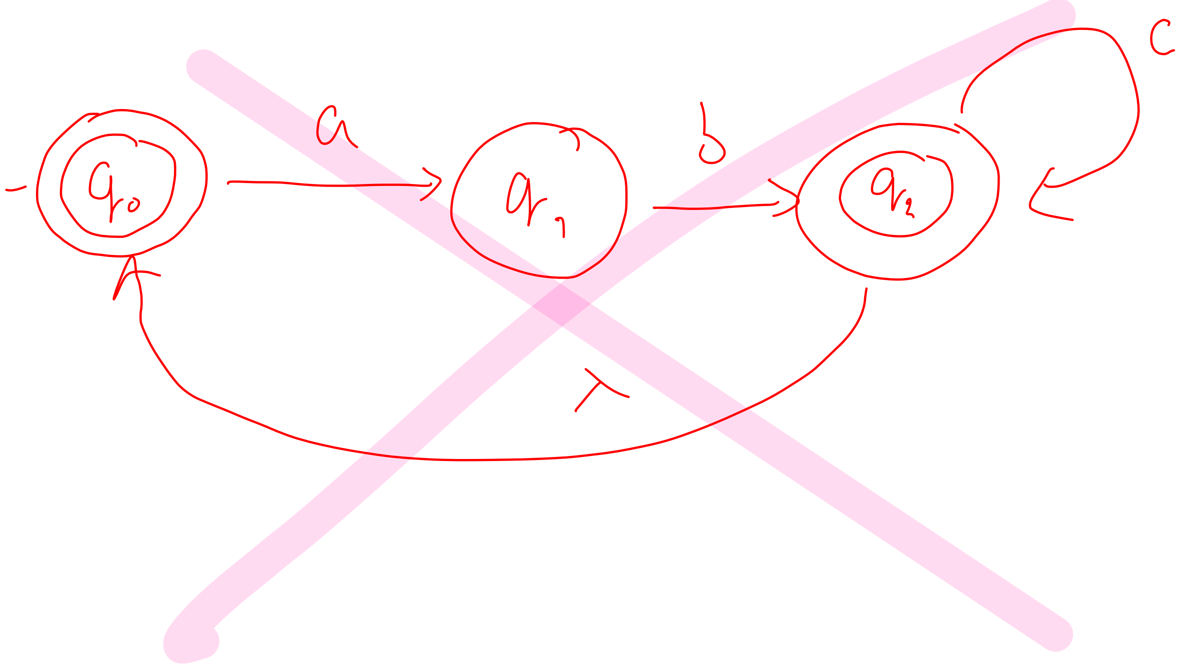
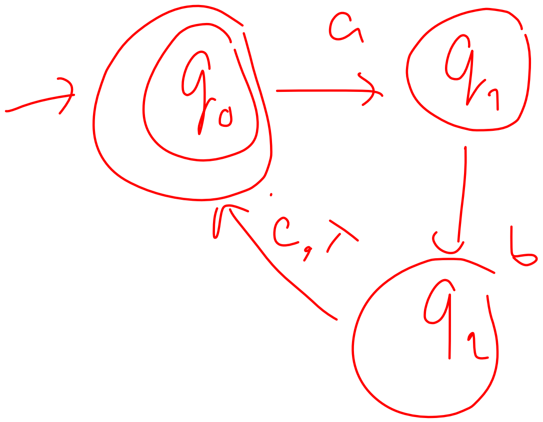
Theory of Computation

Exercise 3: (Nondeterministic Finite Automata - NFA)

