# Discussion 04/12

For definitions, refer Sipser.

$\Sigma = \{a, b\}$

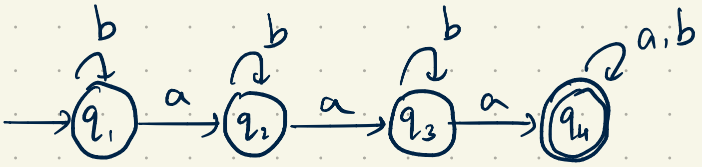
1.4 (a) $\{w \mid w$ has at least 3 'a's & at least 2 'b's$\}$

**Sol.** We want the intersection of 2 DFAs $M_1$ & $M_2$

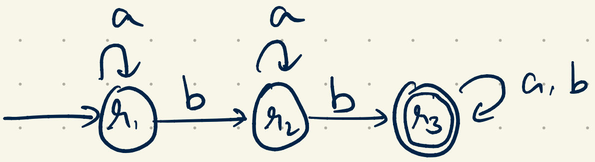
$M_1$ recognizes $\{w \mid w$ has at least 3 'a's$\}$

$M_2$ recognizes $\{w' \mid w'$ has at least 2 'b's$\}$

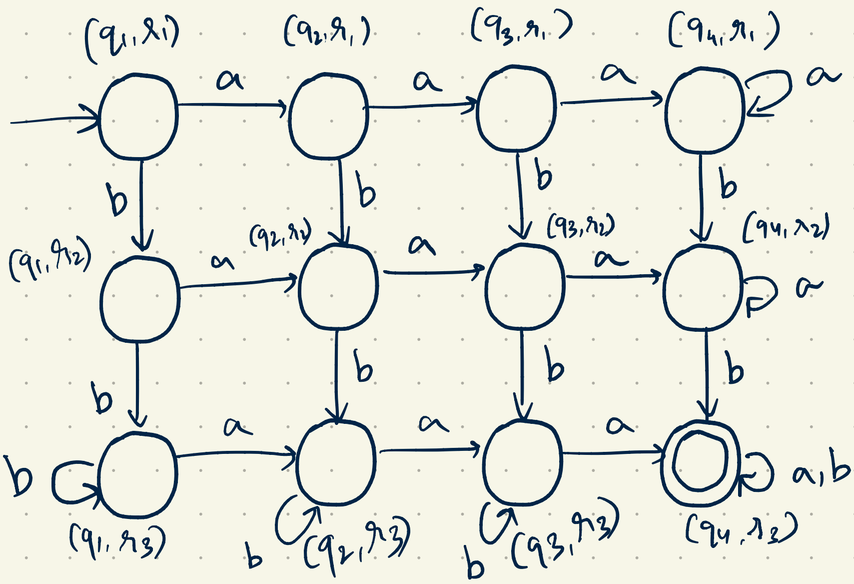
M1




M2




$M_1 \cap M_2$



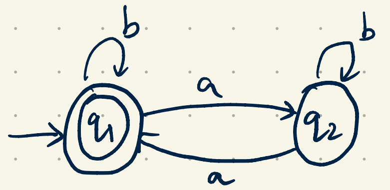
1.4 (c) $\{w \mid w$ has an even number of 'a's and 1 or 2 'b's$\}$

**Sol:** Want $M_1 \cap M_2$, where

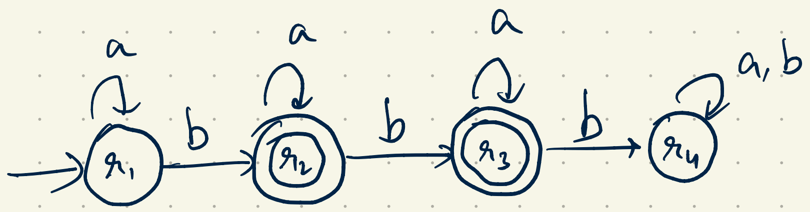
$M_1$ recognizes $\{w \mid w$ has an even number of 'a's$\}$

