CSE 547T - HW3

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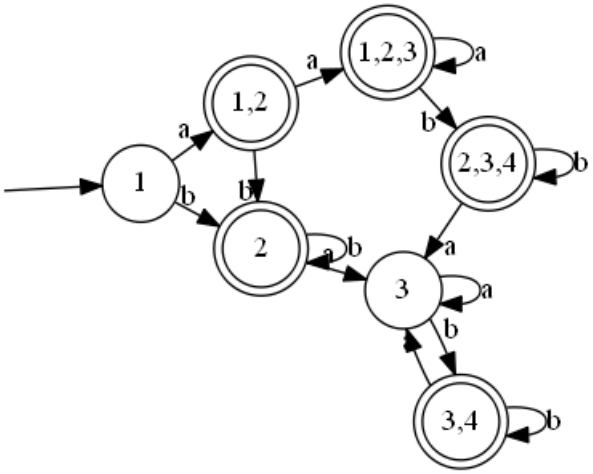
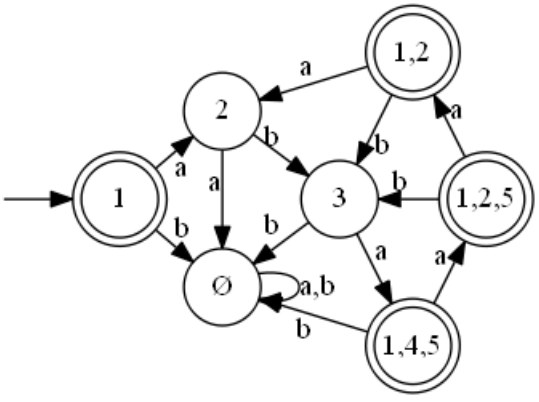
3.38 (c)

	$\sigma(q,a)$	$\sigma(q,b)$
1	{1,2}	{2}
2	{3}	{2}
3	{3}	{3,4}
4	∅	∅



3.38 (d)

	$\sigma(q,a)$	$\sigma(q,b)$
1	{2}	∅
2	∅	{3}
3	{1,4,5}	∅
4	{5}	∅
5	{1}	∅



2.22 (a)

- Assume L is accepted by an FA with m states, where $m \in \mathbb{N}^+$.
- Consider string $s = a^m b a^{2m}$, since $|s| > m$, by pumping lemma we should be able to find such a 3-tuple (u, v, w) where $s = uvw$ and $v \neq \Lambda$ that $uv^i w \in L \ \forall \ i \in \mathbb{N}$.
- Firstly, v couldn't contains b, since all string in L contains only one b. So v should be contained either in a^m part or a^{2m} part. But then the variation of i will break the proportion between this two parts.
- Thus L can't be accepted by an FA.

2.22 (b)

- Assume L is accepted by an FA with m states, where $m \in \mathbb{N}^+$.
- Consider string $s = a^m b^m a^{2m+1}$, since $|s| > m$, by pumping lemma we should be able to find such a 3-tuple (u, v, w) where $s = uvw$ and $v \neq \Lambda$ that $uv^t w \in L \ \forall \ t \in \mathbb{N}$.
- Firstly, let's divide s into 3 parts, which are a^m, b^m and a^{2m+1}. Obviously v can only be contained in one part, otherwise the variation of i will destroy this 3-parts pattern. Secondly, v can't be contained in the first two parts, since when t goes up, $i + j$ will exceed k eventually. But again, v can't be contained in part 3 either. Since $|v| \neq 0$, thus when we take $t = 0$, we will get $i + j = k$ which is not acceptable.
- Thus L can't be accepted by an FA.