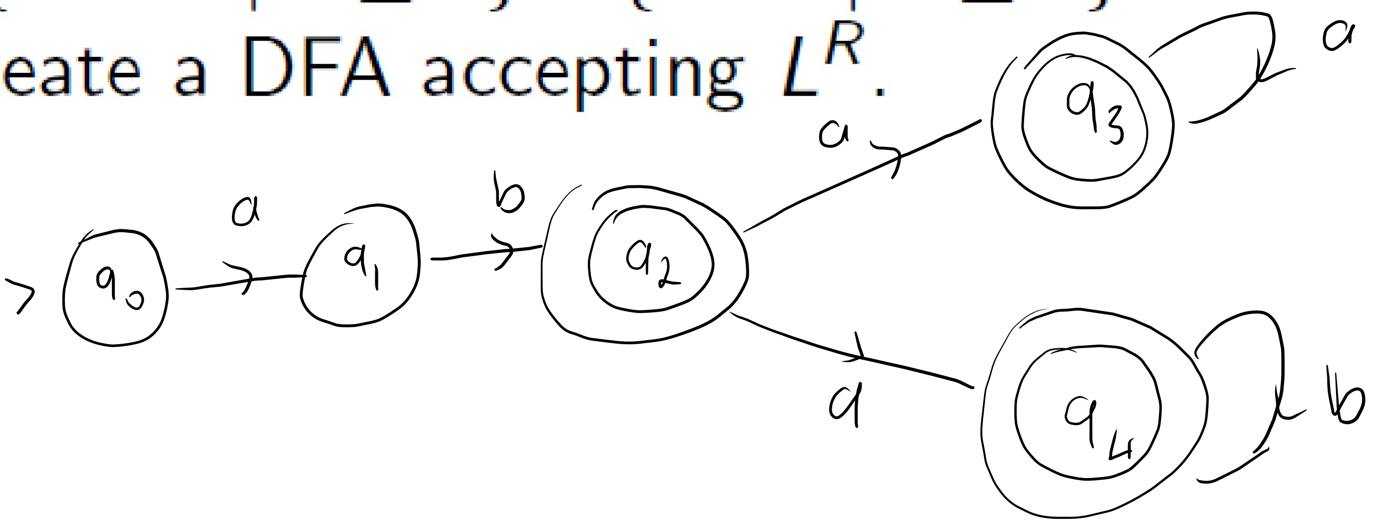
a) Create an NFA no more than 5 states that accepts the language $L = \{abab^n \mid n \geq 0\} \cup \{aba^n \mid n \geq 0\}$.

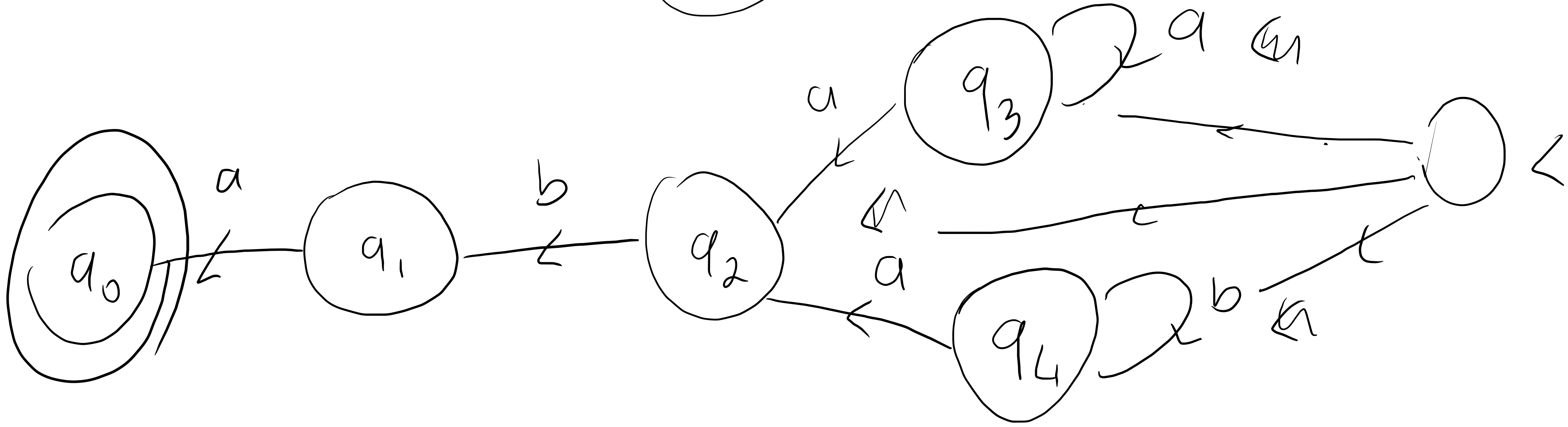
b) Create a DFA accepting L^R.

