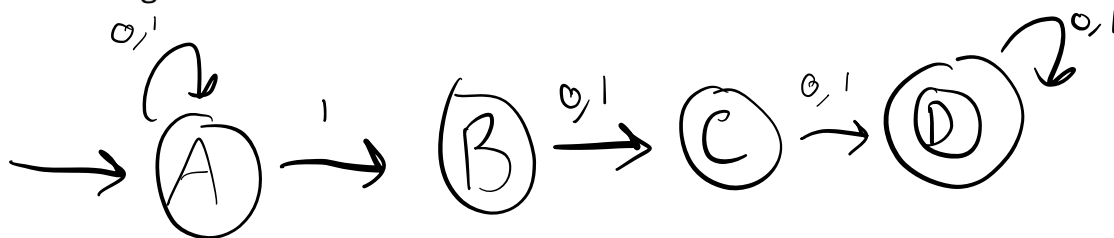


1. [5 points] Construct a NFA to accept the strings over $\{0,1\}^*$, containing 101 or 110 as substring.

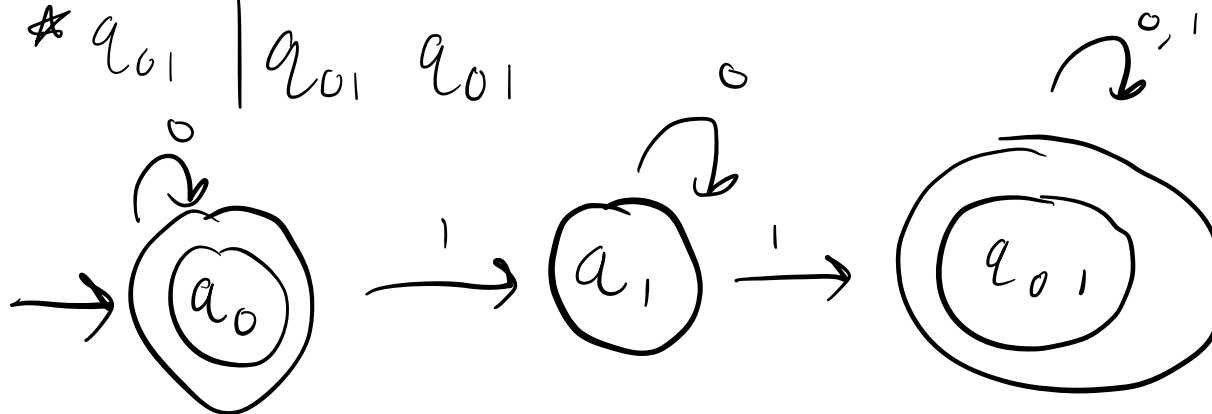


2. [5 points] Construct a deterministic automaton equivalent to $M = (\{q_0, q_1\}, \{0, 1\}, \delta, q_0, \{q_0\})$

State Table is given by,

State/ Σ	0	1
$\rightarrow q_0$	q_0	q_1
q_1	q_1	q_0, q_1

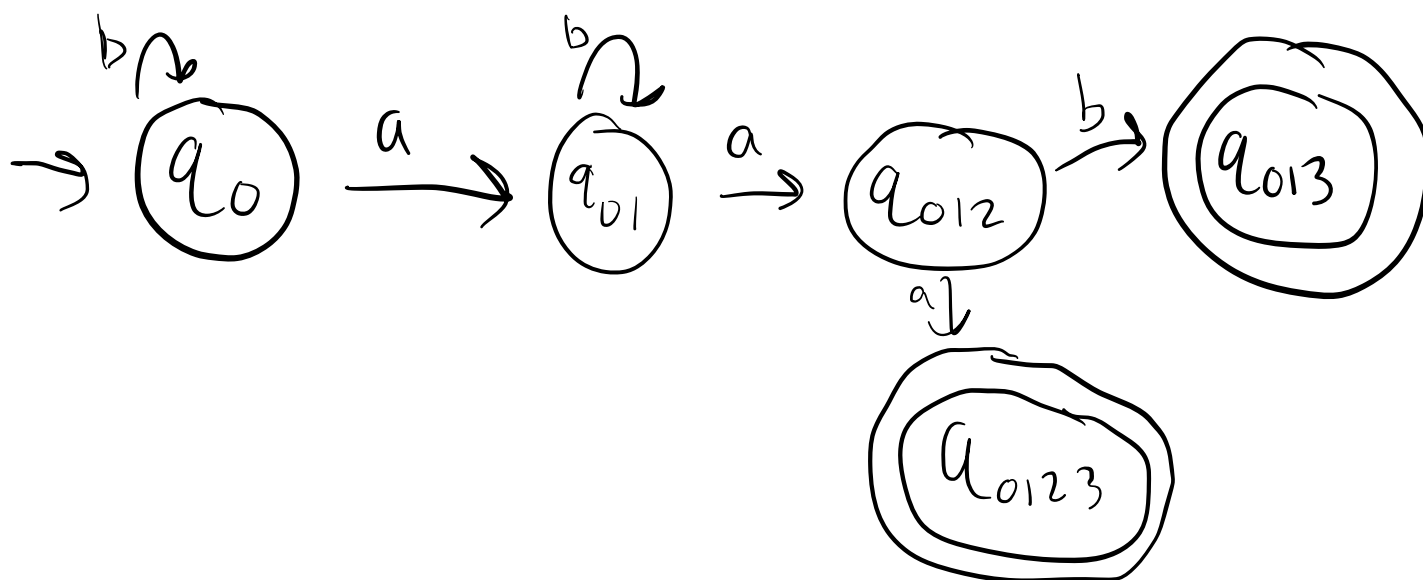
	0	1
$\rightarrow^* q_0$	q_0	q_1
q_1	q_1	q_{01}
$^* q_{01}$	q_{01}	q_{01}



