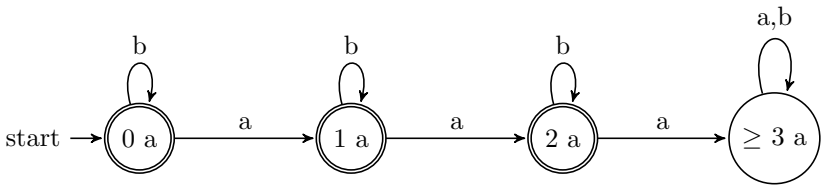
CS 164 **Fall 2015**

WA1

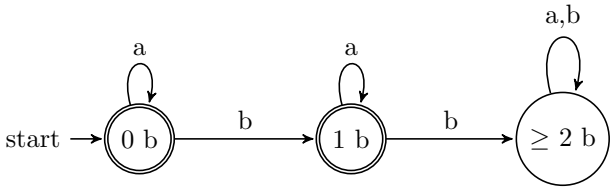
Nikhil Unni (cs164-es)

1. Give a DFA for the following languages over the alphabet $\Sigma = \{a, b\}$:

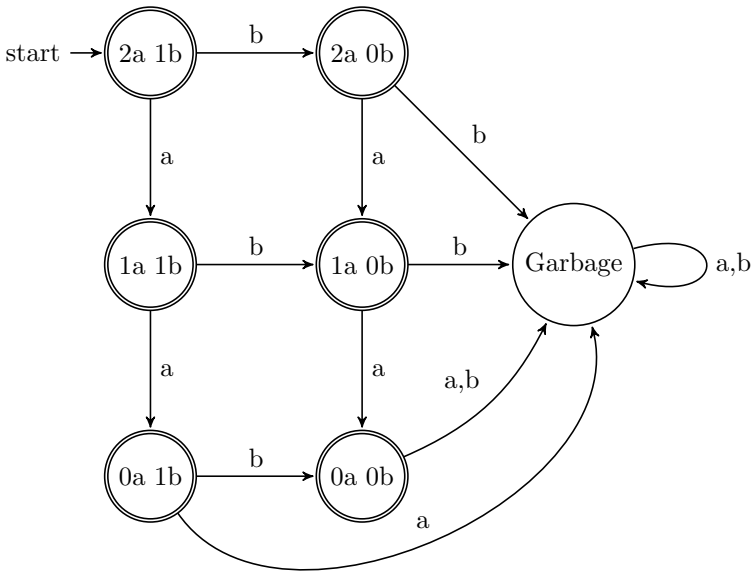
   - All strings that contain at most two a's.



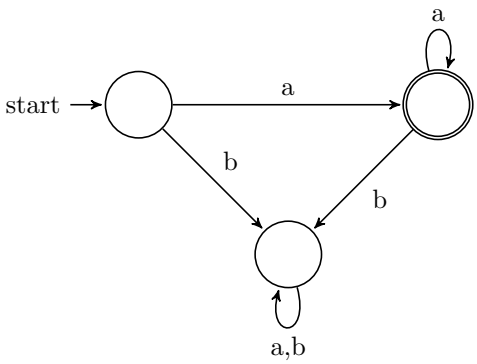
   - All strings that contain at most one b.



   - All strings that contain at most two a's and at most one b.



   - All strings that contain at least one a and no b's.

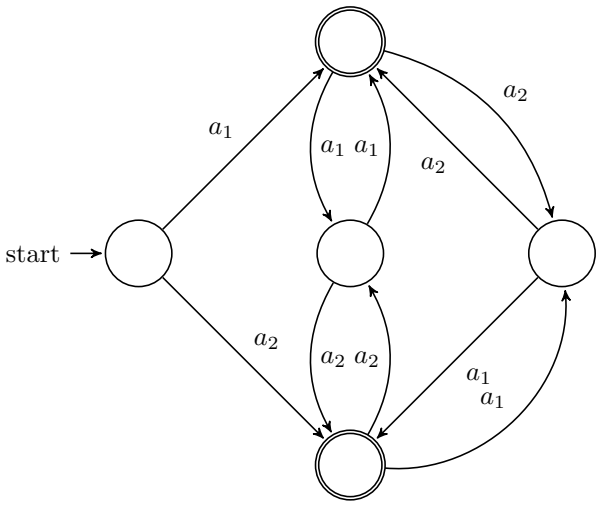


2. Consider the following DFA over the alphabet $\Sigma = \{a, b\}$. (Not pictured.)
   Give a one sentence description of the language recognized by the DFA. Write a regular expression for the same language.

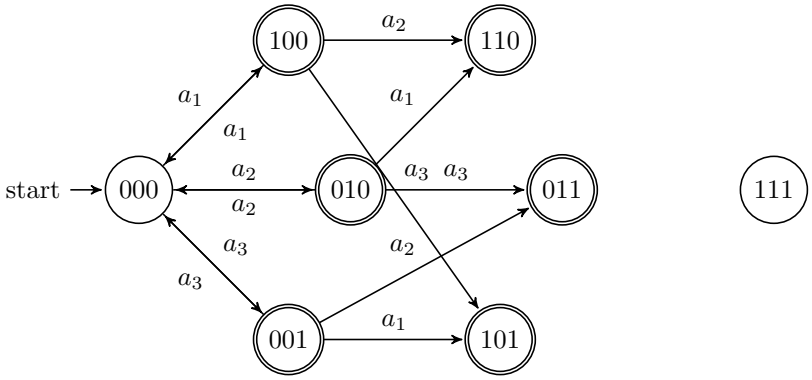
   It is the set of words where the number of a's is divisible by 4. It can be represented by the regex $(b^*ab^*ab^*ab^*)^*$.

3. Let $\Sigma_m = \{a_1, \cdots, a_m\}$ be an alphabet containing m elements, for some integer $m \geq 2$. Let L_m be the following language that includes all strings in which at least one of the characters occurs an odd number of times and one of the characters occurs an even number of times.

   Construct a DFA for the language L_2.



   Also construct an NFA for the language L_3.


100
110
000
010
011
111
001
101
start
a_1
a_2
a_3