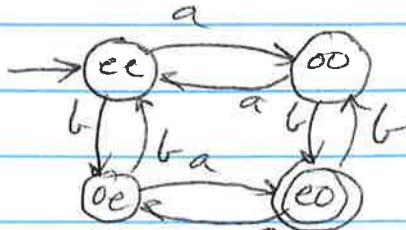


$$L_2 = \{x \mid x \in \{a,b\}^*, |x| \text{ is even} \text{ & } \#_a \text{ is odd}\}$$

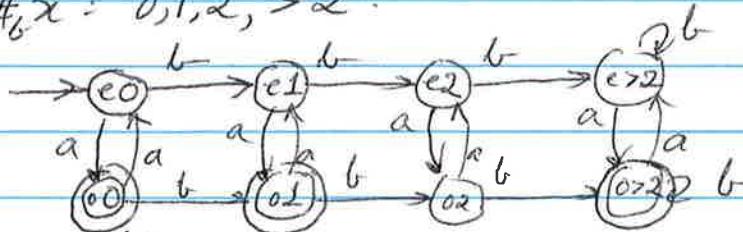
At any instant, keep track of the parity of $|x|$ & $\#_a$.



$$L_7 = \{x \mid \#_a \text{ odd}, \#_b \neq 2\}$$

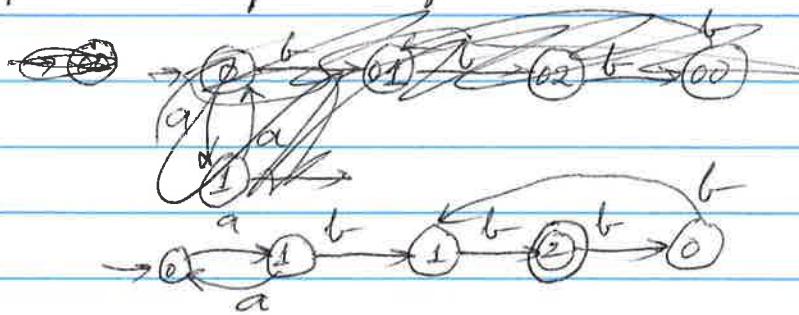
At any instant, keep track of the parity of $\#_a$, and

$$\#_b x = 0, 1, 2, \geq 2.$$



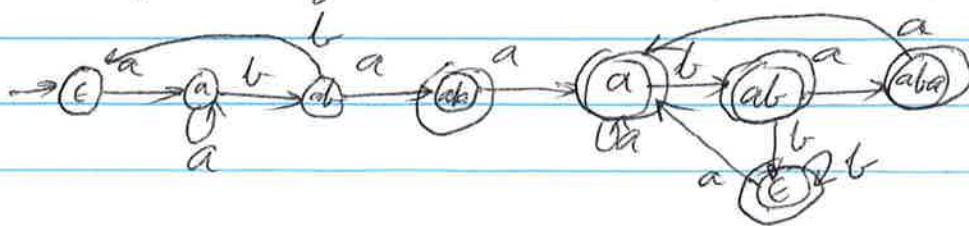
$$L_{14} = \{ab^j \mid i, j \geq 0, i \pmod{2} = 1 \text{ and } j \pmod{3} = 2\}.$$

At any instant, keep track of $i \pmod{2} \approx j \pmod{3}$. Also keep track of the form



$$L_{16} = \{x \mid \text{aba is a substring of } x \text{ & abab is not a substring}\}$$

First keep track of aba. Then keep track of abab.



$$\text{II} \quad L_2 = \left\{ a^{2i} b^{3i} c^{4i} \mid i \geq 1 \right\} = \{ aabbccccc, aaabb6bbcccccc, \dots \}$$

Let L_2 be recognized by a dfa, ~~with~~ & let the dfa have s states. In the set $\{a, a^2, \dots, a^{s+1}\}$, by right cong. lemma, 2 strings must be rt. cong. Let them be a^l & a^m , $l < m$.

By the definition of rt. cong. ($\exists z \in \{a, b, c\}^*$) ($a^l z \in L_2 \Rightarrow a^m z \in L_2\}$.

Let $z = a^{l-3l} b^{4l}$. Then $a^l z \in L$, but $a^m z \notin L$ - which is a contradiction. Hence L_2 is not a dfa lang.

$$L_6 = \{a^i b^j \mid i, j \geq 1 \text{ and } i \neq j\}$$

Proceed as above. Let the rt cong. strings be a^l and a^m , $l < m$.

choose $z = a^m b^m$. Then $a^l a^m b^m \in L_6$, but $a^m a^m b^m \notin L_6$. Hence L_6 is not a dfa lang.

$$L_9 = \{a^i b^j \mid i, j \geq 1 \text{ and } i \leq j \leq i^2\}$$

Proceed as above. Let the rt. cong. strings be a^l & a^m , $l < m$.

choose $z = b^l$. Then $a^l b^l \in L_9$, but $a^m b^l \notin L_9$. Hence L_9 is not a dfa lang.