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1.(a). (b)

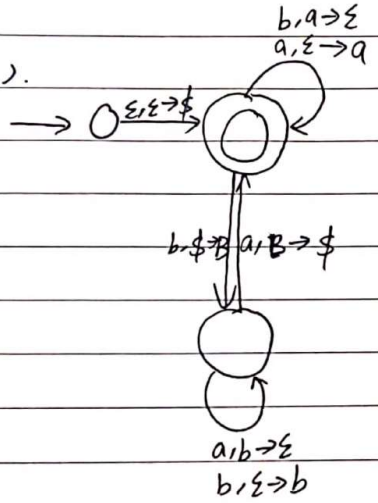
S→aAa|bBb|Q S→AB|BA

A→a|QAQ A→a|aA

B→b|QBQ B→b|aBa

Q→a|b

2(a).



3(a) Yes

Because R is regular Language, RoR will be regular language, too (As Regular languages means are recognized by some NFA. The concatenation of R,R must be regular since their NFA can be concatenated. i.e. link each accepting state of R's NFA to the start state of ~~one~~ ~~the~~ the other R's NFA with ∈). Then (RoRoR) must be RL for the same reason. (concatenate three NFA to recognize RoRoR).

(b) No

we can prove it by pumping lemma.

Let $w=a^P b^P$ so $S=a^P b^P a^P b^P a^P b^P \in triple(R)$

Since $|S| \geq P$, Let $S=xyz$, $xy=a^P \Rightarrow |xy| \leq P$ and $|y| \geq 1$

Then $xy^2z = a^{P+k} b^P a^P b^P a^P b^P \notin triple(R)$

Therefore. it is not necessarily Regular language.

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Assume snip(L) is Regular Language

Then let $tmp(L) = \{xz \mid x \in L, y \in L\}$

$tmp(L) \circ snip(L)$ should be regular, too.

$tmp(L) \circ snip(L) \Leftrightarrow \{xz \mid xyz \in L, |x|=|y|=|z|, x \in L, z \in L\}$

Let $L = a^*$ then $|x|=|y|=|z| \Rightarrow x=z$, $|x|=|y|$

Then $tmp(L) \circ snip(L) \Leftrightarrow \{xz \mid xyz \in L, |x|=|y|, x \in L, z \in L\}$

$\Leftrightarrow \{xx \mid xyx \in L, |x|=|y|, x \in L, y \in L\}$

In this case, we know $tmp(L) \circ snip(L)$ is not regular language.

So, snip(L) is not necessarily regular language