3. [10 points] Construct a deterministic finite automaton equivalent to $M = (\{q_0, q_1, q_2, q_3\}, \{0, 1\}, \delta, q_0, \{q_3\})$ where δ is given by Table

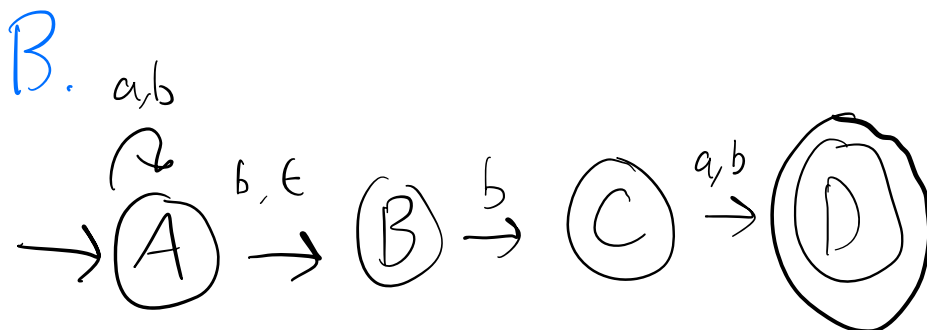
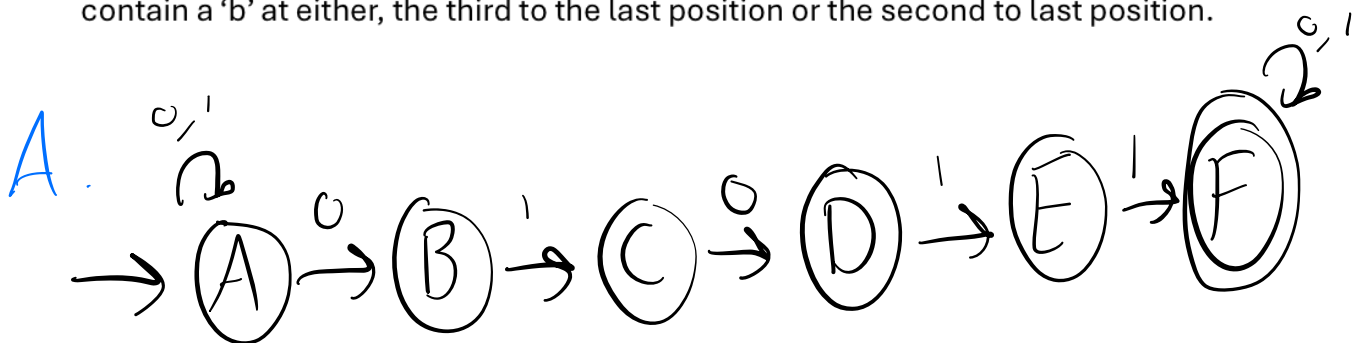
State/ Σ	a	b
$\rightarrow q_0$	q_0, q_1	q_0
q_1	q_2	q_1
q_2	q_3	q_3
q_3		q_2

	a	b
$\rightarrow q_0$	q_{01}	q_0
q_{01}	q_{012}	q_{01}
q_{012}	q_{0123}	q_{013}
$\star q_{013}$	q_{012}	q_{012}
$\star q_{0123}$	q_{0123}	q_{0123}
q_1	q_2	q_1
q_2	q_3	q_3
$\star q_3$	q_4	q_2
q_4	q_4	q_4



