Section Questions

CS301, September 12th

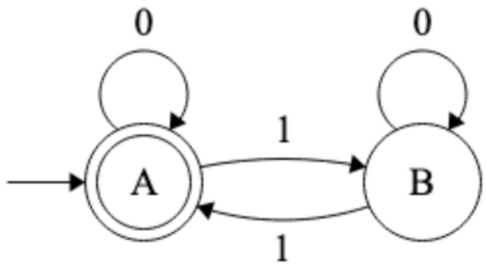
1 Regular Language Proof

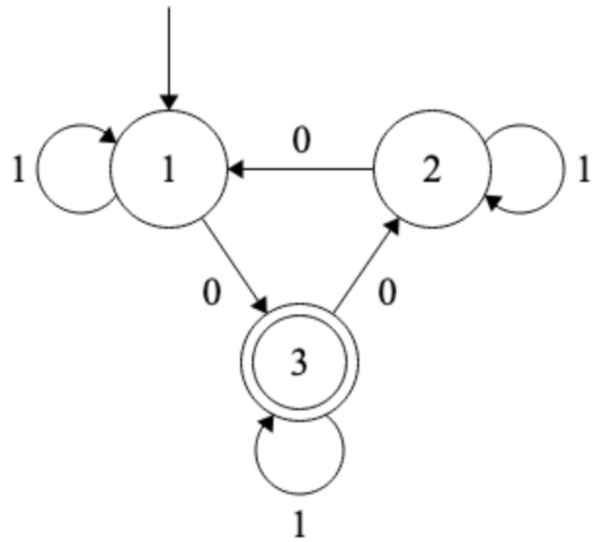
Prove that if L is a regular language, then $\overline{L}$ is regular.
Hint: Construct a DFA which decides $\overline{L}$ *and make sure that you show why your constructed DFA decides it*

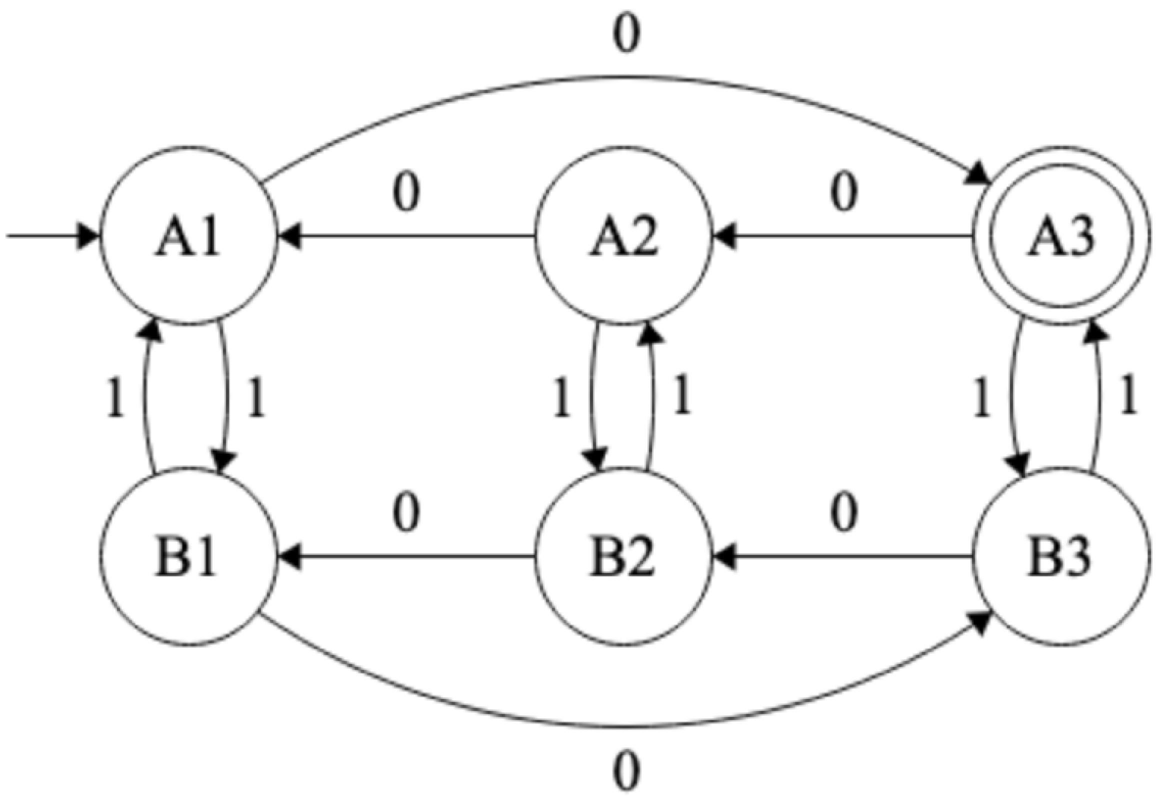
Proof. *Suppose L is an arbitrary regular language.*
By definition of regular, there exists a DFA M_L *which decides it.*
Construct a new DFA M_{L2} *which is the same as* M_L *except it's final states are* $Q_L - F_L$ *where* Q_L *is the states and* F_L *are the final states in* M_L.
Consider an arbitrary string w *in* Σ^*. *If* $w \in L$ *then* M_L *is in a final state and accepts. By our construction* M_{L2} *is not in a final state and rejects. If* $w \notin L$ *the opposite is true. This means* M_{L2} *decides* $\overline{L}$ *so* $\overline{L}$ *is regular by definition*

2 DFA Combination

Let the following DFAs be M_A and M_B which decide languages A and B respectively. Construct the DFA which decides $A \cap B$.

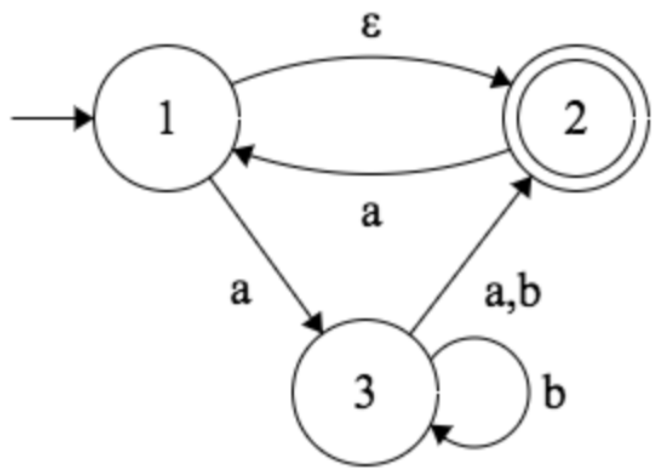






3 NFAs

Consider the following NFA N:



3.1 What is the 5-tuple which represents this NFA?

$Q =$`{1,2,3}`

$\Sigma =$`{a,b}`

$q_0 =$1

$F =${2}

$\delta =$

3.2 Does N accept `abbaa`? If so, provide a sequence of states which causes it to accept

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1,3,3,3,2,1,2
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3.3 Does N accept `abab`? If so, provide a sequence of states which causes it to accept

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Does not accept
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