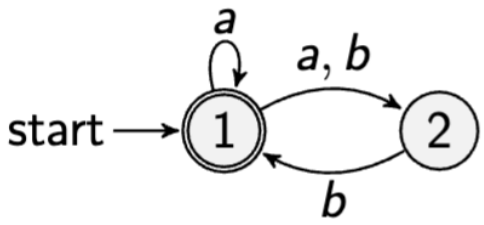
Chapter 1.3 Practice Key

1. Convert the NFA below to equivalent DFA.



Q = {1, 2}

Σ = {a, b}

q0 = 1

F = {1}

δ	a	b	ε
1	{1, 2}	{2}	∅
2	∅	{1}	∅

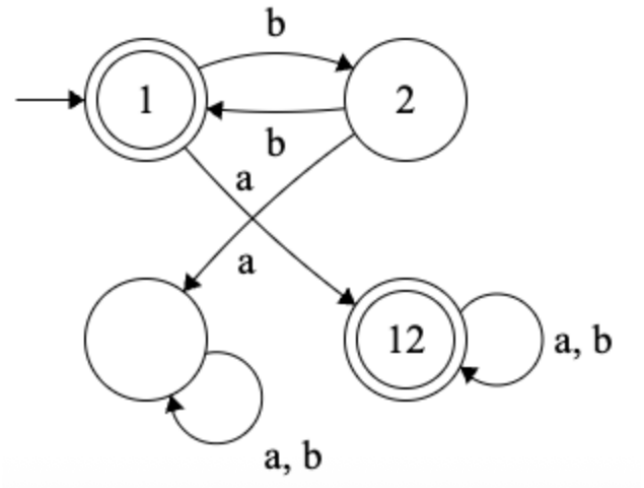
Q′ = {∅, 1, 2, 12}

Σ = {a, b}

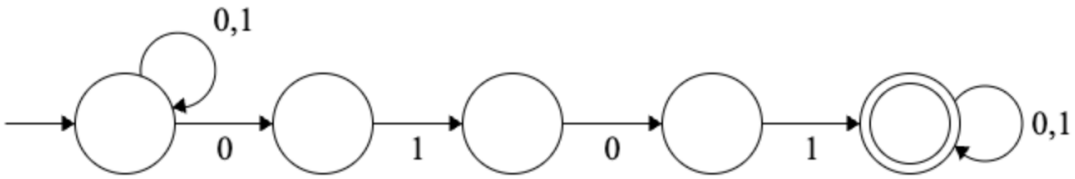
q0 = 1

F = {1, 12}

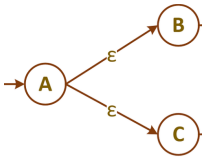
δ'	a	b
1	12	2
2	∅	1
12	12	12
∅	∅	∅

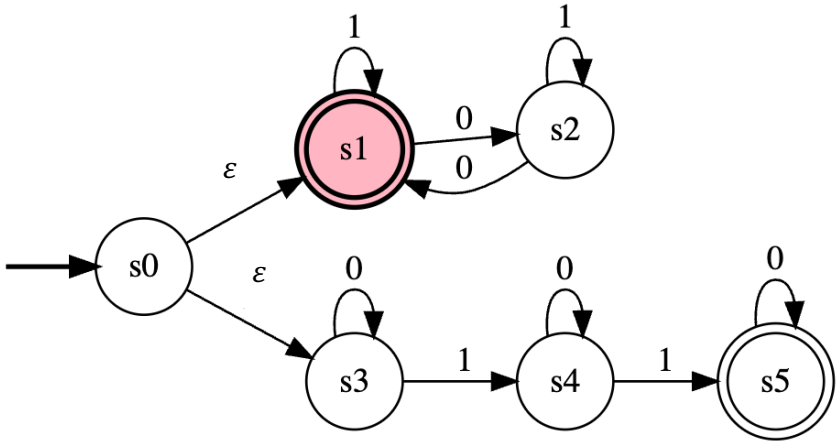


2. Give state diagrams of NFAs with the specified number of states recognizing each of the following languages. Note: In all parts, the alphabet is {0,1}.
   a. {w | w contains the substring 0101 (i.e., w = x0101y for some x and y)}; with 5 states



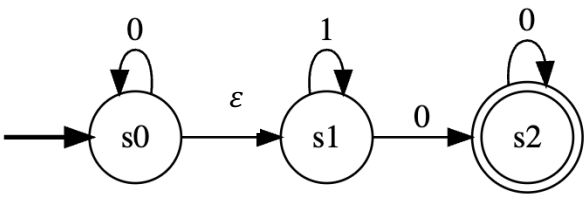
   b. {w | w contains an even number of 0s, OR contains exactly two 1s}; with 6 states. Hint: You can use the notation below for the first states to represent the OR operation.



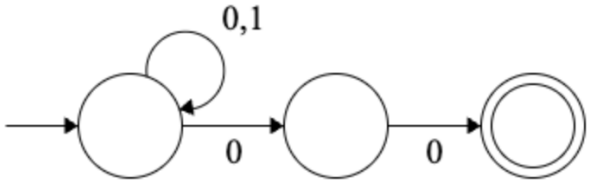


Ignore the coloring.

   c. The language $0^*1^*0^+$; with 3 states (Note: 0^+ means 1 or more 0s)



d. The language {w | w ends with 00}; with 3 states



e. The language {w | w contains at least two 0s or exactly two 1s}; with 3 states (Note: Do not use the notation in b for this.)