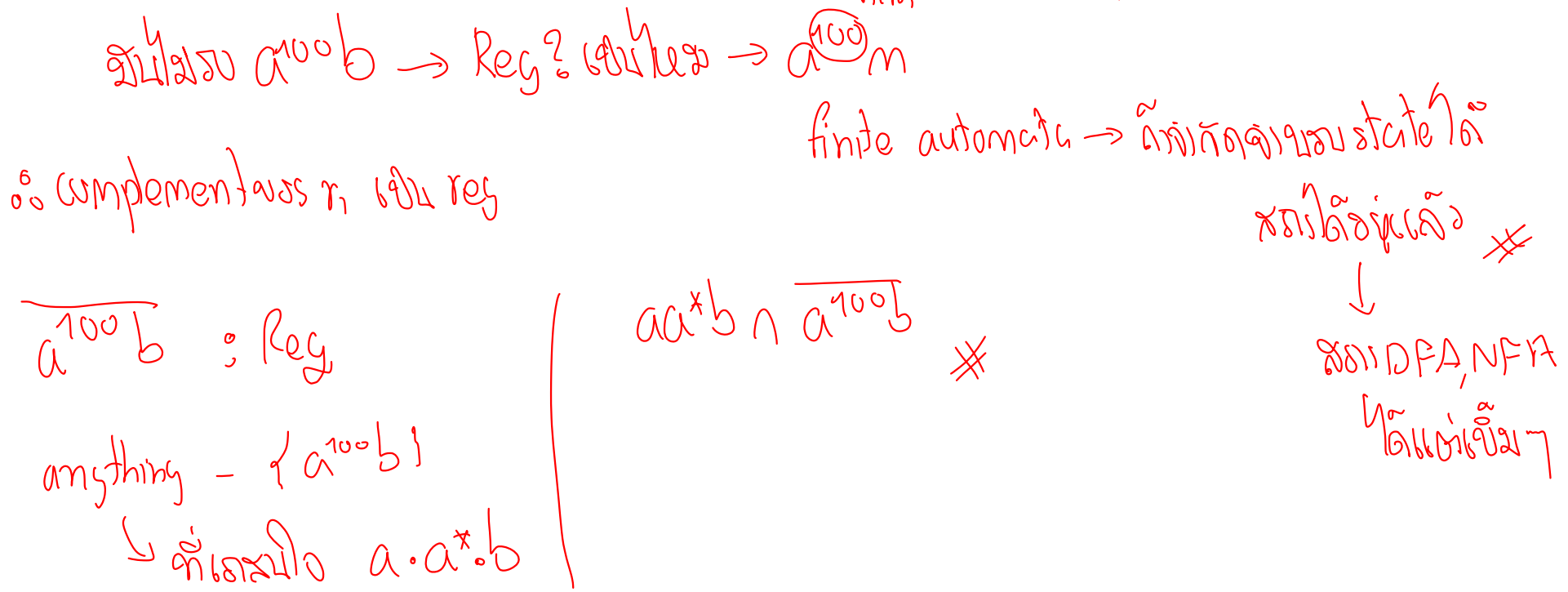
Theory of Computation

Exercise 4:

(Closure properties of Regular Language and Regular Expression)

1. Prove that the language $\{a^m b : m \geq 1 \; and \; m \neq 100\}$ is regular.



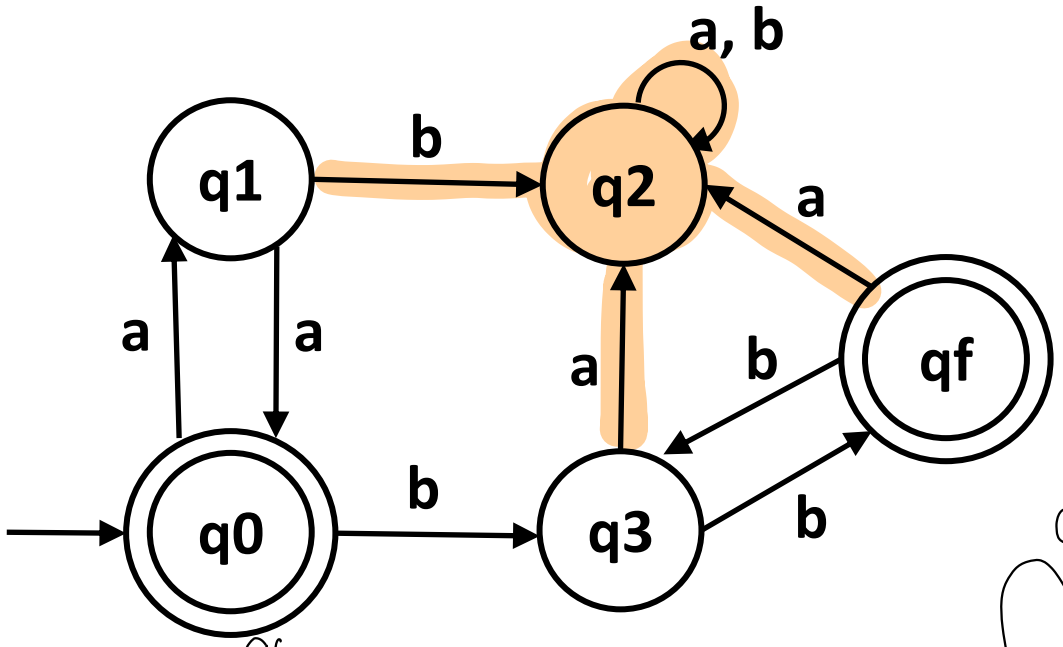
2. Find regular expression for the following language