$M_2$ recognizes $\{w' \mid w'$ has 1 or 2 'b's$\}$

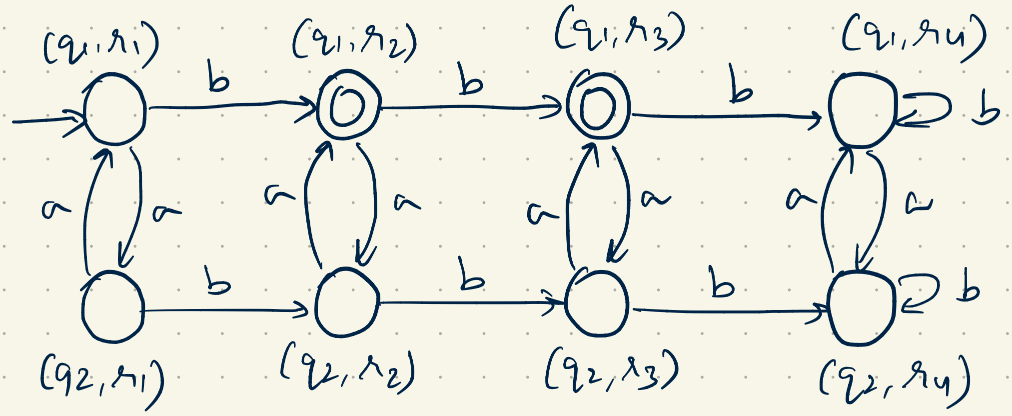
M1




M2




$M_1 \cap M_2$

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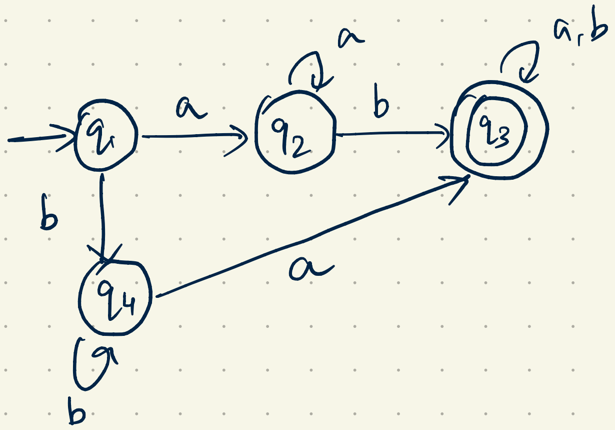
1.5 (c) Construct a DFA that recognizes

$L = \{w \mid w$ contains neither ab nor ba$\}$

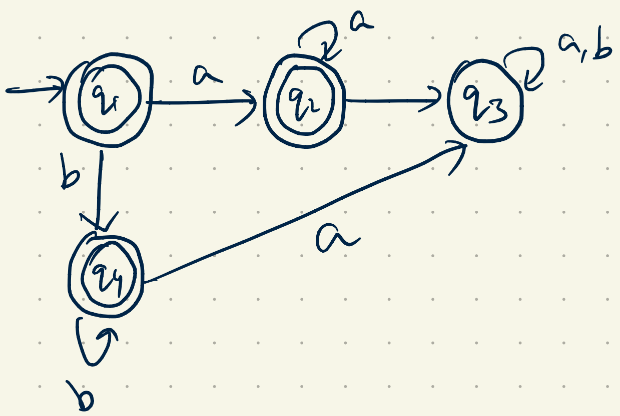
The complement of this language is

$\bar{L} = \{w \mid w$ contains ab or contains ba$\}$

DFA that recognizes $\overline{L}$:



Complement this to get the DFA that recognizes $L$:



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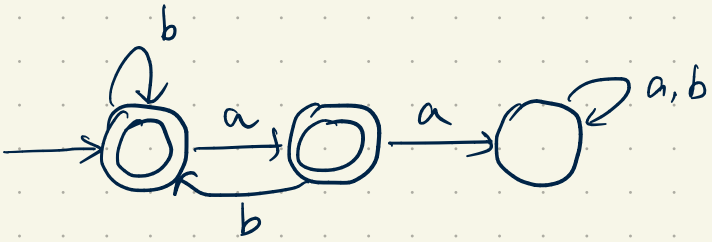
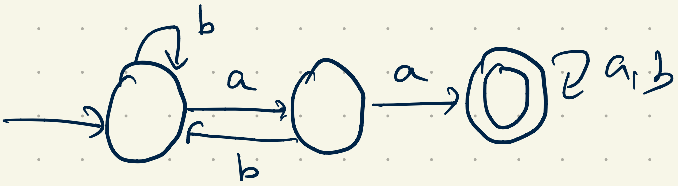
1.5(e) $\{w \mid w \text{ is any string NOT in } (ab^+)^*\} = L$

$\overline{L} = \{w \mid w \text{ is in } (ab^+)^*\}$



recognizes $\overline{L}$

Complement this:



recognizes $L$

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1.6 (i) Construct a DFA that recognizes

$$\{ w \mid \text{every odd position of } w \text{ is a } 1 \}$$

over $\Sigma = \{0,1\}$

Sol Important : $\varepsilon$ (empty string) BELONGS to this language.