Theory of Automata (CS402)
Assignment No.1 Solution

Question No.1
RECURSIVE DEFINITION

a. Give recursive definition of language defined over alphabet $\Sigma = \{a, b\}$, having all strings STARTING WITH **aa** OR ENDING WITH **bb**

1. aa and bb belong to this Language
2. (aa)s and s(bb) also belong to this language such that s belongs to (a+b)*
3. No other strings except describe above are part of the this language

b. Give recursive definition of language defined over alphabet $\Sigma = \{a, b\}$, having all strings with length **MULTIPLE OF** 2

1. ^,aa,ab,ba and bb belong to this Language
2. If s belong to this language then so is ss
3. No other strings except describe above are part of the this language

c. Give recursive definition of language defined over alphabet $\Sigma = \{a, b\}$, having all strings **NOT ENDING** with aa or bb

1. ^, a, b belong to this Language
2. s(ab) and s(ba) also belong to this language where s belongs to (a+b)*
3. No other strings except describe above are part of the this language

d. Give recursive definition of language defined over alphabet $\Sigma = \{a, b\}$, **NOT HAVING** ab at any place.

1. ^,a,b belong to this Language
2. s1s2 are also part of this language where, where s1 belongs to b* and s2 belongs to a*
3. No other strings except describe above are part of the this language

e. Give recursive definition of **ODD PALINDROME** (PALINDROME WITH ODD STRINGS ONLY) defined over alphabet $\Sigma = \{a, b\}$

1. a,b belong to this Language
2. If s belong to this language then so is, (s)(s)(Rev(s)) [parentheses have been added just for clarity]
3. No other strings except describe above are part of the this language

Question No.2
REGULAR EXPRESSIONS

Give Regular Expression for each of the following language defined over alphabet $\Sigma = \{a, b\}$

a. Language having all strings STARTING AND ENDING WITH **ab**

RE: ab(a+b)*ab

b. Language of strings NOT having bb OR aa at any place

RE: (^+a+b)+ (^+b)(ab)*(^+a)+(^+a)(ba)*(^+b)
[You can try to simply it further]

c. Language of all strings NOT HAVING **aab** in start

RE: ^ + (a+b)+(a+b)(a+b)+(aaa+aba+abb+baa+bab+bba+bbb)(a+b)*
[Making all strings of length 3 except aab]

d. Language of all strings NOT HAVING **aab** in end

RE: ^ + (a+b)+(a+b)(a+b)+ (a+b)* (aaa+aba+abb+baa+bab+bba+bbb)

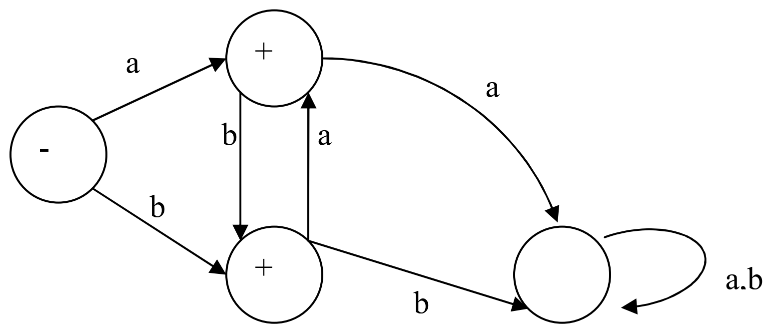
e. Language of all strings HAVING count of b's multiple of 2 [No restriction on count of a]

RE: (a*(ba*b)*a*)*

Question No.3
FINITE AUTOMATA

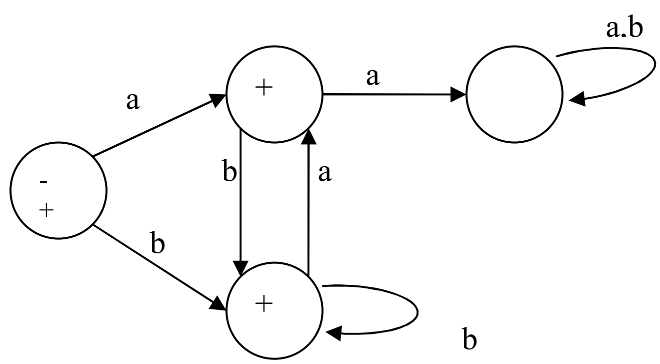
Give Finite Automata for each of the following language defined over alphabet $\Sigma = \{a, b\}$

a. Language having all strings with alternating a's and b's , some example strings are ababab… or bababa…

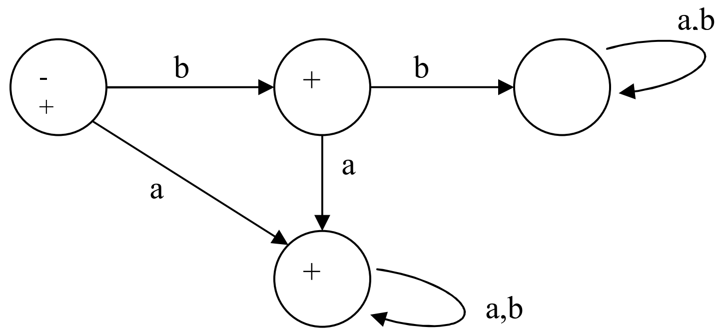


[Other way of defining this language is, language in which if a and b appear then they appear alternatively]

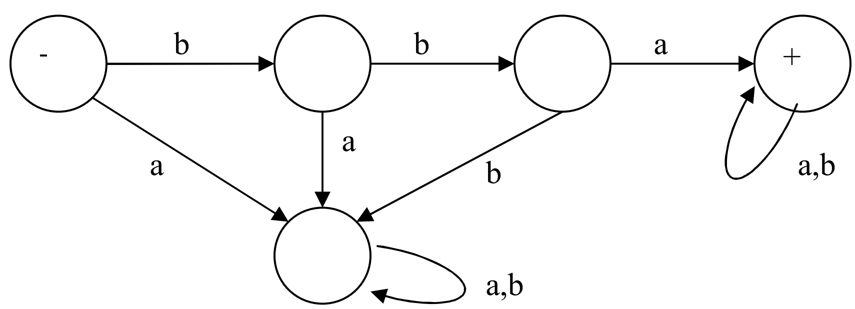
b. Language having all strings NOT containing aa at any place



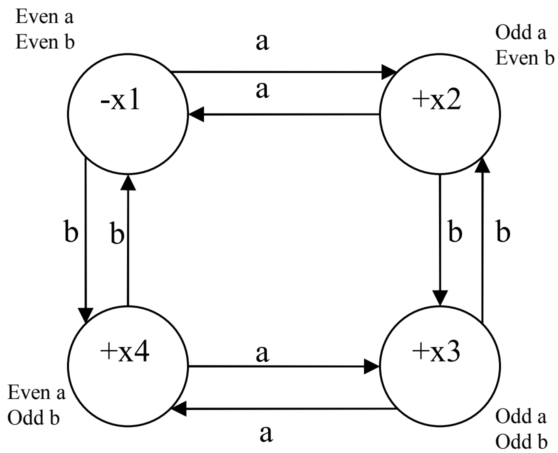
c. Language of all strings NOT STARTING with bb



d. Language of all strings STARTING WITH bba



e. Language having all strings NOT having even no of a’s and b’s



[As we already had EVEN-EVEN FA so we reversed its final states to get FA NOT HAVING EVEN-EVEN STRINGS]