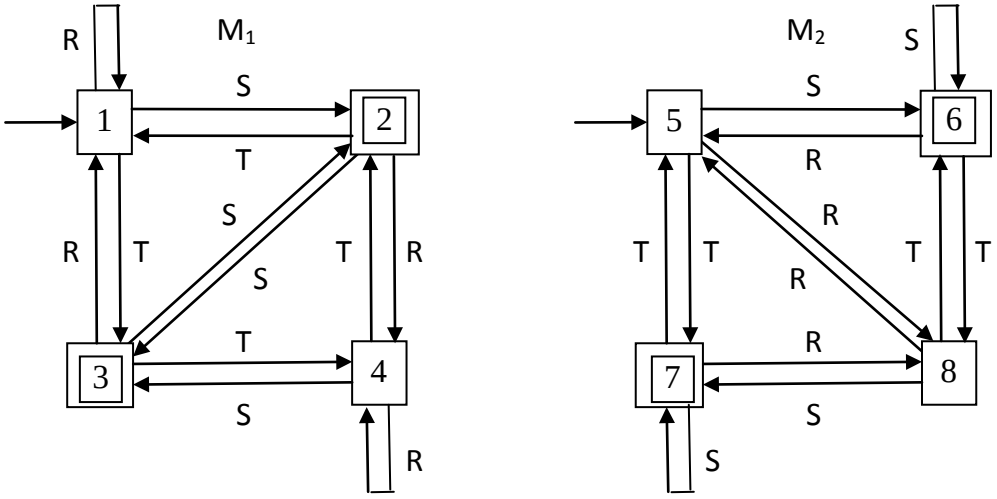
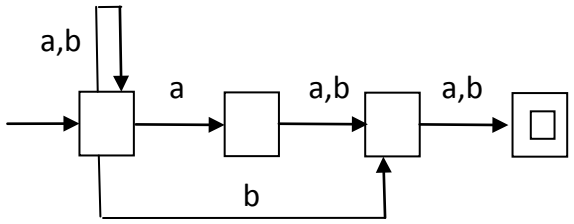
CS 475/575 Exam 1 **Spring 2011** **Name _____**

1. For each of these finite-state machines M_1 and M_2, write an accepting computation sequence using input string RSRSTT.



2. Prove by mathematical induction that the two finite-state machines given in problem 1 are equivalent; that is, for every input string w of every length $n \geq 0$, prove $w \in L(M_1)$ iff $w \in L(M_2)$.

3. Draw a deterministic finite-state machine that is equivalent to the following non-deterministic finite-state machine:



4. Let input alphabet {L, U, D, P} represent these four categories: lowercase, uppercase, digit, punctuation. Define a *strong* password as any string that contains at least two symbols from each category. Also define a *weak* password as any string that is not a strong password. Draw a *non*-deterministic finite-state machine that accepts *weak* passwords.

5. Draw a deterministic finite-state machine that accepts the set of strings over alphabet {a,b} that contain at least one of the following: the substring aaa, or the substring bbb, or two aa substrings, or two bb substrings.

6. Draw a deterministic finite-state machine that accepts the set of valid identifiers in a programming language in which each identifier can be any non-empty string of lowercase letters, other than these specified reserved words: {if, iff, of, off, on, one}.