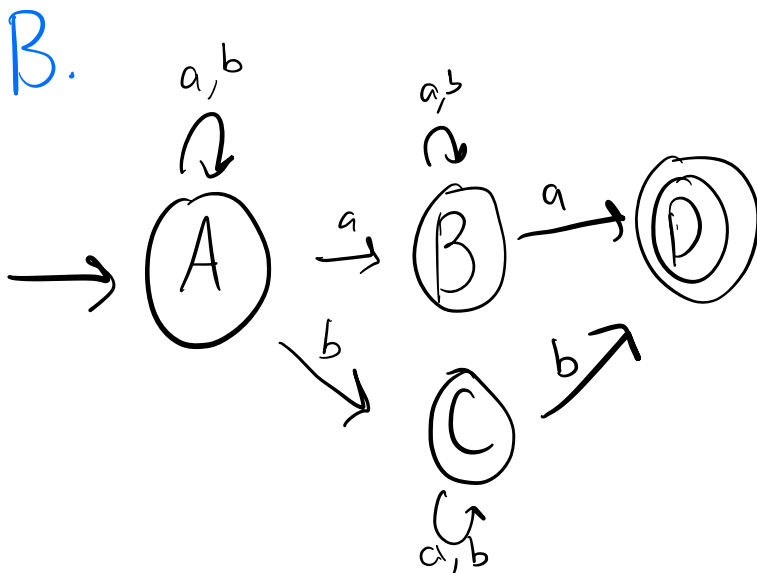
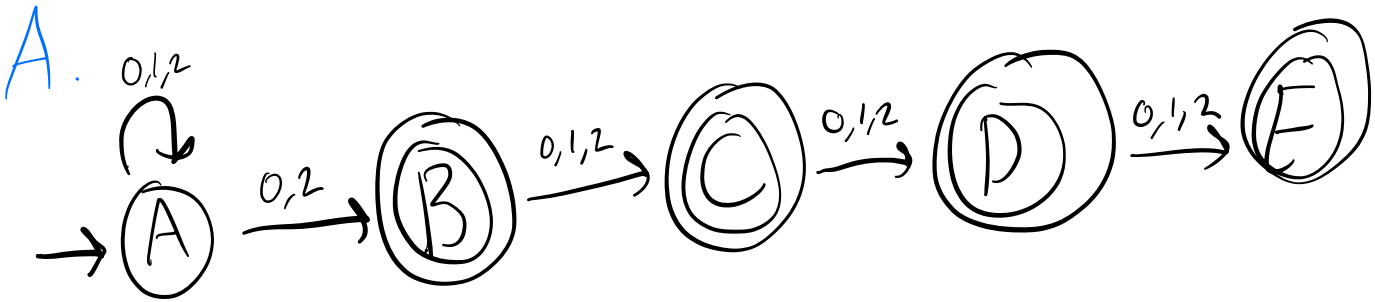
4. [10 points] A. Design NFA for the language of all strings over $\{0, 1\}$ that contain 01011.

B. Design NFA that recognizes the language consisting of all strings over $\{a, b\}$ that contain a 'b' at either, the third to the last position or the second to last position.



5. [10 points] A. Let $S = \{0, 1, 2\}$. Give an NFA for the language L containing all string in Σ^* which have a '0' or a '2' in the last four positions. For example, 110111 and 011121 are both in L , but 0201111 is not. Notice that strings of length four or less are in L exactly when they contain a '0' or a '2'.

B. Let $\Sigma = \{a, b\}$. Design NFA for the language L consisting of strings in which the final letter has appeared before. Solution: NFA is given in following



6. [10 points] Obtain the DFA equivalent to the following NFA,

States	Input	
	a	b
$\rightarrow q_0$	q_1	q_2
q_1	q_0	q_0, q_3
$*q_2$	q_0	q_3
q_3	q_2	q_3

DFA

	a	b
$\rightarrow q_0$	q_1	q_2
q_1	q_0	q_0, q_3
q_0, q_3	q_1, q_2	q_0, q_3
$*q_2$	q_0	q_3
$*q_0, q_3$	q_1, q_2	q_0, q_3
$*q_1$	q_0	q_0, q_3
q_0	q_1	q_2
$*q_0, q_3$	q_1, q_2	q_0, q_3
$*q_1, q_2$	q_0	q_3
$*q_2$	q_0	q_3
q_3	q_2	q_3

