EECS 510 INTRO TO THEORY OF COMPUTATION

ASSIGNMENT 03

MONDAY SEPT 19 2022

PROVE THAT ONE OF THE FOLLOWING LANGUAGES IS NOT REGULAR

1. $\{0^N 1 0^N \mid N \geq 1\}$
2. $\{0^N 1^N \mid N \geq m\}$
3. $\{0^N 1^{2N} \mid N \geq 1\}$

REGULAR MEANS THERE $\exists$ A DFA FOR THE LANGUAGE.

PROOF BY CONTRADICTION:

PF:

SUPPOSE THE LANGUAGE $L := \{0^N 1^N \mid N \geq m\}$ IS REGULAR, AND THUS $\exists D := \{\text{DFA}\}$ FOR L.

SUPPOSE THAT D HAS N STATES

LET $w \in L$, $w = 0^N 1^M$: D ACCEPTS THE STRING w

THUS THERE MUST BE A REPITITION IN THE PREFIX "0", BECAUSE THERE ARE N 0s & N STATES

READING N TRANSITIONS CAUSES $N+1$ STATES VISITED

REPETION IS AS FOLLOWS

$\underbrace{000000}_{y}01 = w$

IF YOU TAKE STRING W AND REPEAT y TWICE THEN $y \neq \epsilon$ & $y \geq 1$ 0s IN IT, HOWEVER THIS MEANS THAT THERE ARE GREATER THAN $N+1$ 0s IN THE STRING, AND ONLY M 1s. WHICH CAUSES A CONTRADICTION.

THEREFORE L IS NOT REGULAR

EECS 510 INTRO TO THEORY OF COMPUTING

ASSIGNMENT 02

MORGAN BERGEN

---

2. GIVE A REG EXP FOR THE BINARY STRINGS WHOSE NUMBER OF 0s IS DIVISIBLE BY 5

$$(0|1(10)^*(0|11)(01^*01|01^*00(10)^*(0111))^*1)$$

DFA WHERE N=5

$$\delta_0 : Q_0 \times \Sigma \rightarrow Q$$

DESIGNING A DFA WHERE $w \bmod 5 = 0$, $w \,\%\, N \Rightarrow R$
CAN LEAD US TO THE EXP. ↑

3. GIVE AN ENGLISH LANGUAGE DESCRIPTION OF THE REGULAR EXPRESSION $(0^*1^*)^*000\,(0+1)^*$

THIS IS A REGEXP FOR STRINGS CONTAINING AT LEAST THREE 0s

$L = \{000, 0000, 0001, 00000, 00001, 0100, 1000, 0010, \ldots\}$