a)



q_0	a b	q_1 $\emptyset$
q_1	a b	$\emptyset$ q_2
q_2	a	$\{q_3, q_4\}$

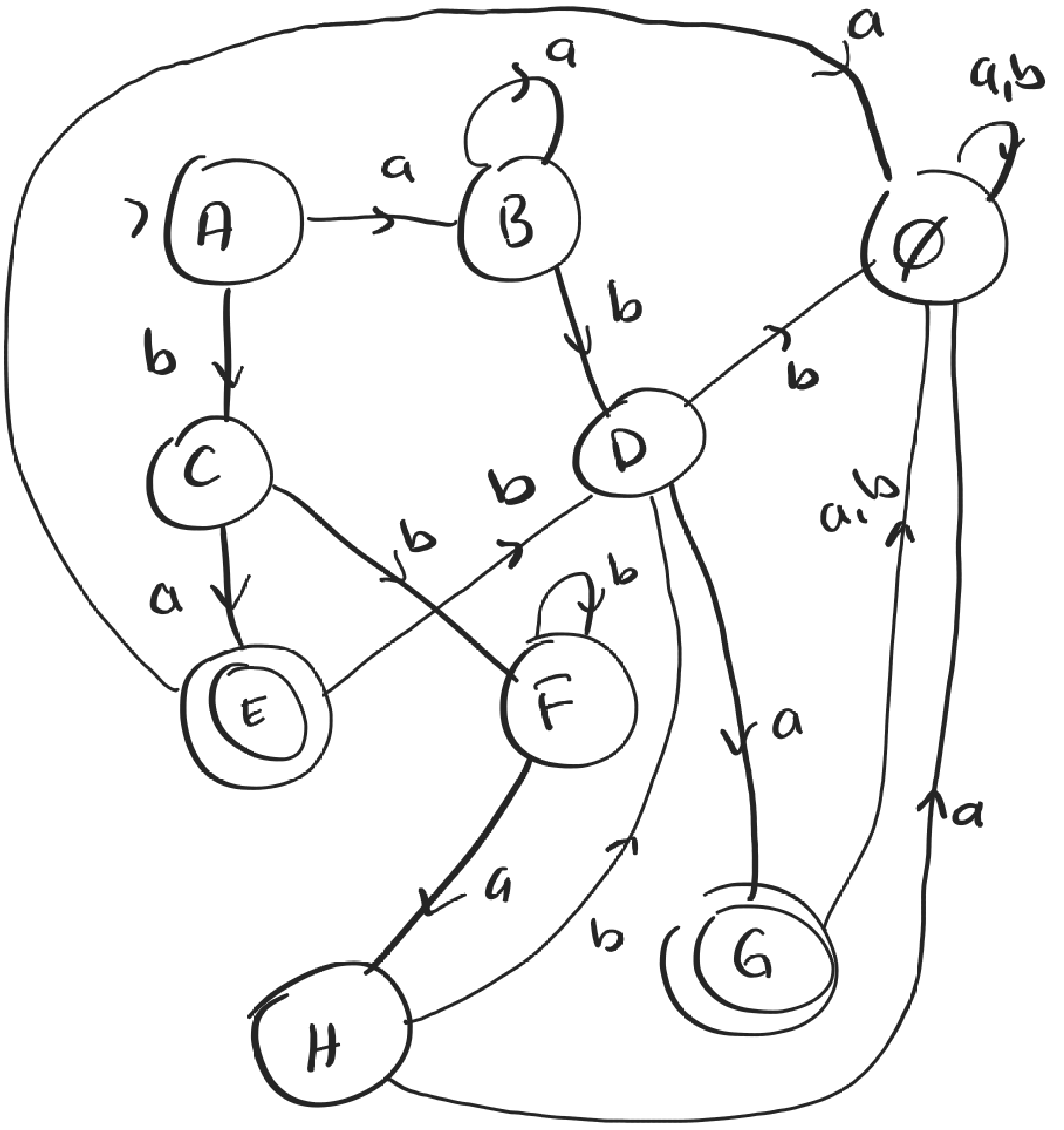
b)