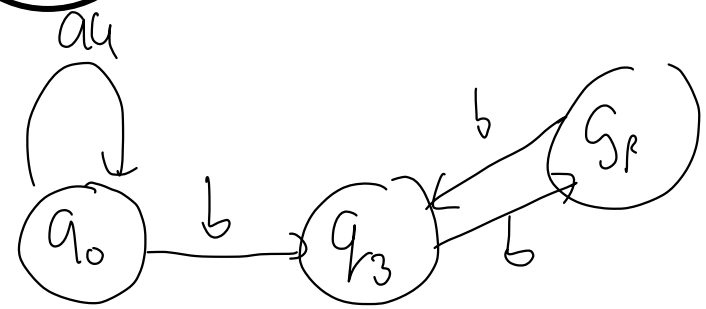
$$L = \{ w \in \{a, b\}^* : w \ does \ not \ end \ with \ ab \}$$

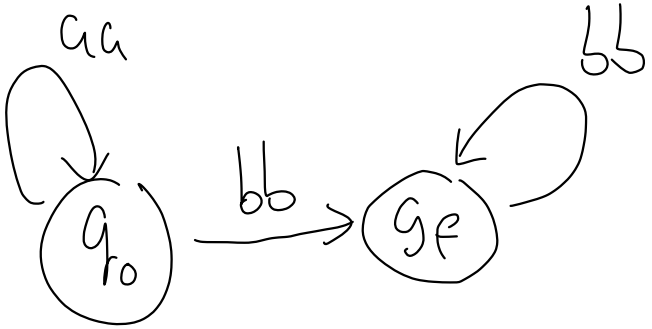
ตัวอย่าง: L = { λ, a, b, aa, ba, bb, aaa, aba, abb, baa, bba, bbb, ... }

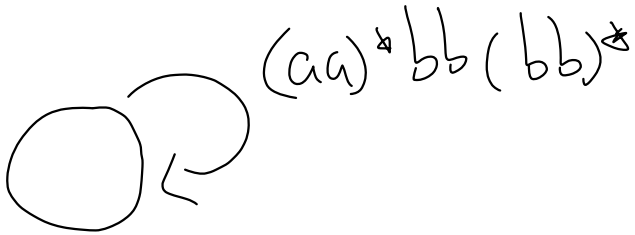
$(a+b)^* \cdot (aa+ba+bb) + a + b + \lambda$ ตอบ

*3. Find regular expression for the following DFA. (Submit 3)





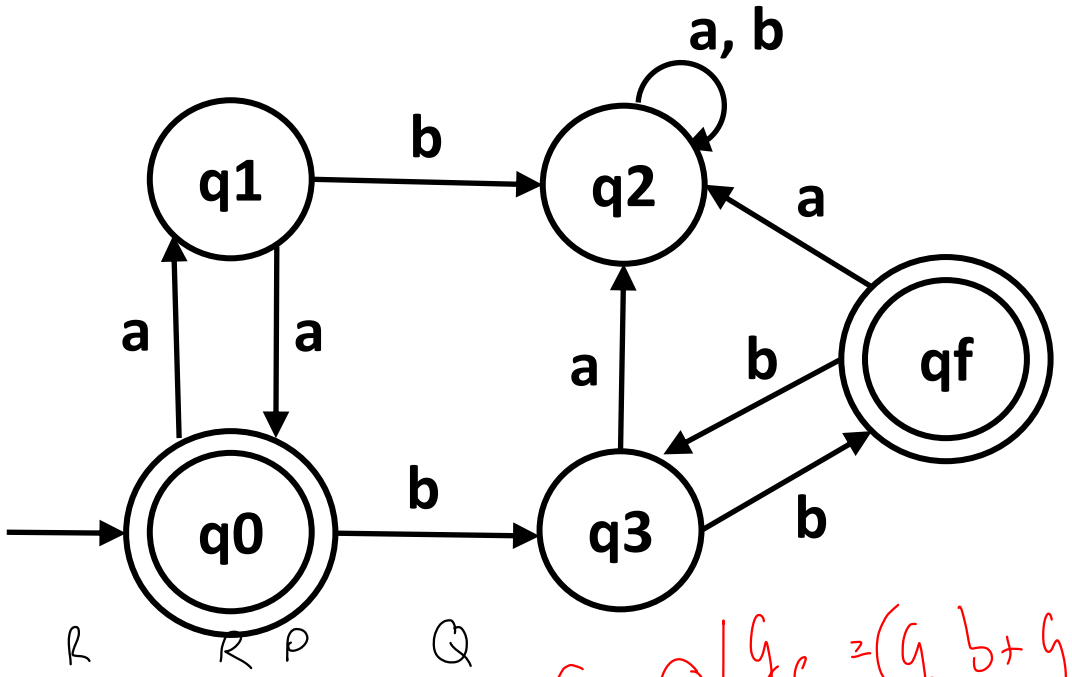




$R = Q + RP$ $\quad \epsilon + RR^* = R^*$

$R = QP^*$

*3. Find regular expression for the following DFA. (Submit 3)



