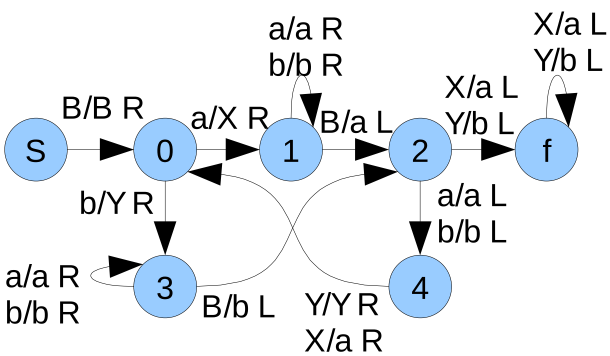
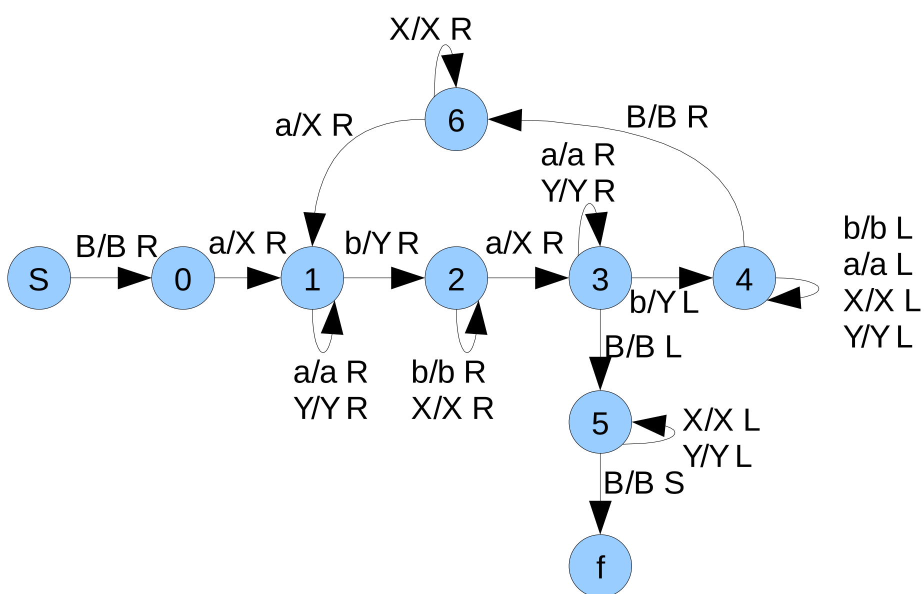
Languages and Machines

Ex Chap 8 (p 291): 3b, 5b, 24, 25

3.
(b)



5.
(b)



24

Prove: all languages accepted by non-deterministic Turing machines are also accepted by deterministic Turing machines. Or, more generally, all non-deterministic Turing machines are equivalent to some deterministic Turing machine.

To prove this, we simply need to turn to the theorems in chapter 5 proving the equivalence of deterministic and non-deterministic FSM. Using the algorithms there to convert non-determinism to determinism would seem to be all that is required (this feels too easy...).

25

Prove: all finite languages are recursive.

Theorem 8.8.7 states that a language is recursive if it can be enumerated in lexicographic order. Since our language is a finite set, and all finite sets are countable (see lemma), then our language must be recursive.

Lemma: all finite sets are enumerable:
Let S be a finite set and $|S|=n$.
Let $N = \{1,2,...,n\}$.
Let s be an element in S and assign $f(n) = s$.
Let $S' = S - \{s\}$.
Let s' be an element of S' and assign $f(n - 1) = s$.
Continue until all elements of the set have been assigned a natural number. This is an enumeration of S.