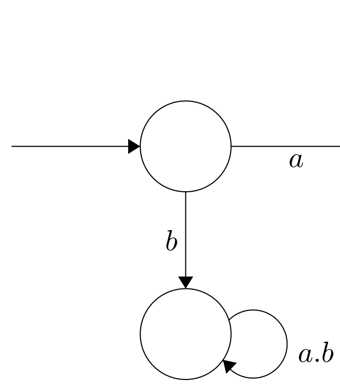
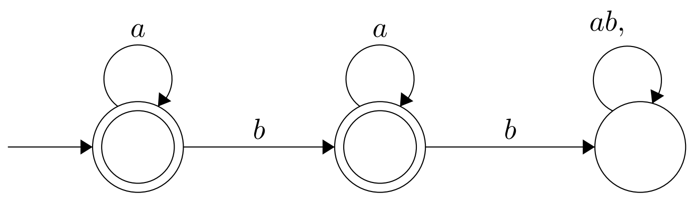
4.e Consider the Language L = w—w Start and an a and has at most one b The language l is the intersection of two simpler languages L_1 and L_2. no L_1= w—w starts with a and L_1 = w—w has at most one b Let M be the DFA and M_1 and M_2 be and DFAs that recognizes L_1 and L_2 .

- below is given DFA of M_1 [12pt]article tikz

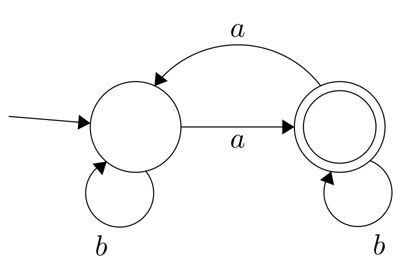


- below is given DFA of M_2

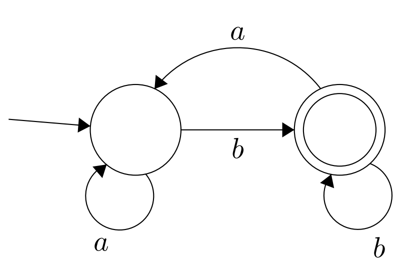


4.f Consider the language L = w—w has an odd number of A's and ends with b. the language L is the intersection of two simpler languages say L_1 and L_2. Now L_1 = w—w has an odd number of a's and L_2 = w—w end with a b let M be be DFA that recognizes L and M_1 and M_2 be the DFA that recognizes L_1 and L_2

- below is given DFA of M_1 tikz



- below is given DFA of M_2



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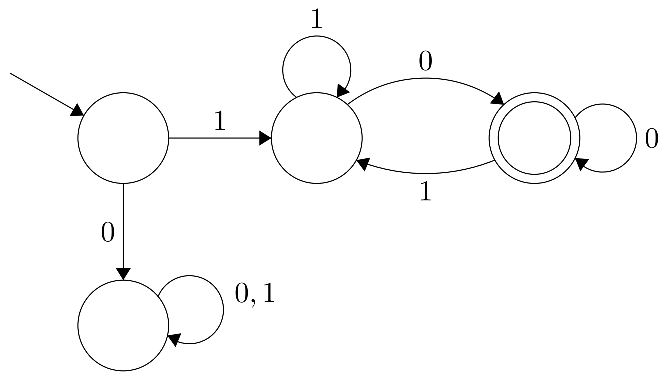
6.A Language L w—w begins with 1 and ends with 0



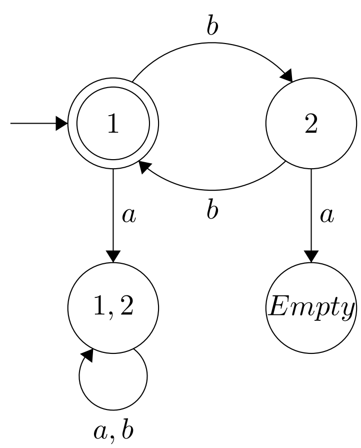
16.A Constructing equivalent DFA for the given NFA:

1) Q^1 = p(Q) where Q^1 is the subset of all sets of Q. so $Q^1 = \varnothing, (1), (2), (1, 2)$

2) $q^{'}\ _0 = q_0$ where q_0 is the start state in NFA. here $q^{'}\ _0 = 1$

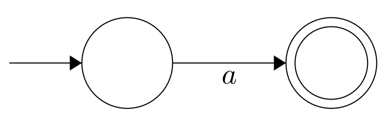
3) $F^{'} = R \in Q^{'}$ — R contain an accept state of NFA the machine M accepts the possible states where the NFA is present in the accept state.

