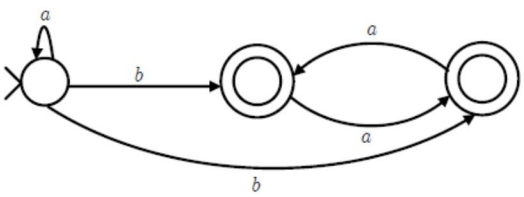
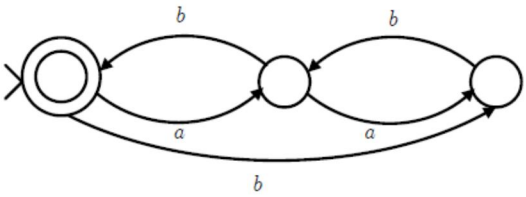
CS 152 – Sample 1

1- Find a regular expression for the following FAs:





$$\begin{cases} A = aA + bB + bC \\ B = aC + \lambda \\ C = aB + \lambda \end{cases}$$

دستگاه معادلات تعلم

Arden rule: $x = ax + b \Rightarrow x = a^*b$, $\lambda \notin L(a)$

$$\begin{cases} A = aA + bB + bC \\ B = a(aB + \lambda) + \lambda \end{cases} \Rightarrow$$

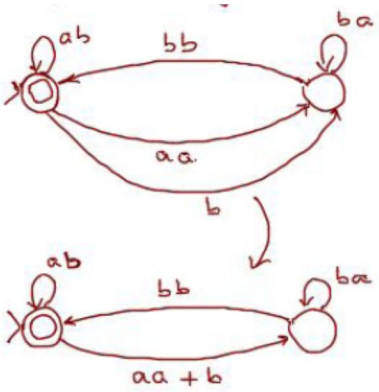
$$B = aaB + (a + \lambda)$$

$$\begin{cases} A = aA + bB + bC \\ B = (aa)^*(a + \lambda) \end{cases} \Rightarrow$$

$$A = aA + b(aa)^*(a + \lambda) + b(a(aa)^*(a + \lambda) + \lambda) \Rightarrow$$

$$A = a^*(b(aa)^*(a + \lambda) + b(a(aa)^*(a + \lambda) + \lambda))$$

initial state

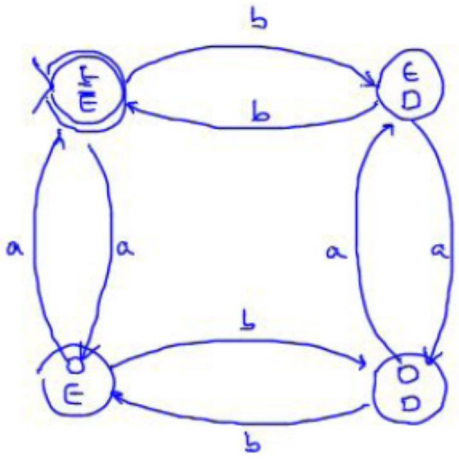


$$(ab)^*((aa + b)(ba)^*bb)^*(ab)^*$$

$$(ab)^*((aa + b)(ba)^*bb)^*(ab)^*$$

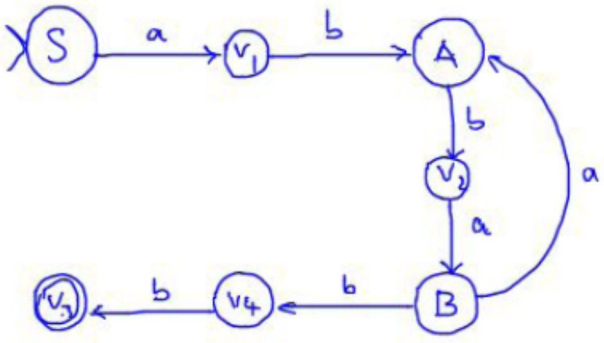
2- Find a DFA for the following language:

$$L = \{w \in \{a,b\}^* : n_a(w) \text{ and } n_b(w) \text{ are even } \}$$



3- Design a DFA for the following grammar:

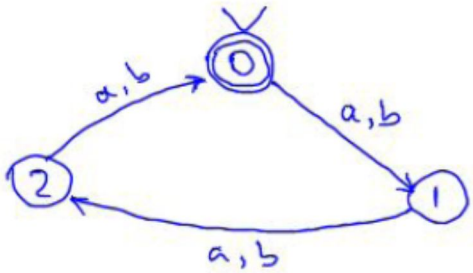
$$S \rightarrow abA, \qquad A \rightarrow baB, \qquad B \rightarrow aA \mid bb$$



DFA

4- Find the corresponding DFAs for the following languages:

$$L = \{w : |w| \bmod 3 = 0\}$$



$$L = \{w : n_a(w) \bmod 3 > n_b(w) \bmod 3\}$$