1. Construct the minimal-state NFA that accepts the language $\{ab, abc\}^*$

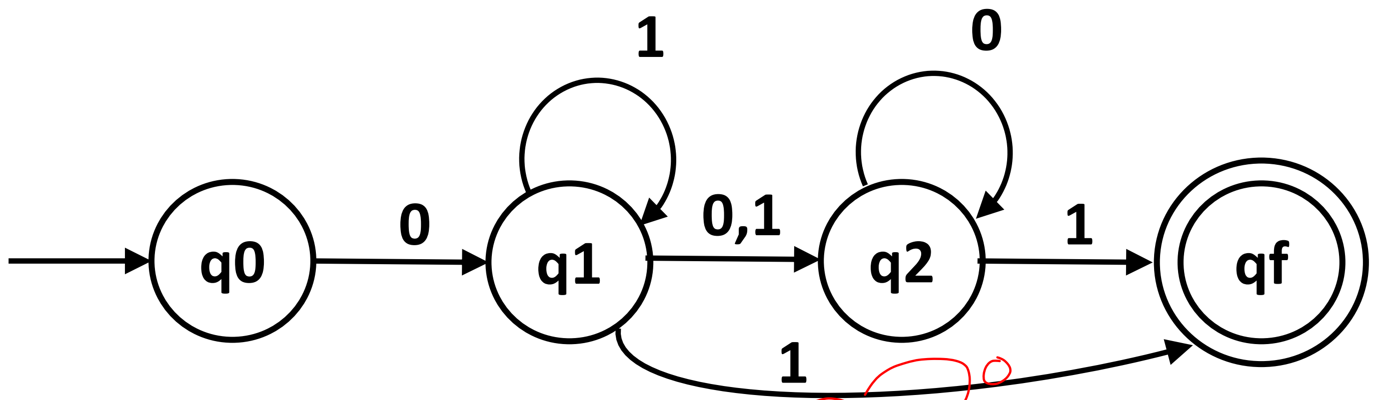


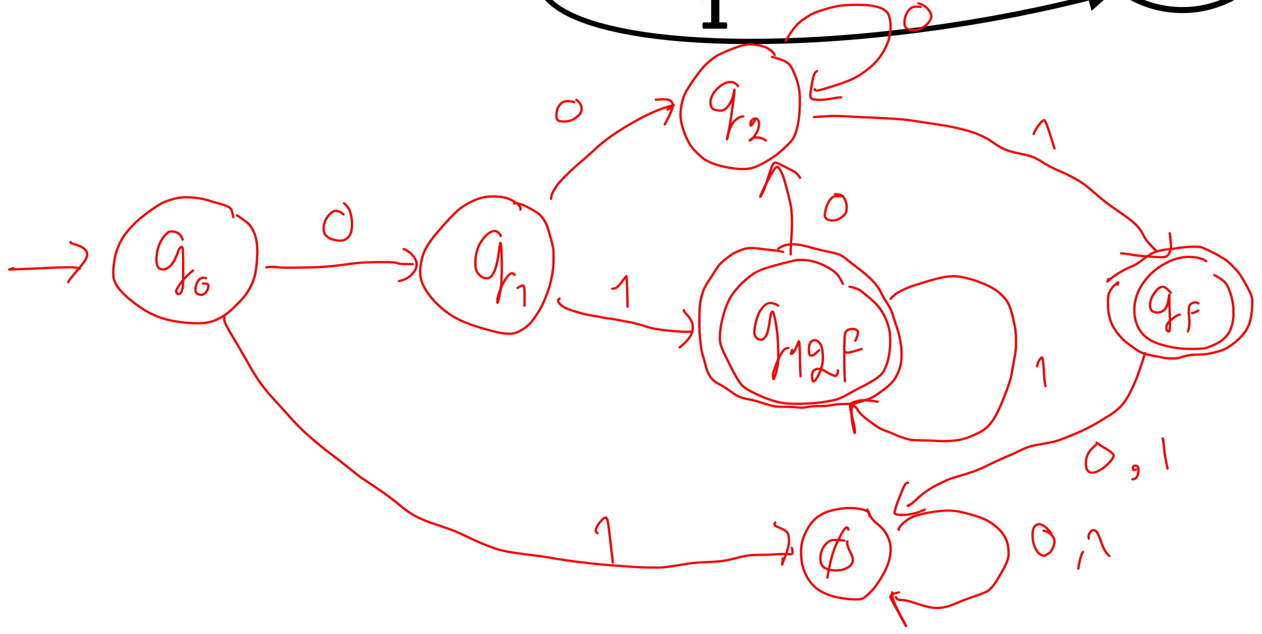


2. Convert the following NFA to DFA

	0	1
q_0	q_1	$\emptyset$
q_1	q_2	q_{12f}
q_2	q_2	q_f
q_f	$\emptyset$	$\emptyset$

NFA

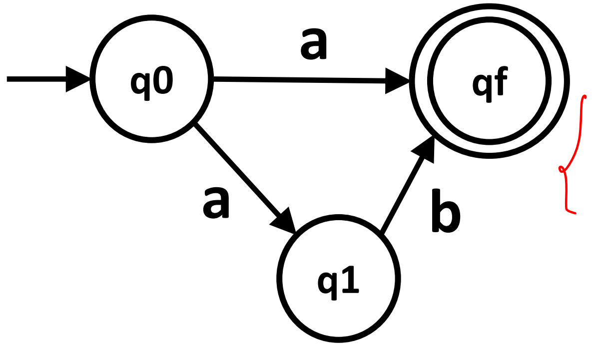




(Submit 2)

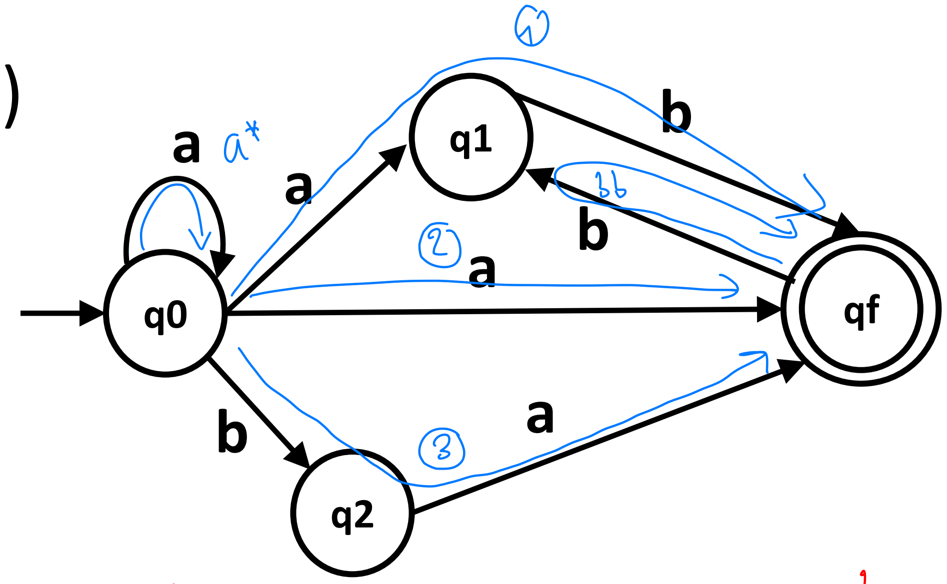
