Start time: 9:03 pm
End Time: 11:46 pm
Total Time: 2:43

Andrew Plum
Prof. Woo
CS 385

# Homework 3

9/18/2024

**Section 3.1:**

1) $L((a+bb)^*) = \{aaaaaa, aaabb, aabba, abbaa, bbaaa, abbbb, bbbba\}$

2) $L((ab+b)^*b(a+ab)^*) = \{b, bb, ba, abb, bbb, baa, bab\}$

8) Either $n$ or $m$ must be odd and the other must be even. So the regular expression which constructs L:

$(a(aa)^*(bb)^*) + ((aa)^*b(bb)^*)$

Proof: if $n+m$ must be odd, the $n$ must be odd and $m$ must be even, or vice-versa. This initial choice is made by the + and from there it is just making sure $n$ & $m$ are the parity they should be.

19) b) $L(b^*c^*(a+b+c)b^*c^*(a+b+c)b^*c^*(a+b+c)b^*c^*$

Proof: Allow the choice of allowing the letter a up to three times; no other restrictions.

abc
bac
bca
cab
acb
cba

c) $L([(a+b+c)^*a(a+b+c)^*b(a+b+c)^*c(a+b+c)^*] +$
$[(a+b+c)^*b(a+b+c)^*a(a+b+c)^*c(a+b+c)^*] +$
$[(a+b+c)^*b(a+b+c)^*c(a+b+c)^*a(a+b+c)^*] +$
$[(a+b+c)^*c(a+b+c)^*a(a+b+c)^*b(a+b+c)^*] +$
$[(a+b+c)^*a(a+b+c)^*c(a+b+c)^*b(a+b+c)^*] +$
$[(a+b+c)^*c(a+b+c)^*b(a+b+c)^*a(a+b+c)^*])$

Proof: You need to have every permutation of a, b, & c with any number of any of the letters between the each of them. This regular expression does that.

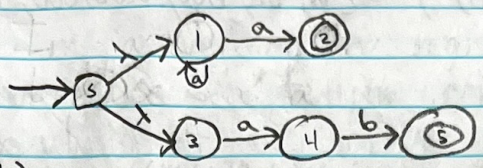
22) a) True, the star of something starred is just that something starred.

b) True, they generate the same languages

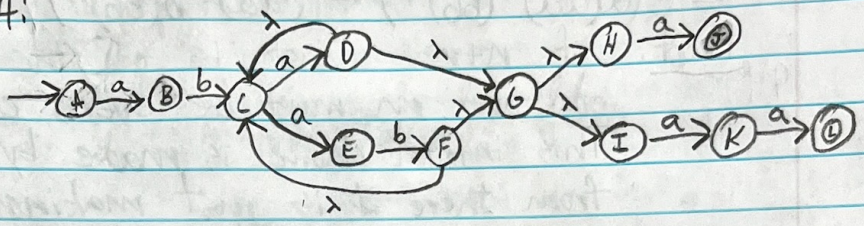
c) True, they generate the same languages

22) d) False, a counterexample is $r$, can only be generated by the right side.

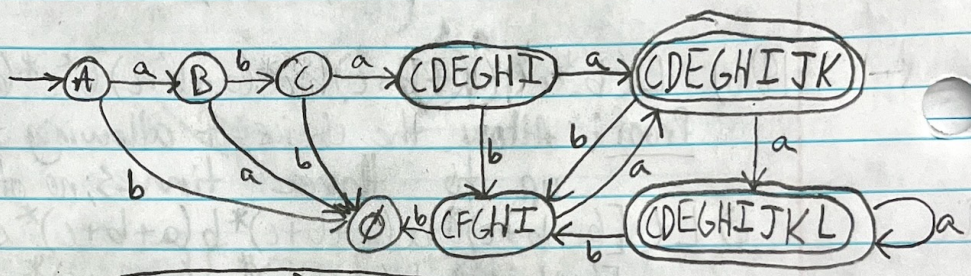
Section 3.2: 1)



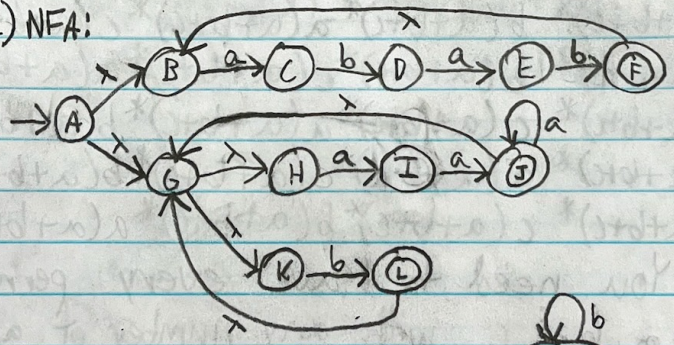

6) b) NFA:



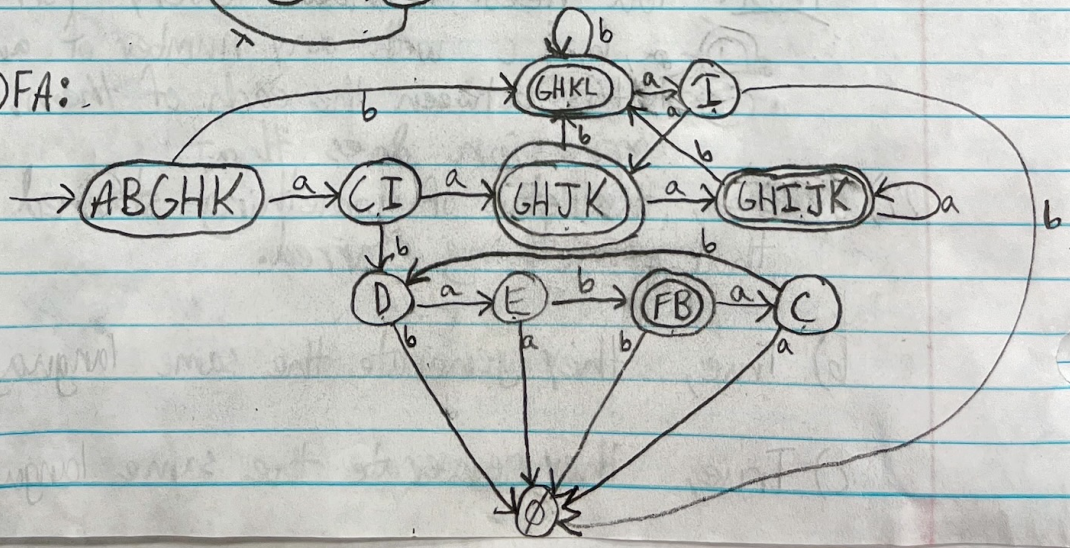

DFA:




c) NFA:




DFA:



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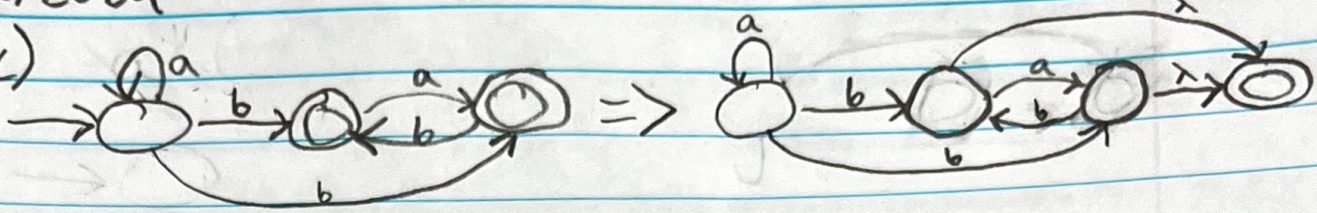
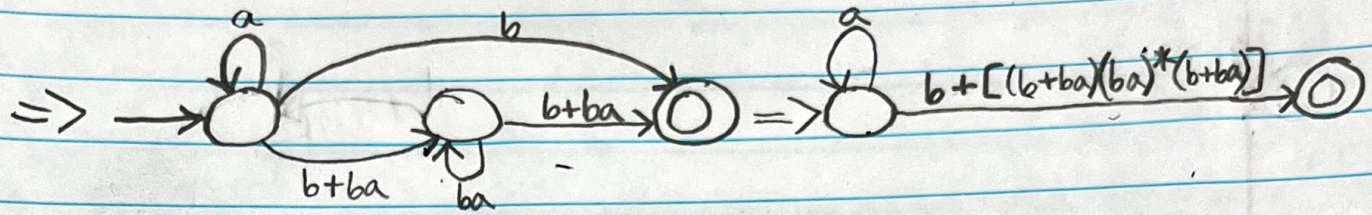
# Homework 3 Cont.

Section 3.2 (cont):

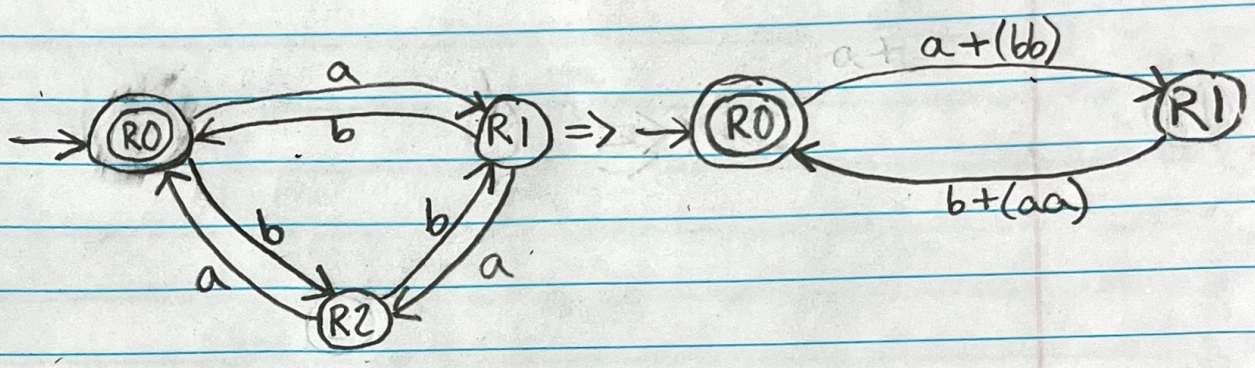
12) c)




=> $a^*[b+[(b+ba)(ba)^*(b+ba)]]$ ← The regular expression

15) c)




=> $[a+(bb)][b+(aa)]$ ← The regular expression