4) the state diagram for the equivalent DFA is as follows.

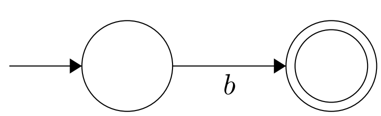


28.A Given regular expression $R = a(abb) * \cup b$ now we convert this regular expression into NFA by following steps

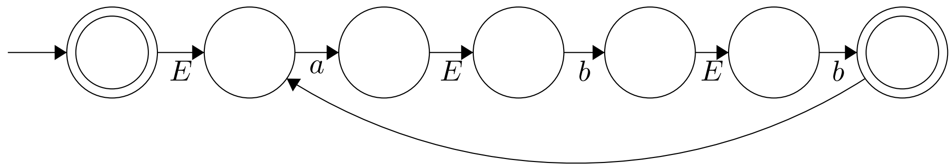
1) NFA for A



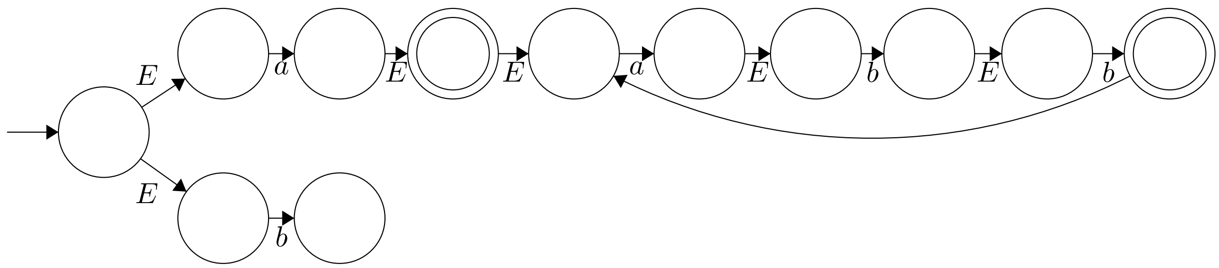
2) NFA for B



3) NFA for (abb)*



4) NFA for a(abb*)$\cup b$



29.B Consider the language A_2 = www—w $\cup a, b*$

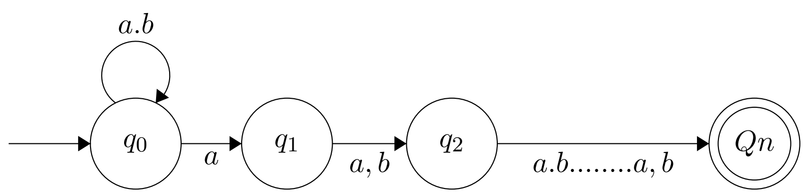
assume A^2 is a regular language. and let p be the pumping length given by the pumping lemma. By pumping lemma, this string can be divided into three pieces xyz such that —xy— ¡ p, —y— ¿ 0 and xy'z $\cup$A^2 ¿ 0.

let aabaabaab be the string that belongs to A^2. the pumping length of the string is 2. to satisfy the conditions of the pumping lemma, x = a, y = a, z = baabaab. so S = aabaabaab = $(\frac{a}{x})$ $(\frac{a}{y})$ $(\frac{baabaab}{z})$

pump the middle part such that xy'z (i¿0). for i = 2 the y becomes aa. the string after pumping is aaabaabaab. so S = (a) (a)' (baabaab) = $\frac{a}{x}$ $\frac{aa}{y}$ $\frac{baabaab}{z}$

the string aaabaabaab is not element of A_2 it is a contradiction. so the pumping lemma is violed therefore A^2 is not a regular language.

60 C_k is the language consisting of all strings that contains an a exactly k places from the right hand end. let N be the NFA with K+1 states that recognizes C_k 1) the state diagram of NFA N is followsL



2) the formal description of NFA

Similar to a DFA, the formal definition of NFA is: (Q, E, , q_0, F), where

Q is a finite set of all states

E is a finite set of all symbols of the alphabet

: Q x E→ Q is the transition function from state to state

q_0 Q is the start state, in which the start state must be in the set Q

F Q is the set of accept states, in which the accept states must be in the set Q