*3. What are the languages accepted by the following NFA ?

a)



$\{a\, b^n ; n \in \{0,1\}\}$

b)



~~$\{\{\{a\}^* \cup \{a^*b\} \cup [a^*ba]\} \cdot \{bb\}^*\}$~~

$a^* \cdot (ab + a + ba) \cdot bb^*$

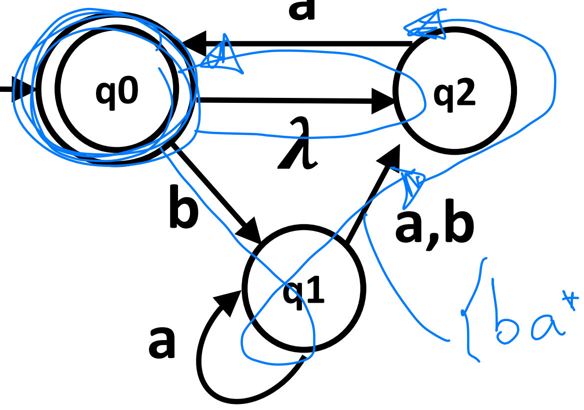
↓

ก็เป็นของ NFA, DFA, regular expres

ได้ → regular language

$\{\{a\}^* \cup \{\{b\} \cdot \{a\}^* \cdot \{\{a\} \cup \{b\}\}\} \cup \{a\}^+\}$

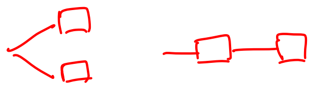
c)