$q_0 = q_1 a + \epsilon$ — (1)

$q_1 = q_0 a$ — (2)

$q_2 = q_1 b + q_2 a + q_2 b + q_3 a + q_4 a$ — (3)

$q_3 = q_0 b + q_F b$ — (4)

$q_f = q_3 b$ — (5)

R R P Q

$q_0 = q_0 aa + \epsilon$ (1) ← (2)

$= \epsilon (aa)^*$

$= (aa)^*$

$q_f = (q_0 b + q_f b) b$ (5) ← (4)

$= q_0 bb + q_f bb$

$= \underbrace{(aa)^* bb}_{Q} + q_f bb$

R P

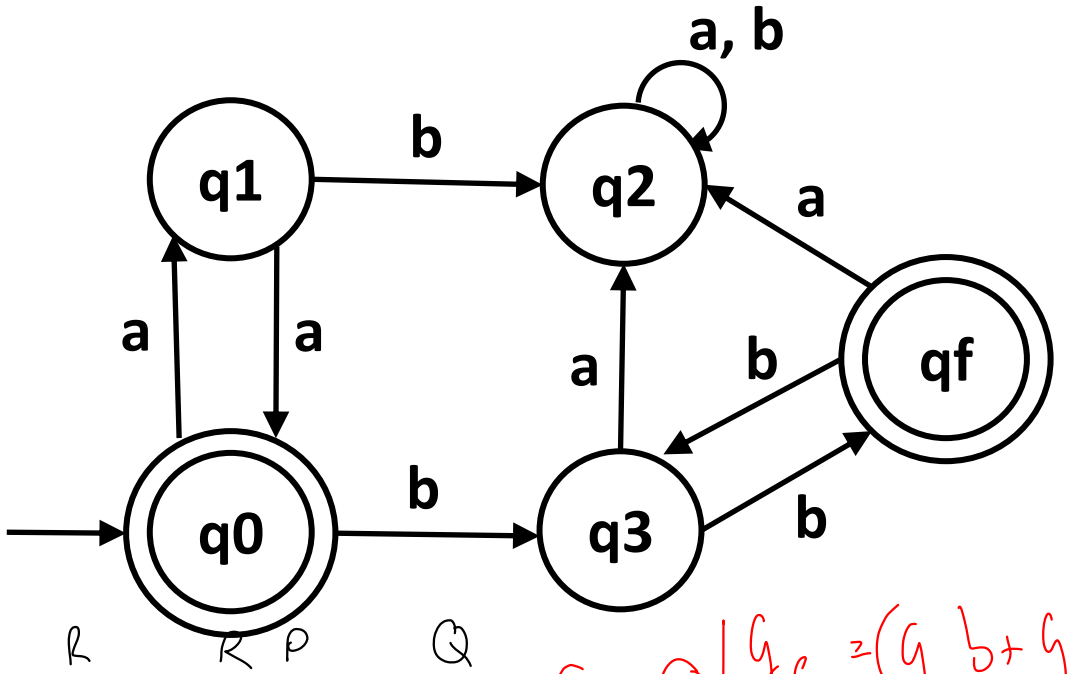
$q_f = (aa)^* bb (bb)^*$

$q_0 + q_f = (aa)^* + (aa)^* bb (bb)^*$

$= (aa)^* (\epsilon + bb(bb)^*)$

$= (aa)^* (bb)^*$

*3. Find regular expression for the following DFA. (Submit 3)



$q_0 = q_1 a + \epsilon$ — (1)

$q_1 = q_0 a$ — (2)

$q_2 = q_1 b + q_2 a + q_2 b + q_3 a + q_4 a$ — (3)

$q_3 = q_0 b + q_F b$ — (4)

$q_f = q_3 b$ — (5)

R R P Q

$q_0 = q_0 aa + \epsilon$ (1) ← (2)

$= \epsilon (aa)^*$

$= (aa)^*$

$q_f = (q_0 b + q_f b) b$ (5) ← (4)

$= q_0 bb + q_f bb$

$= \underbrace{(aa)^* bb}_{Q} + q_f bb$

R P

$q_f = (aa)^* bb (bb)^*$

$q_0 + q_f = (aa)^* + (aa)^* bb (bb)^*$

$= (aa)^* (\epsilon + bb (bb)^*)$

$= (aa)^* (bb)^*$