For the next part, you can use 2 other methods to confirm the answer.

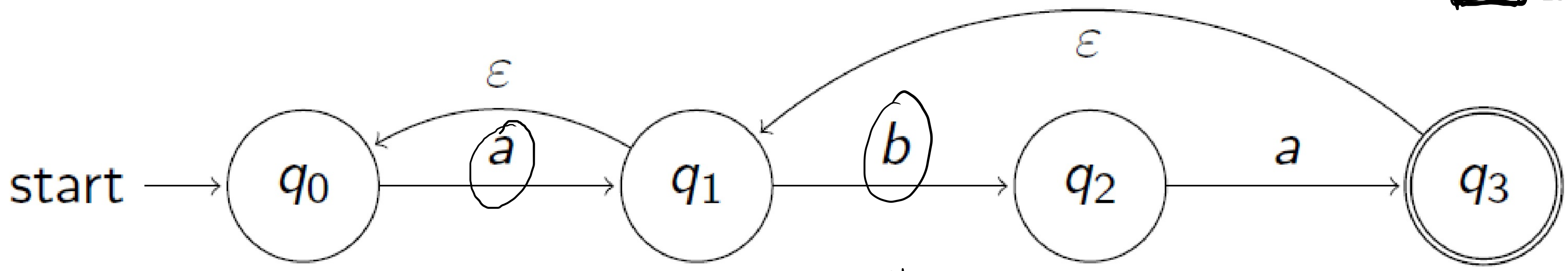
Case with multiple initial states:

A	> $\{q_2, q_3, q_4\}$	a	$\{q_2, q_3\}$ B
		b	$\{q_1, q_4\}$ C
B	$\{q_2, q_3\}$	a	$\{q_2, q_3\}$ B
		b	q_1 D
C	$\{q_1, q_4\}$	a	$\{q_0, q_2\}$ E
		b	q_4 F
D	q_1	a	q_0 G
		b	$\emptyset$
E*	$\{q_0, q_2\}$	a	$\emptyset$
		b	q_1 D
F	q_4	a	q_2 H
		b	q_4 F
G*	q_0	a	$\emptyset$
		b	$\emptyset$
H	q_2	a	$\emptyset$
		b	q_1 D

