Homework 1

Cpt S 317, Spring 2017

Due Date: January 30, 2017

Total points: 25

Any answer that involves a design for a Finite Automaton (DFA or NFA) should contain information about the following five components of the FA (corresponding to the 5-tuple description):
i) The set of states Q; ii) the alphabet Σ; iii) the start state; iv) the set of final states F; v) the set of transitions δ, which can be either shown in the form of a state diagram (preferred) or a transition table. You can either present the answer in the form of a state diagram with all the above information (as shown in the left side of slide #8 in the Finite Automata lecture notes) or in the tabulated form (as shown in the right side of the same slide). State diagram representation is preferred.

Also, please look at the PDF for "Rubrics" that describes how this homework will be graded.

A digital version of this homework in PDF and the Rubrics in PDF are available at `http://www.eecs.wsu.edu/~ananth/CptS317`.

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1. Give a DFA for each of the following languages defined over the alphabet $\Sigma = \{0, 1\}$:

   a) (3 points) L={ w | w contains the substring 101 }

   b) (3 points) L={ w | w ends in 001 }

c) (4 points) L={ w | w has a 1 in its 2^{nd} last position, if such a position exists}

2. (5 points)

   Give a DFA for the following language over the alphabet $\Sigma = \{0, 1, 2\}$:

   L={ w | the sum of the symbols in w is a multiple of 3}

   For example, 021201 is part of the language because the sum of all its symbols equals 6 (6 mod 3 = 0); whereas, 010012 is not in the language because it sums up to 4 (4 mod 3 = 1).

3. (5 points)

   Give a DFA for the following language over the alphabet $\Sigma = \{0, 1\}$:

   L={ w | every <u>odd</u> position in w (if the position exists) is a 1 }. Assume string positions are indexed from 1. For example, the string $1011101 \in L$ but the string $1001 \notin L$.

4. (5 points)

   Give a DFA for the following language over the alphabet $\Sigma = \{0, 1\}$:

   L={ w | w starts with 1 and has odd length, or starts with 0 and has even length }.

   E.g., strings 1101011, 000101 are in L, while 1011 and 00001 are *not* in L.