Assignment 3

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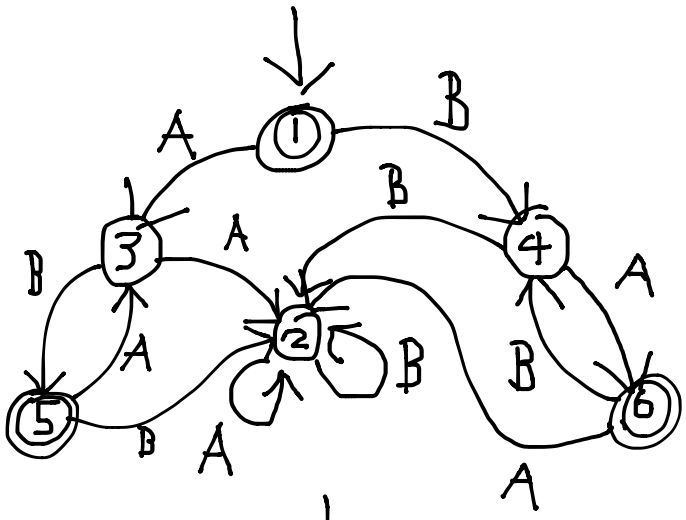
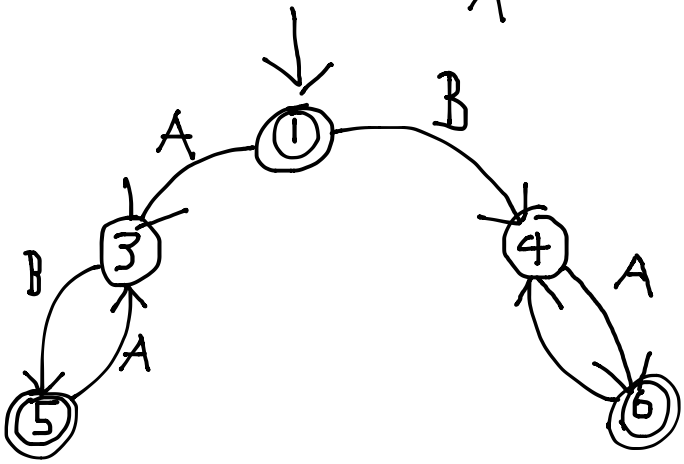
1 Problem 0

1.1 Q1,Q2, Q4

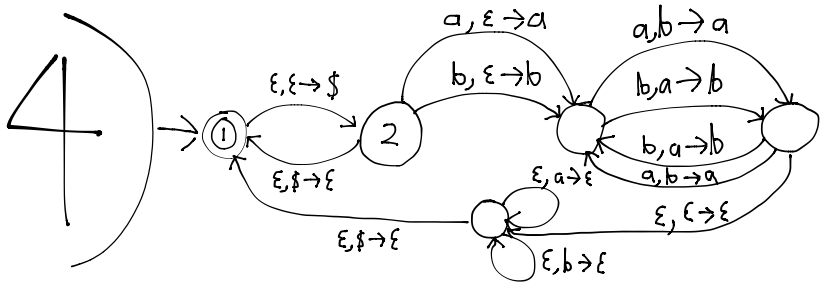
1)


1
2
3
4
5
6
A
B

2)


1
3
4
5
6
A
B

4)


1
2
ε, ε → $
ε, $ → ε
a, ε → a
b, ε → b
a, b → a
b, a → b
b, a → b
a, b → a
ε, a → ε
ε, ε → ε
ε, $ → ε
ε, b → ε

1.2 Q3

$S \to \epsilon$
$S \to X$
$S \to Y$
$Y \to \epsilon$
$Y \to abY$
$X \to \epsilon$
$X \to baX$

1.3 Q5

We are aiming to prove that the string $a^n b^{2n}$ is proved by the grammar $S \to aSbb|\epsilon$ for all $n \geq 0$.

Base case: $N = 1$

The valid string for $n = 1$ is abb.

We can create it with $S \to aSbb \to a\epsilon bb = abb$

We can suppose that we can generate the string $a^{n+1}b^{2(n+1)}$ using the grammar. This string is equal to $aa^n b^{2n} bb$. That string can then be derived from a further expansion of the original context.

$aSbb \to ... \to a^n b^{2n} b \to aa^n b^{2n} bb$

Hence, we have proven that the string $a^{n+1}b^{2(n+1)}$ can be derived from the original grammar. Following on from this, we can show that

As we have shown that the base case and inductive step are correct, we have proved that every string in the language$\{a^{2n}b^n : n \leq 0\}$