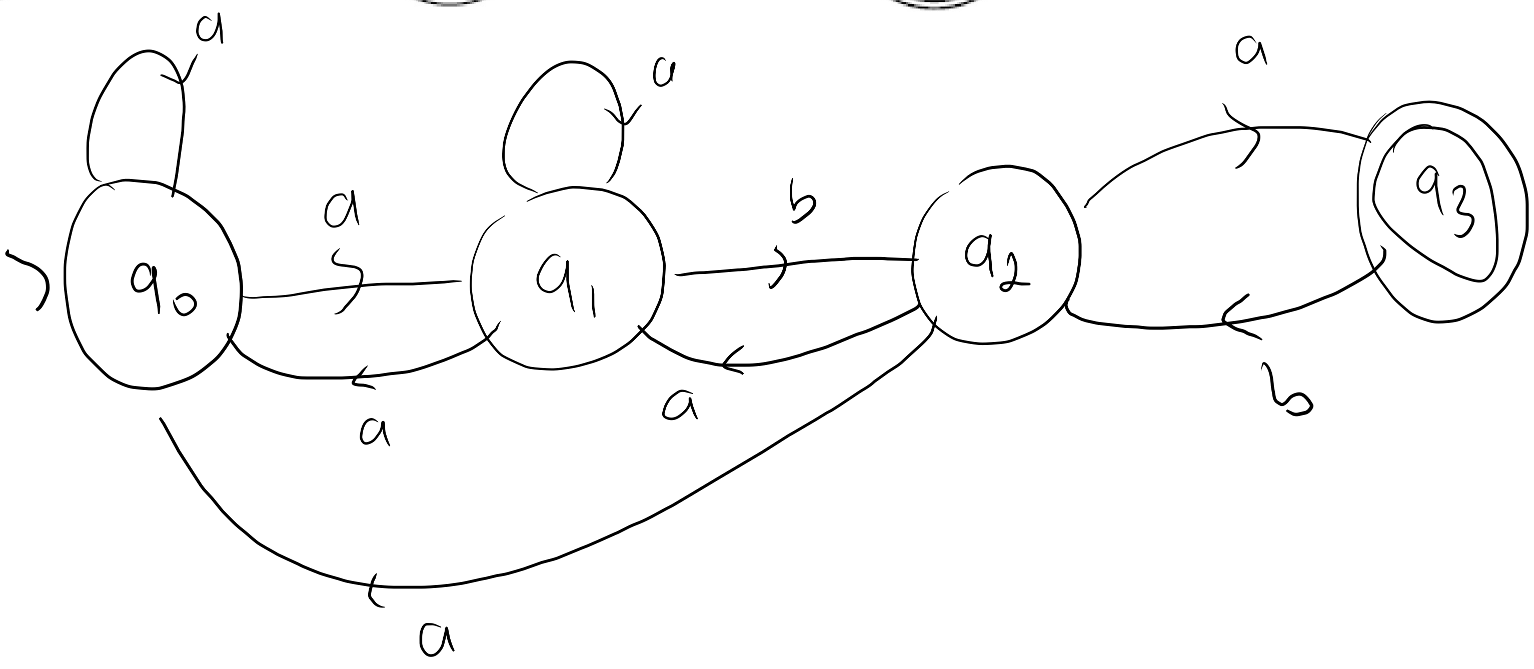


Eliminate the ε-transitions from the given ε-NFA.

