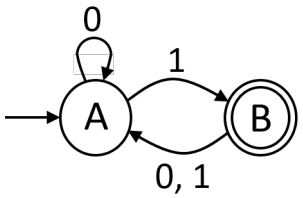
CSCI 338
Homework 2

Assigned 9/6/2022, due by start of class (3:05 pm) on 9/13/2022. Please submit this assignment to the appropriate dropbox on D2L. You must follow the collaboration policy detailed on the course website.

Problem 1 (5 points). Assuming the alphabet is $\{0, 1\}$, prove that the following language is regular: $\{w : w$ ends with an odd number of 1's$\}$. For example, $w = 10010111$ should be accepted, since it ends with three 1's, $w = 1101011$ should be rejected since it ends with two 1's, $w = 110100$ should be rejected since it ends with zero (even number) 1's.

Solution. DFA:



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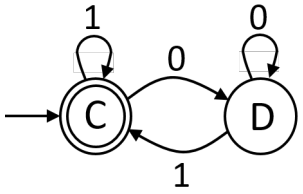
Problem 2 (5 points). Assuming the alphabet is $\{0, 1\}$, prove that the following language is regular: $\{w : w$ does not end with a 0$\}$

Solution. DFA:



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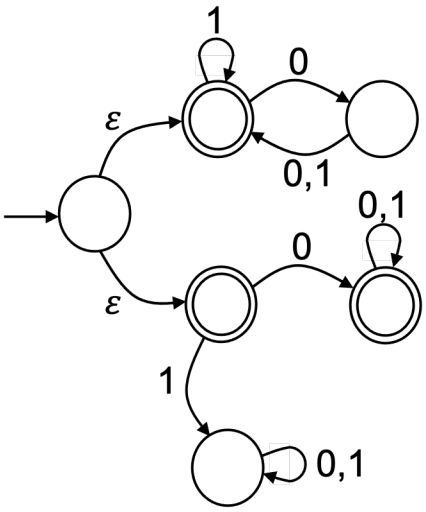
Problem 3 (5 points). Assuming the alphabet is $\{0, 1\}$, build an NFA that recognizes the following language:

$\{w : w$ ends with an even number of 0's or w does not start with a $1\}$.

Solution. Union:



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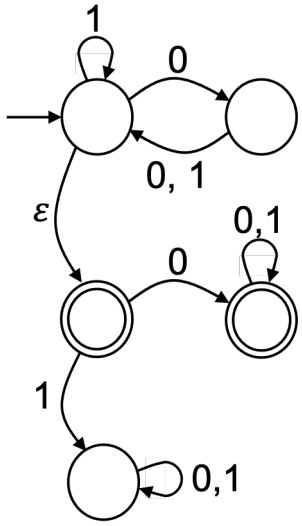
Problem 4 (5 points). Assuming the alphabet is $\{0, 1\}$, build an NFA that recognizes the following language:

$\{w = uv : u$ ends with an even number of 0's and v does not start with a $1\}$. In plain english, if the string *can* be segmented into two parts (u and v) such that the first part ends with an even number of 0's and the second part does not start with a 1, then that string should be accepted.

Solution. NFA:



You can also observe that this language includes all possible $\{0,1\}$ strings since all strings s that start with 0 can have $u = \epsilon$ and $v = s$ and all strings that start with 1 have u equal all the leading 1's until the first 0 (or the end of the string) and v equal the rest of s (or ϵ). In this case the NFA is one that accepts everything. $\square$