

Mid-Term Examination, Ling549/CSE 477, Fall, 1997

October 21, 1997

Due Date: October 28, 1997

Problem 1 (10 points):

Let A be the set of all English words. Let R be a relation such that aRb iff a is at least as long as b .

- Is R a partial order?
- a linear order?
- an equivalence relation?

Problem 2 (10 points):

State whether each of the following is true or false:

1. $\phi \in \phi$
2. $\phi \subseteq \phi$
3. $\phi \in \{\phi\}$
4. $\{a, b\} \in P\{a, b, \{a, b\}\}$
5. $\{a, b\} \subseteq P\{a, b, \{a, b\}\}$

Problem 3 (25 points):

Show that in any group of people there are at least two persons that have the same number of acquaintances within the group. (Hint: Use the notion of one-to one correspondence.)

Problem 4 (20 points):

Construct a finite state automaton M (i.e., the state diagram) with $\Sigma = \{a, b\}$ and $L(M) =$ the set of all strings that do NOT contain aab .

If M is nondeterministic then construct M' such that M' is deterministic and $L(M) = L(M')$.

Problem 5 (20 points):

Write a regular expression for the language accepted by the finite state machine, M in Figure 1.

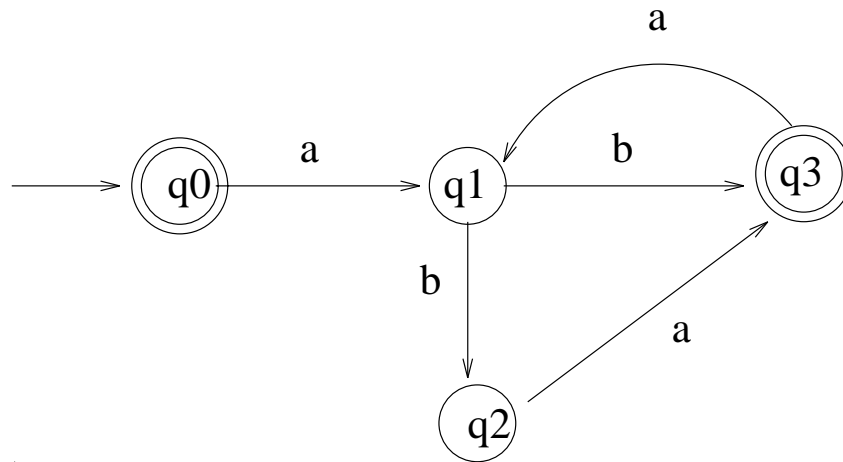


Figure 1: Finite State Automaton M

Problem 6 (15 points):

Which one of the following are true?

1. $baa \in a^*b^*a^*b^*$
2. $b^*a^* \cap a^*b^* = a^* \cup b^*$
3. $a^*b^* \cap c^*d^* = \phi$