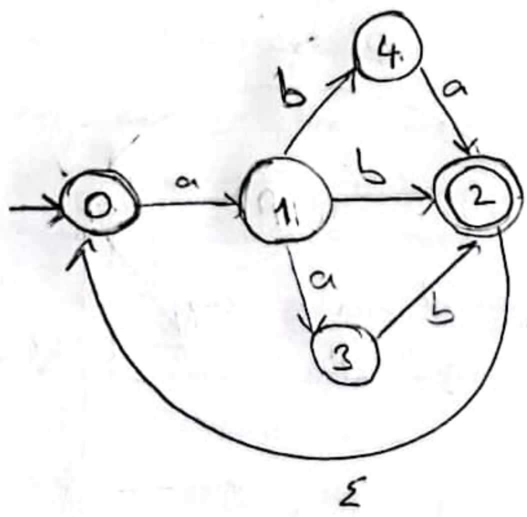
1) a)



b) $Q' = P(Q)$, $Q = \{0,1,2,3,4\}$

$Q' = \{\emptyset, \{0\}, \{1\}, \{2\}, \{3\}, \{4\}, \{0,1\}, \{0,2\}, \{0,3\}, \{0,4\}, \{1,2\},$
$\{1,3\}, \{1,4\}, \{2,3\}, \{2,4\}, \{3,4\}, \{0,1,2\}, \{0,1,3\}, \{0,1,4\},$
$\{0,2,3\}, \{0,2,4\}, \{0,3,4\}, \{1,2,3\}, \{1,2,4\}, \{1,3,4\}, \{2,3,4\}$
$\ldots \{0,1,2,3,4\}\}$ → all possible subsets

$\delta'(\{0\},a) = ECLOSE\{\delta(0,a)\} = \{1\}$
$\delta'(\{0\},b) =$ " $\{\delta(0,b)\} = \emptyset$
$\delta'(\{1\},a) =$ " $\{\delta(1,a)\} = \{3\}$
$\delta'(\{1\},b) =$ " $\{\delta(1,b)\} = \{2,4\}$
$\delta'(\{2\},a) =$ " $\{\delta(2,a)\} = \{0\}$
$\delta'(\{2\},b) =$ " $\{\delta(2,b)\} = \{0\}$
$\delta'(\{0,1\},a) = EC\{\delta(0,a)\} \cup E\{\delta(1,a)\} = \{1,3\}$
$\delta'(\{0,1\},b) =$ " $\{\delta(0,b)\} \cup$ " $\{\delta(1,b)\} = \{2,4\}$

⋮

2) Let the string $w = a^n b^m c^n d^m$

There should be p, which is pumping length.

by pumping lemma, $w = xyz$

let $n = 2$ and $m = 3$

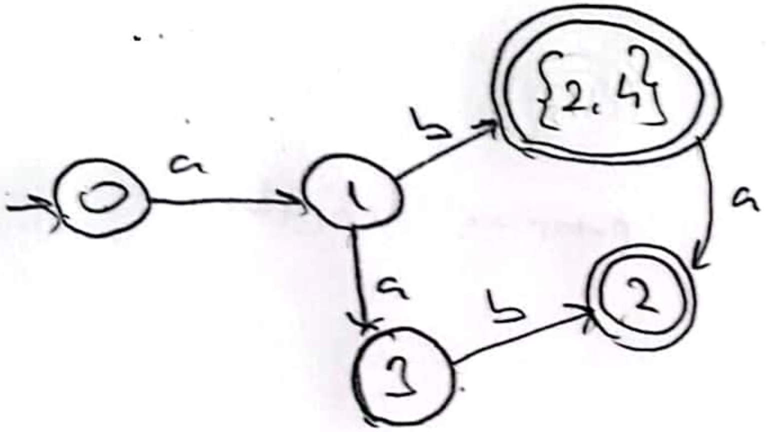
$w = \underbrace{aab}_{x}\underbrace{bb}_{y}\underbrace{ccddd}_{z}$ $\quad |xy| \leq p$, xy^iz must be in L

xy^2z must be in the language by the pumping lemma

$\underbrace{aab}_{x}\underbrace{bbbb}_{y}\underbrace{ccddd}_{z}$ but the number of b's are not equal to the number of d's

So, proof by contradiction, L is not regular

CamScanner



0
a
1
b
{2, 4}
a
a
b
2
3