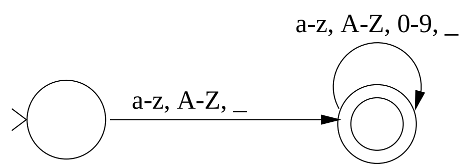
CS4124 Homework #2 Solution

3

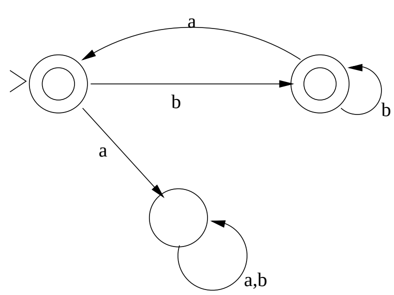


4

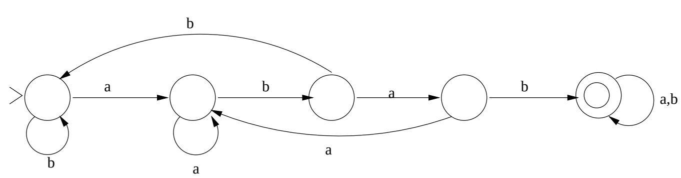
If the alphabet is infinite, a DFSA **can** have infinite computation. However, it **cannot** if the alphabet is finite.

2.1.3

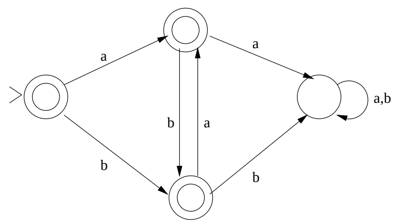
(a)



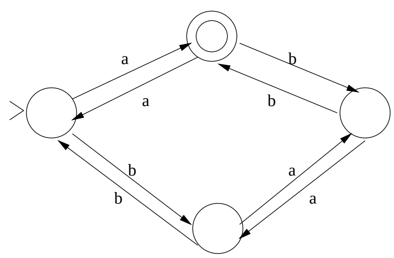
(b)



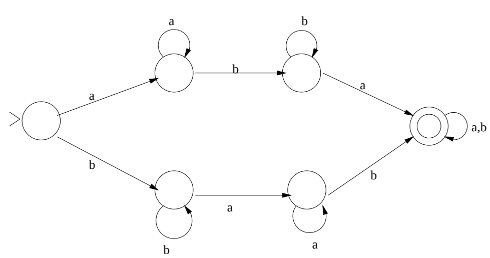
(c)



(d)



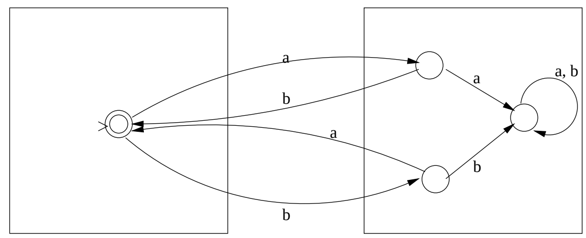
(e)



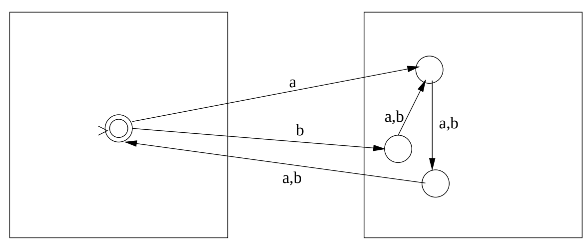
2.1.5

(a)

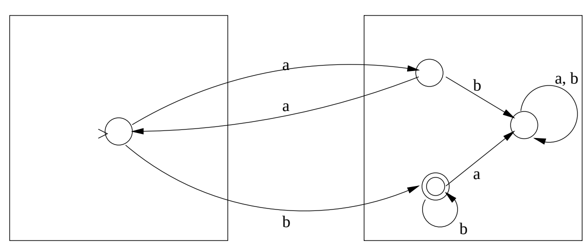
(i)



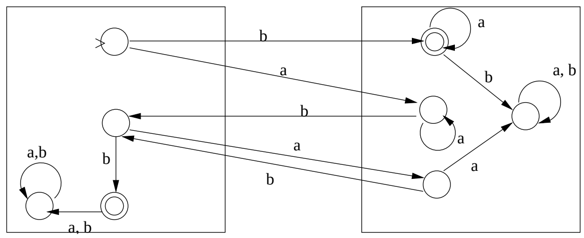
(ii)



(iii)



(iv)



(b) Define a deterministic 2-tape finite automaton to be a sextuple $(K_1, K_2, \Sigma, \delta, s, F)$, where

K_1 and K_2 are finite and disjoint sets of states,

Σ is an alphabet,

$s \in K_1 \cup K_2$ is the initial state,

$F \subseteq K_1 \cup K_2$ is the set of final states,

δ is a function from $(K_1 \cup K_2) \times \Sigma$ to $(K_1 \cup K_2)$

A configuration for such a machine is an ordered triple (q, w_1, w_2), where $q \in K_1 \cup K_2$ is the current state, $w_1 \in \Sigma^*$ is the remaining input on the first tape, and $w_2 \in \Sigma^*$ is the remaining input on the second tape.

We define the relation $(q, w_1, w_2) \vdash_M (q', w_1', w_2')$ to hold between two states when the machine can pass from the first to the second in a single move. Formally, this means that either

- $q \in K_1, w_1 = \sigma w_1', and\ \ w_2 = w_2'$, where $\delta(q, \sigma) = q'$, or
- $q \in K_2, w_1 = w_1', and\ \ w_2 = \sigma w_2'$, where $\delta(q, \sigma) = q'$.

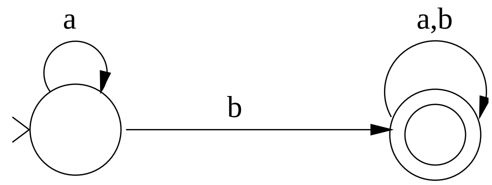
We define $\vdash_M^*$ to be the reflexive transitive closure of $\vdash$.

We say thta M accepts an ordered pair of strings (w_1, w_2), $w_1, w_2 \in \Sigma^*$, if $(s, w_1, w_2) \vdash_M^* (q, e, e)$ for some $q \in F$.

Finally, if $L \subseteq \Sigma^* \times \Sigma^*$ is a set of ordered pairs of strings, we say that M accepts L if M accepts (u, w) if and only if $(u, w) \in L$.

2.2.9

(a)



(b)