (iii) 0(10)*1

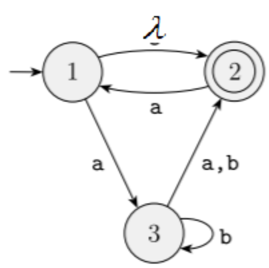
(VI) Convert the NFA constructed above for (01 + 001 + 010)* to an equivalent DFA

(VII) Convert the following automata to regular expressions. (Show step by step similar to the example in the notes. No need to simplify the regular expressions)

  (i)



(ii)



(VIII) From the NFA constructed for (0 + 1)*010 in Problem #5, construct it back to a regular expression. (Eliminate one state at a time in the NFA to construct the regular expression. You may end up with a slightly looking different but an equivalent regular expression.)