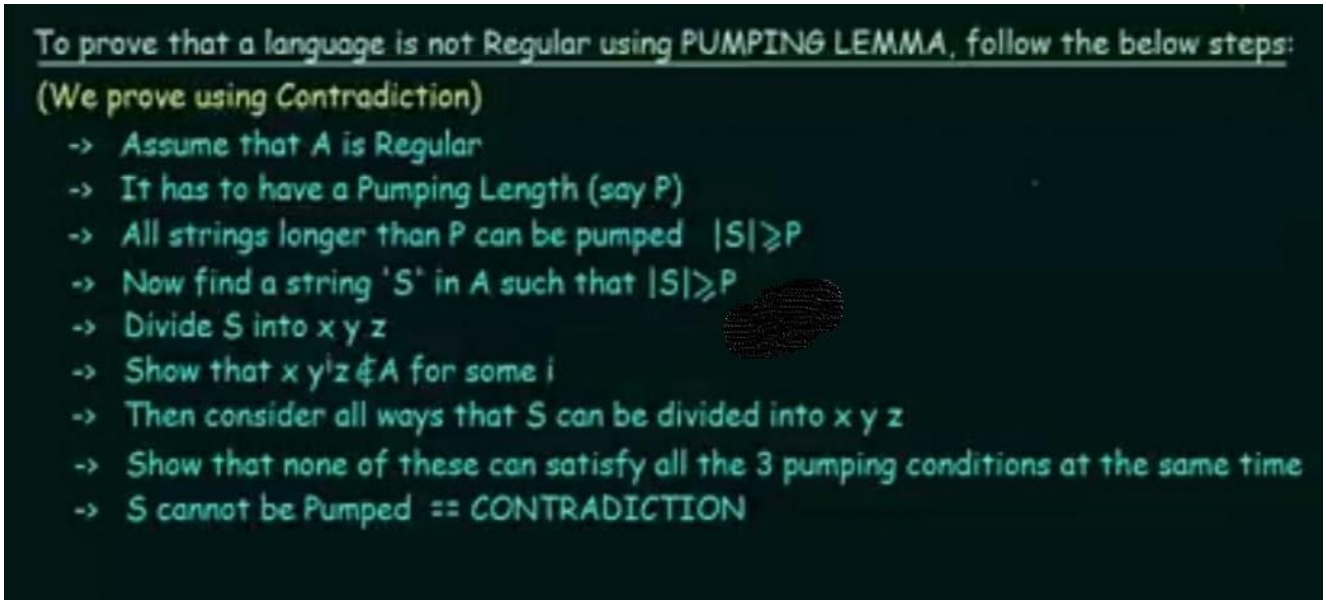
Pumping Lemma

1. PL is used to prove that a language is not regular
2. It cannot be used to prove that a language is regular

If A is a RL, then A has a pumping length 'P' such that any string 'S' where |S|>=P may be divided into 3 parts S=XYZ such that the following conditions must be true

(1) xy^iz € A for every i>=0
(2) |Y|>0
(3) |XY|<=P



Using PL prove that the language A={a^nb^n|n>=0} is not regular

Assume A is regular

Pumping length = P

S= a^pb^p

Divide S into X Y Z

P=7

S= aaaaaaabbbbbbb

Case 1

Y is in 'a' part

aa aaaa abbbbbbb

x y z

XY^iZ->XY^2Z / example i=2

aa aaaaaaaa abbbbbbb

11≠7

case 2

Y is in ‘b’ part

aaaaaaabb bbbbbbbb b

7≠11

aaaaaaabb bbbb b

x y z

case 3

aaaaa aabbaabb bbbbb

Y is in ‘a’ and ‘b’ part

not follow pattern

aaaaa aabb bbbbb

x y z

|XY|<=P

P=7

CASE 1

6<=7

CASE 2

13<=7

CASE 3

9<=7

ALL THREE CASES CDTN NOT SATISFIED

2. A={YY|Y€(0,1)*}

Assume A is regular
It must have a pumping length = P
$S=0^P10^P1$
S->X Y Z
P=7
0000000100000001

00 0000 0100000001
X Y Z

$XY^iZ \rightarrow XY^2Z$ / example i=2

00 00000000 0100000001

String doesnot lie in the language

|y|>0

|XY|<=P

6<=7