Date: September 14, 2020

AFLL

Today's Class:-

Pumping lemma for regular languages

Lang
- finite (Regular)
- infinite
  - Reg
  - Not Reg!

RL (Infinite) → Pumping property

Possessing pumping property
Doesn't mean Lang - Regular

Infinite Lang

↓

Pumping lemma

↙ fail to possess (pas)

↙

Lang is definitely not regular

→ Lang clears/passes/possess P.P

↓

↙ may be reg

↓

FA, RG, RE

→ may not be regular

Prove 0^K where K is composite no. is not regular !

$L = \{ 0^K \mid$ where K is composite no. $\}$

$L^C = \{ 0^b \mid$ where b is a prime no. $\}$

n ⇒ # states in m/c for L

0^{2n} 0^{3n} 0^{4n} 0^{5n} 0^{6n} . . . . . .

n=4

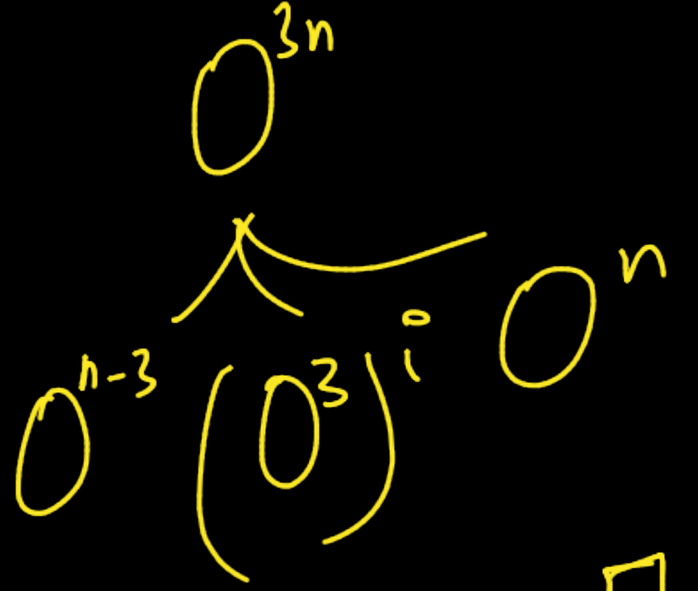
$0^{2n} = 0^{n-2}(0^2)^i 0^n$

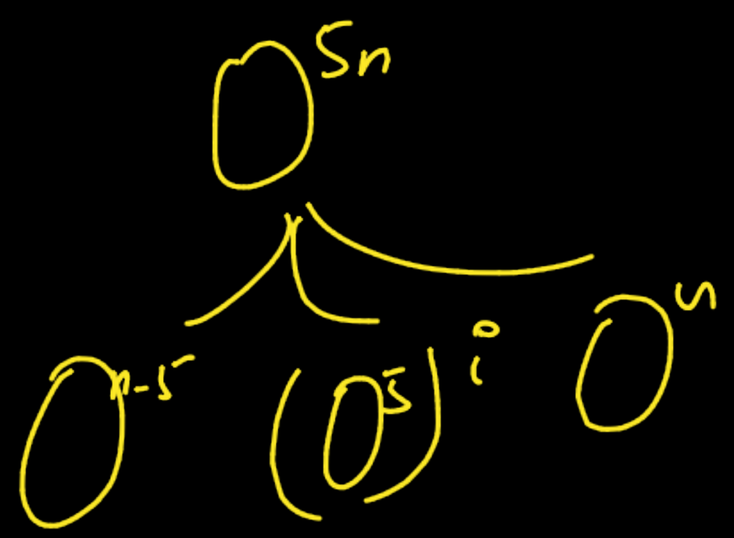
$0^8 = 0^{4-2}(0^2)^i 0^4$

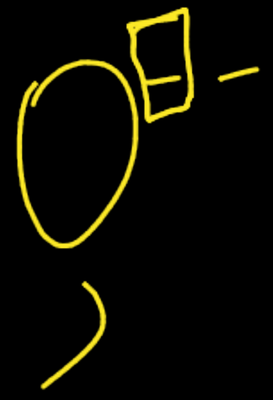
$\therefore 0^{4-2} 0^4 = 0^6 \in L$

$\forall x y z$ ⇒ ∃ some i

i = 1, 2, ... ∞ i = 0







$\forall i$

$xy^iz \in L$

FA

RE

RG

$L = \{0^k$ k is composite always satisfies pumping prop. $\}$

PL → $L = \{ 0^k$ where k is composite no. $\}$

L always satisfies PL

Can you prove L^c is not regular (Pumping lemma)?

then by using closure prop's of RL's I can say

L^c L is not regular

0^p p is prime.

