

Theory of Computation

Exercise 15: (Turing Machine)

(No exercise. Just submit homework 10)

*1. Find the language of Turing Machine M.

$$M = (\{q_0, q_1, q_2, q_3, q_4, q_f\}, \{a, b\}, \{a, b, x, y, \square\}, \delta, q_0, \square, \{q_f\})$$

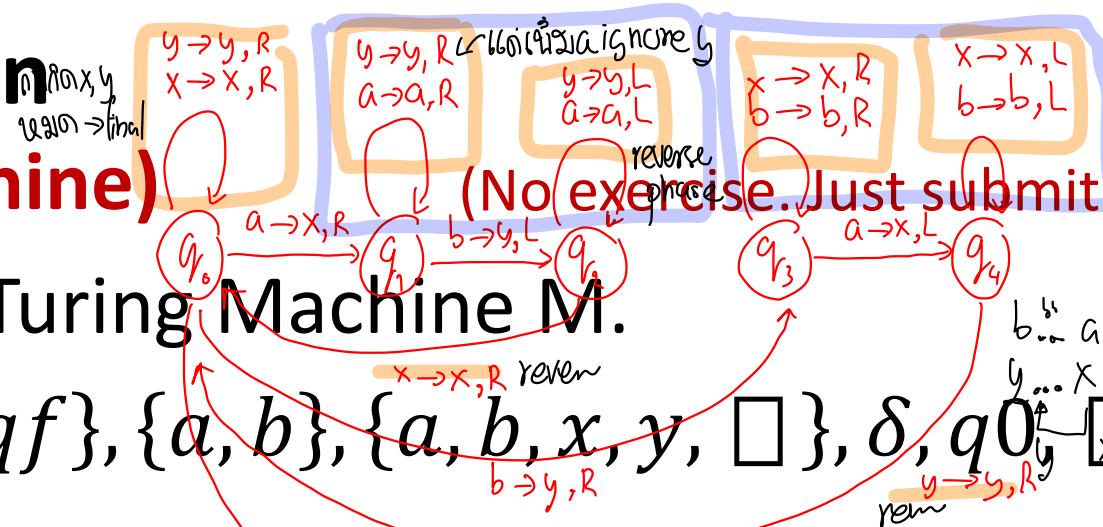
$$\begin{aligned} \delta: \delta(q_0, x) &= (q_0, x, R), \\ \delta(q_0, y) &= (q_0, y, R), \\ \delta(q_0, a) &= (q_1, x, R), \\ \delta(q_0, b) &= (q_3, y, R), \\ \delta(q_0, \square) &= (q_f, \square, L), \end{aligned}$$

$$\begin{aligned} \delta(q_1, a) &= (q_1, a, R), \\ \delta(q_1, y) &= (q_1, y, R), \\ \delta(q_1, b) &= (q_2, y, L), \end{aligned}$$

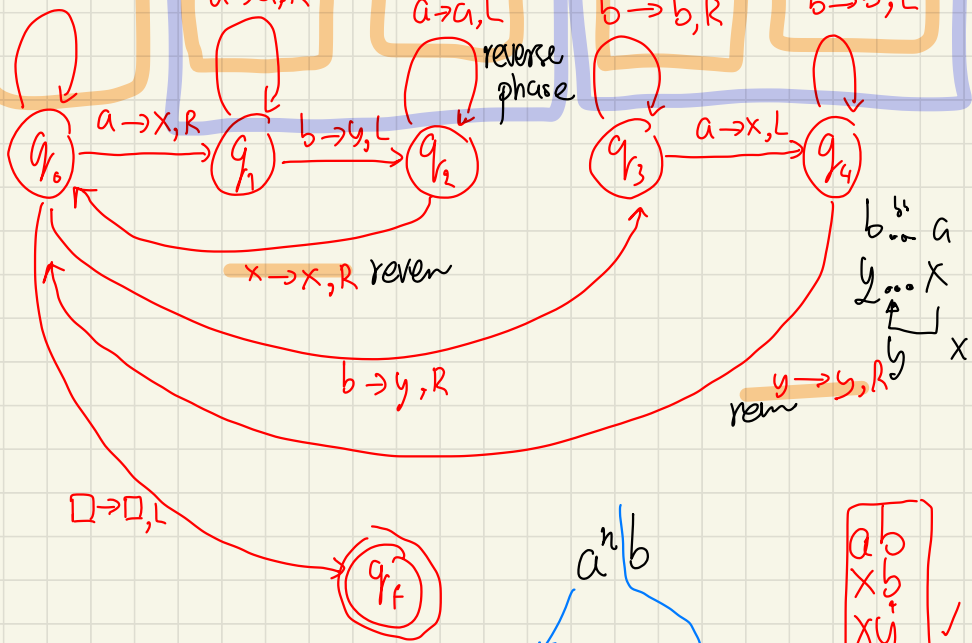
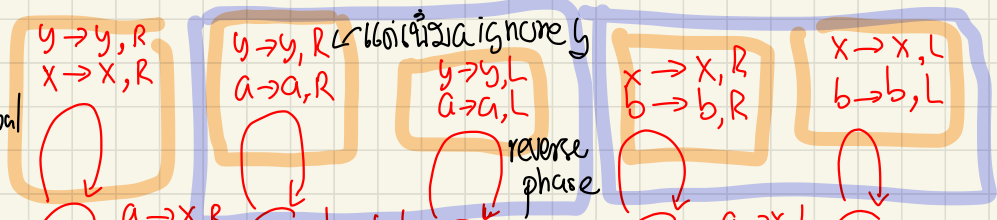
$$\begin{aligned} \delta(q_2, a) &= (q_2, a, L), & \delta(q_4, b) &= (q_4, b, L), \\ \delta(q_2, y) &= (q_2, y, L), & \delta(q_4, x) &= (q_4, x, L), \\ \delta(q_2, x) &= (q_0, x, R), & \delta(q_4, y) &= (q_0, y, R) \end{aligned}$$

$$\begin{aligned} \delta(q_3, a) &= (q_4, x, L), \\ \delta(q_3, b) &= (q_3, b, R), \\ \delta(q_3, x) &= (q_3, x, R), \end{aligned}$$

$$L = \{w; n_a(w) = n_b(w)\}$$



initial x, y
 read \rightarrow final



$b \dots a$
 $y \dots x$
 \uparrow
 x

$n_a = n_b$

