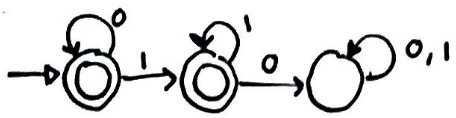
CS 334 MIDTERM 2019 FALL

PROBLEM ONE

0^*1^* : BUILD A DFA FOR THIS LANGUAGE



PROBLEM TWO

MAKE CONTEXT-FREE LANGUAGES

A. contains @ least 3 b's

$S \to AbAbAbA$
$A \to aA \mid bA \mid cA \mid \epsilon$

B. length of w is odd and middle element is a

$S \to XSX \mid a$
$X \to a \mid b \mid c$

C. $a^x b^{x+y} c^y : x, y \geq 0$

$S \to AC$
$A \to aAb \mid \epsilon$
$C \to bCc \mid \epsilon$

TRUE / FALSE

$\{w : w = xx^R, x \in \{0,1\}^*\}$ IS THIS REGULAR?

False, take $0^p 1 1 0^p$

$\{w : w = xyx^R, x, y \in \{0,1\}^*\}$ IS THIS REGULAR?

TRUE. say $x = \epsilon$. Hence, $x\Sigma^*x$ is just Σ^*. This is regular.

NFA that has k-states must accept a string no greater than k.

TRUE.

complement of every CFL is always a CFL.

FALSE.

complement of a CFL is never a CFL.

FALSE (ϵ string ... versus Σ^*)

Pumping lemma

$\{www, w \in \{\Sigma^*\}\}$ $\swarrow (0,1)$

Find a distinctive string. Take

$0^p 1 0^p 1 0^p 1$

let $p = i + j$, $j \geq 1$

$0 0^{p-1} 1 0^p 1 0^p 1$

$0 0 0^{p-2} 1 0^p 1 0^p 1$

$0 0 0 0^{p-3} 1 0^p 1 0^p 1$

$\vdots$

and so on.

$n, p-n$

$n \neq 0 \rightarrow p-n \neq p$

$p + mn \neq p, \forall m \neq 0$

$p + n$

$p + 2n$

$\vdots$

CFL pumping lemma

$s = uvxyz$

$|vy| \geq 1$

$|vxy| \leq p$

$\forall i : uv^ixy^iz \in L$