L → RL → closed → RL

complement

$L \rightarrow$ not regular

$L^c \rightarrow$ not regular

$(L^c)^c = L$

Lets proove $L = \{ 0^p \}$ where $\{p$ is prime$\}$ is not regular

Using pumping lemma!

$L_1 = a^n b^{n+2}$

$L_2 = a^n b^n c^n$

$L_3 = a^n b^m c^m$

$L_4 = wcw^R \quad w \in \{a,b\}^*$

$L_5 = a^n b^m \quad n \neq m$

$L = \{ 0^p$ where p is prime $\}$ is not regular

a) The opponent claims that the lang is regular

b) Lets say there are n states in the hypothetical m/c for L.

c) we pick the string $w = 0^p$ where $p > n$

$|w| \geq n$

d) Lets say we can break the string w in 3 parts xyz

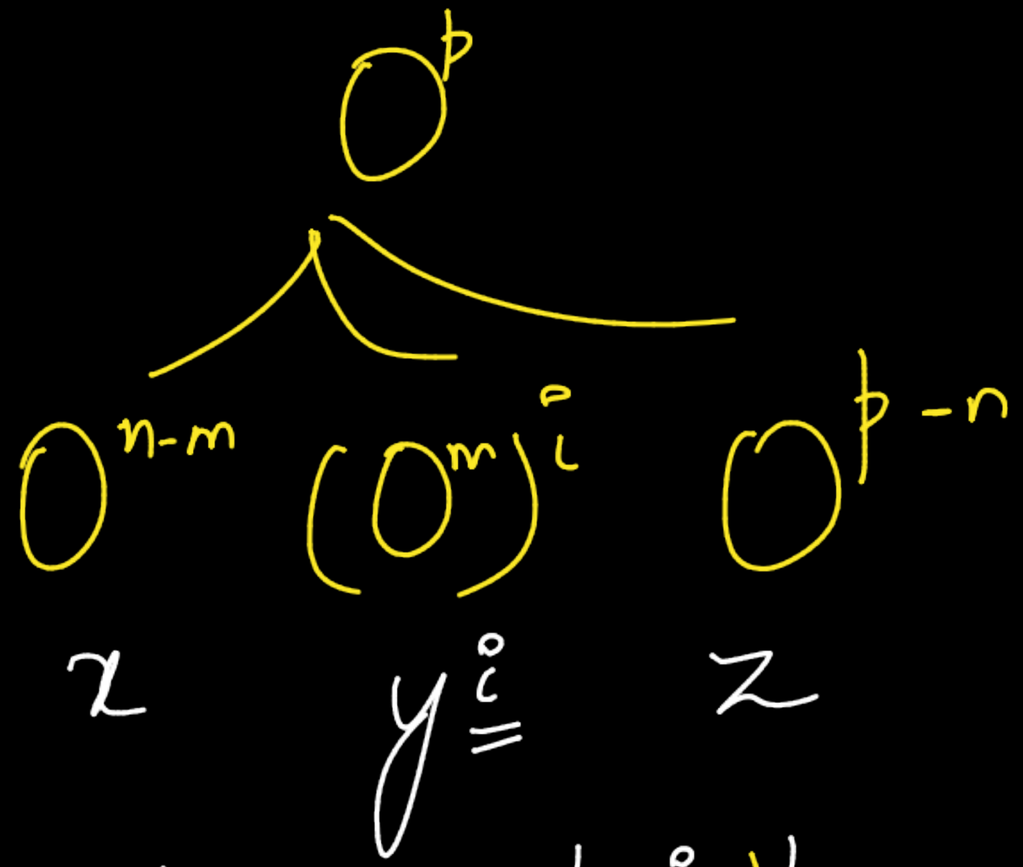
$= p$

$|xy| \leq n$

$1 \leq |y| \leq n$

$1 \leq m \leq n$

e)



$$|xyz| = p + |0^{m(i-1)}|$$

$$= p + m(i-1)$$

$p > n$

$|xy| \leq n$

y is made up some 0^i (n)