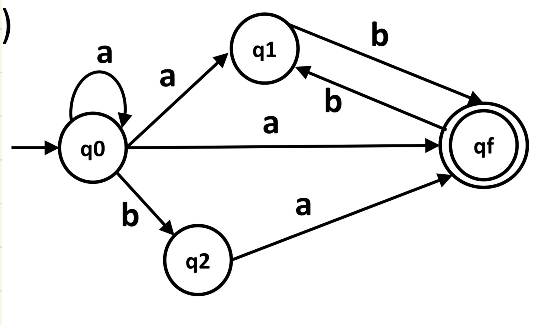
a^*

$L_c = \{a, ba^* \cdot \{a,b\} \cdot a\}^*$

$\{ba^* \cdot \{a,b\} \cdot a\}^*$



+ = union , · concat



$q_f = q_0 a + q_1 b + q_2 a$ — (1)

$q_2 = q_0 b$ — (2)

$q_1 = q_0 a + q_f b$ — (3)

$q_0 = \epsilon + q_0 a$ — (4)

$q_0 = a^*$

$R = Q + RP$

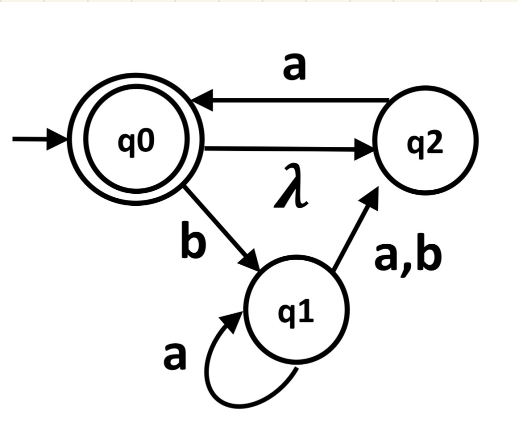
$R = QP^*$

$$q_f = q_0 a + (q_0 a + q_f b) b + q_0 ba$$

$$= q_0 a + q_0 ab + q_f bb + q_0 ba$$

$$= (a^* a + a^* ab + a^* ba) + q_f bb$$

$$q_f = (a^* a + a^* ab + a^* ba)(bb^*)$$



$q_0 = \epsilon + q_2 a$ (1)

$q_1 = q_0 b + q_1 a$ (2)

$q_2 = q_1 a + q_2 b + q_0$ (3)

$R = Q + RP$

$R = QP^*$

$q_1 = q_0 b + q_1 a$

$q_1 = q_0 ba^*$ — (4)

$q_1 = (\epsilon + q_2 a) ba^*$ (4) ← (1)

$q_1 = \epsilon ba^* + q_2 aba^*$ — (6)

$q_2 = q_1 a + q_2 b + \epsilon + q_2 a$ (3) ← (1) — (5)

$q_2 = (\epsilon ba^* + q_2 aba^*) a + q_2 b + \epsilon + q_2 a$ (5) ← (6)

$= \epsilon ba^* a + q_2 aba^* a + q_2 b + \epsilon + q_2 a$

$= \underset{Q}{\epsilon ba^* a + \epsilon} + \underset{R}{q_2} \underset{P}{(aba^* a + b + a)}$

$q_2 = (\epsilon ba^* a + \epsilon)(aba^* a + b + a)^*$

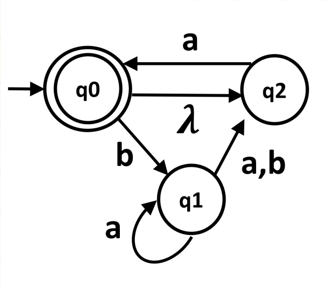
$q_0 = \epsilon + (\epsilon ba^* a + \epsilon)(aba^* a + b + a)^* (a)$

$(ba^* a) \cdot (aba^* a + b + a)^* (a)$

$(ba^* a)((aba^* a)^* b^* a^*)(a)$

$(ba^* a)(a^* + b^* + a + a^*)(b^* a^*)(a)$

$(ba^* a)(b^* + a + a^*)(b^* a^*)(a)$



λ

aaaaaaaaaaa

ba^*a

ba^*b

$a^* + ba^*(a+b) + a^+$