a b

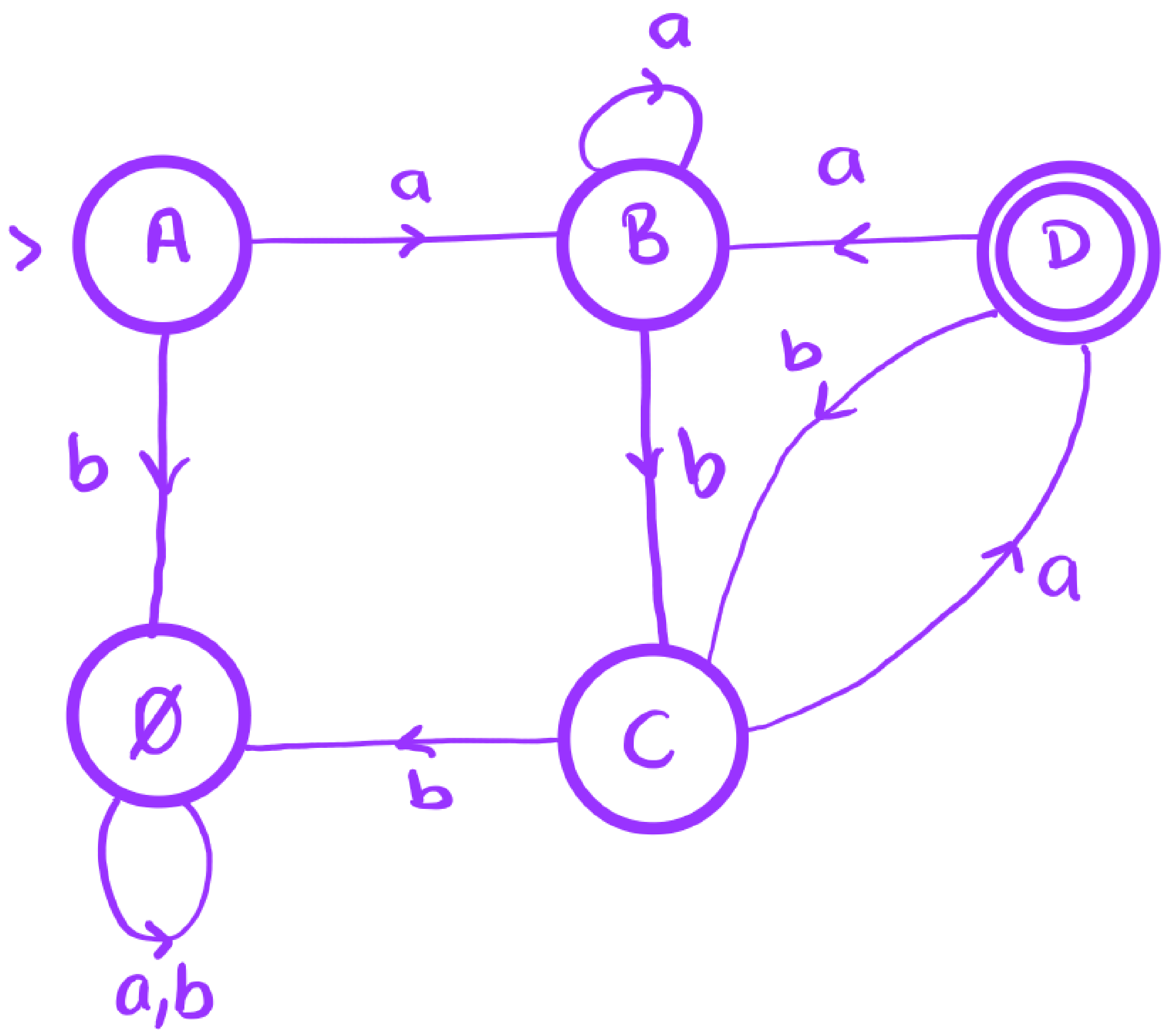


> q_0	a	$\{q_1, q_0\}$
	b	$\{\}$
q_1	a	$\{q_1, q_0\}$
	b	q_2
q_2	a	$\{q_0, q_1, q_3\}$
	b	$\{\}$
* q_3	a	$\{q_0, q_1\}$
	b	$\{q_2,\}$ —



Create an equivalent DFA for the NFA you found in the previous problem.

$>$ A q_0	a	$\{q_0, q_1\}$ B
	b	$\emptyset$
B $\{q_0, q_1\}$	a	$\{q_0, q_1\}$ B
	b	q_2 C
C q_2	a	$\{q_1, q_3\}$ D
	b	$\emptyset$
D* $\{q_1, q_3\}$	a	$\{q_0, q_1\}$ B
	b	q_2 C



Write regular expressions for the following languages.

a) The set of all strings of 0's and 1's such that every pair of adjacent 0's appears before any pair of adjacent 1's.

$$(1+e).(0+01)^* . \underbrace{(0+e)}_{\text{You can delete this part.}} . (1+10)^*$$

Informally describe the languages of the following regular expressions.

a) (1+e)(00*1)*0*.

$00^* = 0^+$

101

100100

$0^* = \{e, 0, 00, 000 \ldots\}$

The set of strings of 0s and 1s with no pair of adjacent 1s.

$L = \{w \in \{0,1\}^* \mid$ "11" is not a substring of $w\}$

Σ^*