CS/ECE 374 FALL 2018
Homework 2 Problem 1

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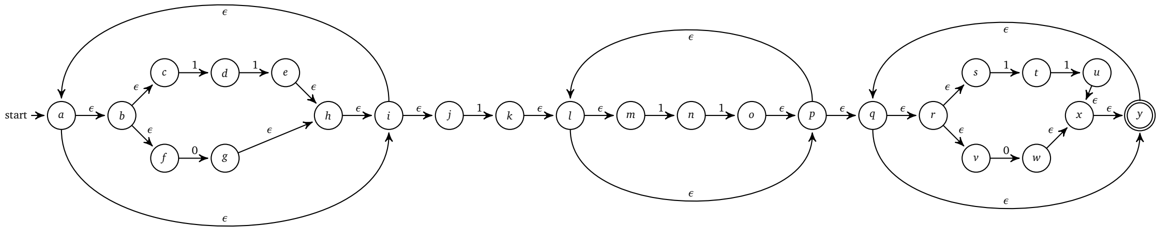
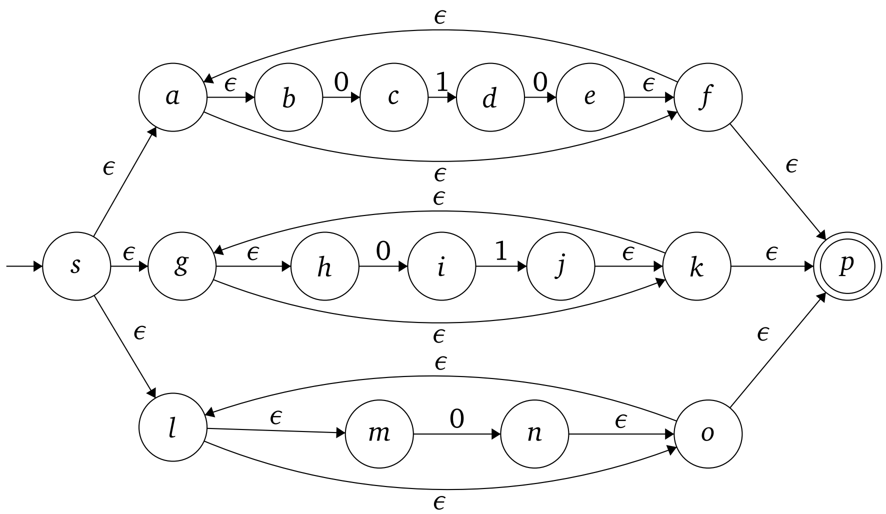
1. Draw an NFA that accepts the language $\{w \mid$ there is exactly one block of 1s of odd length$\}$. (A "block of 1s" is a maximal substring of 1s.)
2. (a) Draw an NFA for the regular expression $(010)^* + (01)^* + 0^*$.
   (b) Now using the powerset construction (also called the subset construcion), design a DFA for the same language. Label the states of your DFA with names that are sets of states of your NFA. You should use the incremental construction so that you only generate the states that are reachable form the start state.

Solution: 1.The regular expression of the language $\{w \mid$ there is exactly one block of 1s of odd length$\}$ is $(11+0)^*1(11)^*(0+11)^*$. This regular expression fulfills the requirement there is exactly one block of 1s of odd length and it covers all the three possibilities that the odd length of 1s is at the beginning, in the middle and at the end of the string.

Then we constructs the following NFA based on the regular expression:

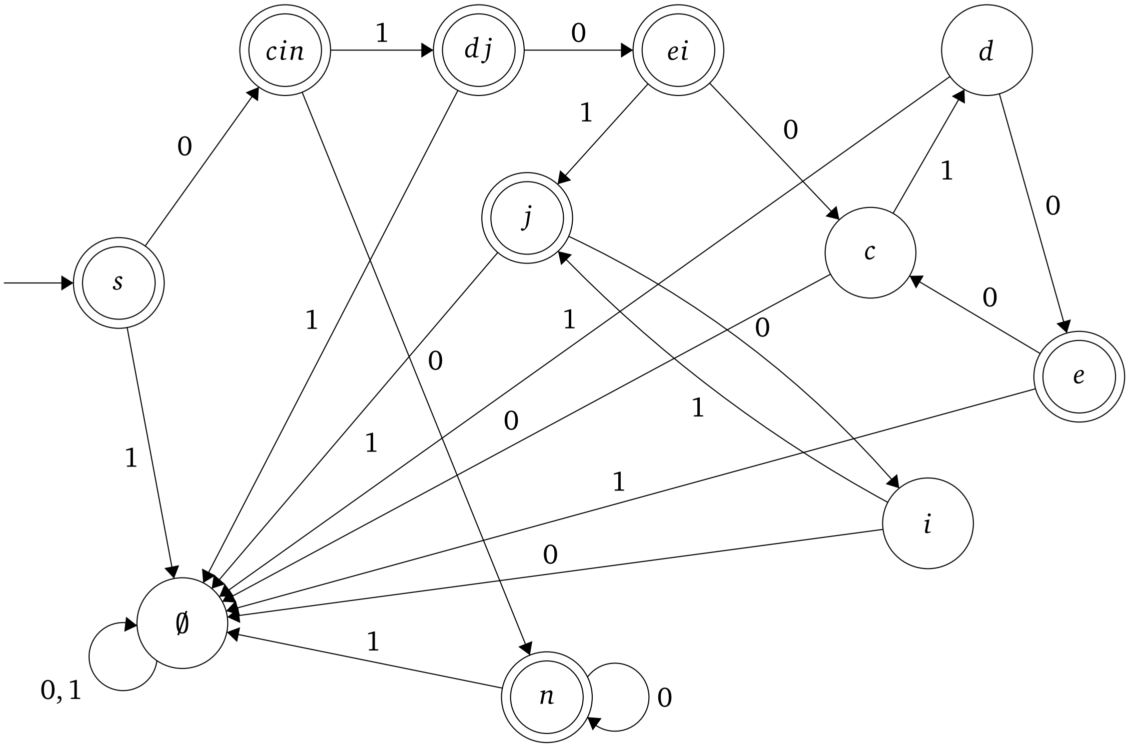


2.(a)Given the regular expression $(010)^* + (01)^* + 0^*$, Thompson's algorithm constructs the following 17-state NFA.



2.(b)Given the NFA as input, the incremental subset construction computes the following table, leading to a DFA with just 9 state.

q'	$\epsilon - reach(q')$	$q' \in A'$?	$\delta'(q',0)$	$\delta'(q',1)$
s	sabfghklmop	Yes	cin	∅
cin	cilmnop	Yes	n	dj
n	lmnop	Yes	n	∅
dj	dghjkp	Yes	ei	∅
ei	abefip	Yes	c	j
c	c	No	∅	d
j	ghjkp	Yes	i	∅
d	d	No	e	∅
i	i	No	∅	j
e	abefp	Yes	c	∅
∅	∅	No	∅	∅



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