$(a+b)(a+b) \Rightarrow (a\,a,\ a\,b,\ b\,a,\ b\,b)(a+b)$

CIS 306 **Quiz 1** **Discrete Structures II**

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Jan 28, 2021
Due: Jan 28, 2021

No calculators are allowed. Show your work. The points for each problem are indicated. Problems with incomplete work may receive partial, or no credit.

$(x+y+z)(x+y+z)$

COs: ***[Question 3 fulfills Course Outcome 4 for CIS 306]***

Points: _____ / 15

1. [5 pts] Given an alphabet, Σ = {x, y, z}, list all strings of length 1 to 3 in the language L = (x + y + z)* → L = All strings with any number of x's, y's, or z's in them, including the empty string. (description)

length size = 0.

$(x+y+z)^* = (x \text{ or } y \text{ or } z)^* = \{x, y, z\}^* = (x+y+z)^0 + (x+y+z)^1 + (x+y+z)^2 \ldots$

• All strings of size 1-3 will be within: $L^1 + L^2 + L^3$.

$(x+y+z)(x+y+z) = (xx+xy+xz+yx+yy+yz+zx+zy+zz)$

L^1

$L^2 =$

$L^3 = (L^1)(L^2) = (x+y+z)(xx+xy+xz+yx+yy+yz+zx+zy+zz)$

$L^3 = [(xxx, xxy, xxz, xyx, xyy, xyz, xzx, xzy, xzz,$
$yxx, yxy, yxz, yyx, yyy, yyz, yzx, yzy, yzz,$
$zxx, zxy, zxz, zyx, zyy, zyz, zzx, zzy, zzz)]$

Solution: Length $1\text{-}3 = L^1 + L^2 + L^3$

λ not included since length $= 0$

2. [5 pts] Let the alphabet Σ = {a, b}. Given the regular expression r = (a + b)*bb, assume a language L(r) is the language defined by the regular expression r. Explain in English what accepted strings in the language are like.

for $r = (a+b)^*bb$, $L(r)$ is the language consisting of all strings possible with a and b containing always at least 1 bb substring, appended to the end of string.

Ex: $(a+b)^*$ contains λ; but $\lambda bb = bb$, so substring bb must always be in any string in the language; concatenated at end with bb always.

[redacted]

$2ab = ab$

$(a+b)ab = aab, abb$

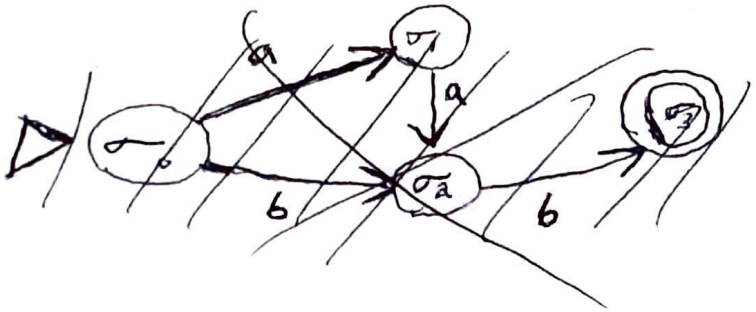
$(a+b)^2 ab = aaab + abab + baab + abbb$

$(a+b)^2 bb = aabb + abbb + baab + abbb$

some work / inquiry done to solve question 2

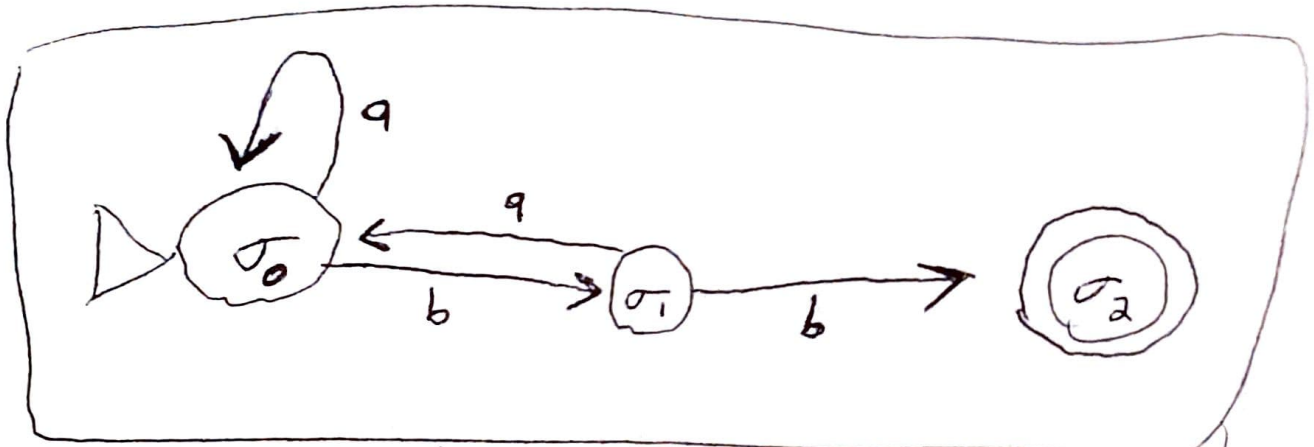
3. [5 pts] Design and draw the transition diagram of a finite automaton (FA) for the regular language above, in question 2

66 always.



$I = \{a, b\}$

$S = \{\sigma_0, \sigma_1, \sigma_2\}$



Solution for question 3