CS 3350 Spring 2013 midterm exam

1. (20 pts) Give an example of each of the following. In all questions, the alphabet is $\{a, b\}$. If no example exists, answer "impossible". No justification needed.

   (a) Eight different substrings of *abab*.

   (b) Eight different suffixes of *abababa*

   (c) A finite automaton for the language $\{\varepsilon, ab\}$.

   (d) An NFA for the language $\{\varepsilon, ab\}$.

   (e) An NFA which is not a DFA.

   (f) A language L such that $L \cup L \neq L$.

   (g) An NFA with 3 states, all accepting.

   (h) A finite automaton for $\{\varepsilon\}$ with 4 states, all accepting.

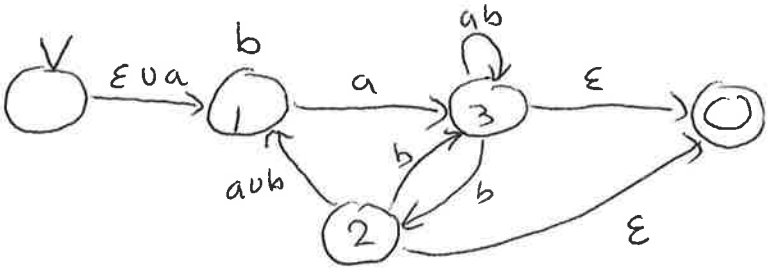
   (i) An infinite regular language.

   (j) A language L_2 such that $L_2 \cdot L_2$ (concatenation) has exactly 8 strings.

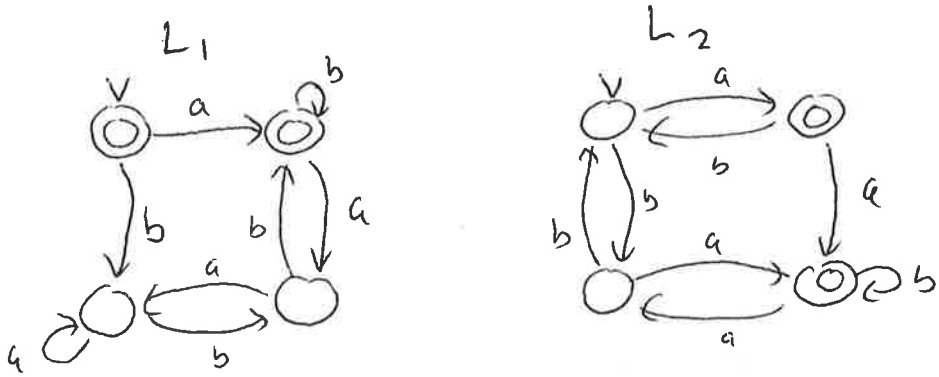
   (k) Two different languages L_1 and L_2 such that $L_1 \subset L_2$.

2. (20 pts) Construct a regular expression for all words over $\Sigma = \{a, b\}$ that have at least one b and that have an even number of a after the last b.

3. (20 pts) During the algorithm for finding a regular expression corresponding to a Finite Automaton, we have readched the following GNFA. Perform one more step of the altorithm b removing state number 3 and updating the appropriate transitions.



4. (20 pts) Below are two Finite Automata for languages L_1 and L_2./ Construct an NFA that accepts the concatenation of the languages: $L_1 \cdot L_2$.



5. (20 pts) Below is an NFA for a language L. Follow our general algorithm to construct a DFA for L. You don't need to include unreacheable states.