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Here, the formal description of Turing machine T_1 and T_2 need to be defined. A finite state transducer (FST) is formally defined by the $(Q, \Sigma, \Gamma, \delta, q_0)$ tuple, where:

• The finite set of states is Q.

• The input alphabet is Σ.

• The output alphabet is Γ.

• The transition function δ takes a state and an input symbol and returns a state and an output symbol.

$\delta : Q \times \Sigma \rightarrow Q \times \Gamma$

• The start state q_0.

The finite state transducer T_1 is formally defined by the $(\{q_1, q_2\}, \{0,1,2\}, \{0,1\}, \delta_1, q_1)$, where the transition function δ_1 is as follows:

Input / *State*	0	1	2
q_1	$\{q_1, 0\}$	$\{q_1, 0\}$	$\{q_2, 1\}$
q_2	$\{q_1, 0\}$	$\{q_2, 1\}$	$\{q_2, 1\}$

The second FST is defined as $T_2 = (\{q_1, q_2, q_3\}, \{a, b\}, \{0,1\}, \delta_2, q_1)$. The transition function δ_2 is given by:

Input / *State*	*a*	*b*
q_1	$\{q_2, 1\}$	$\{q_3, 1\}$
q_2	$\{q_3, 1\}$	$\{q_1, 0\}$
q_3	$\{q_1, 0\}$	$\{q_2, 1\}$