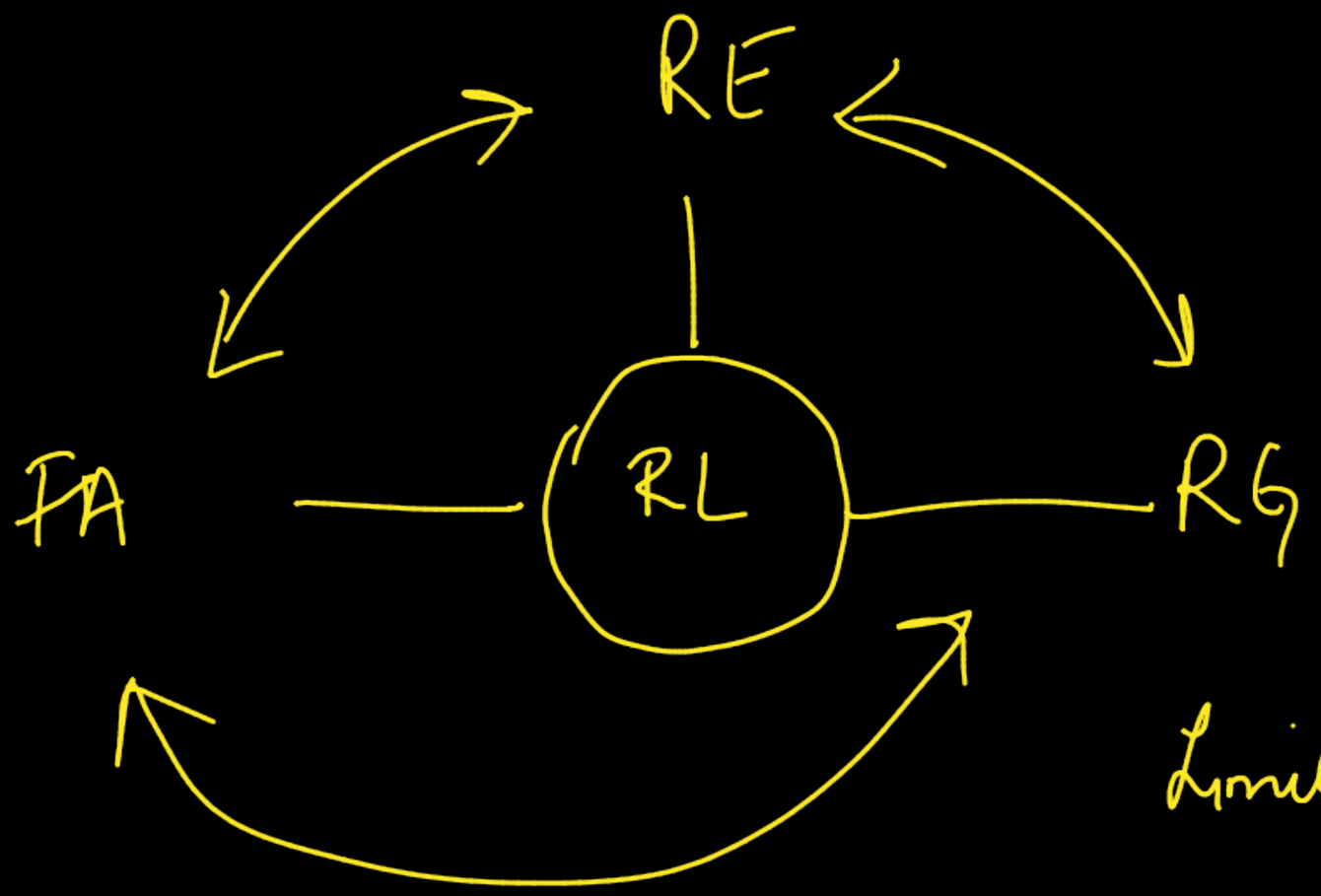
$1 \leq m \leq n$

Choose $i = p+1$

$$= p + m(p+1-1)$$

$$= p + mp$$

$$= p(1+m) \notin L?$$



Limits

Not regular - pumping lemma