Automata and Grammars

Seminar 4

1. Describe a reduction between Mealy and Moore machine.

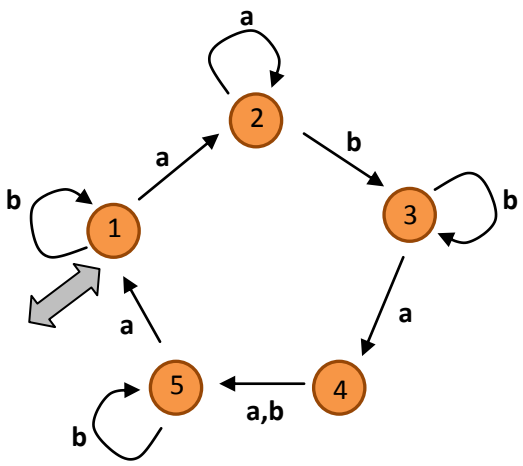
2. Describe a Mealy or Moore machine, that implements the following operation over bit vectors:
   a) bit-wise OR of bit vectors
   b) bit-wise AND of bit vectors
   c) arithmetic sum of bit vectors
   Suggest the design of the input alphabet.

3. Consider a simplified HTML that has only the following tags:
   , ,
   <a>, ,
   <table>, </table>,
   <tr>, </tr>,
   <td>, <td>;
   all without attributes. Is it possible to construct a DFA such that it can recognize that the input text is correctly formatted simplified HTML text?

4. Let A and B be DFAs over alphabet X. Suggest an algorithm that decides whether:
   a) $L(A) = \emptyset$
   b) $L(A) = L(B)$
   c) $L(A) \subseteq L(B)$
   d) $L(A) = X^*$
   e) $L(A)$ is infinite

5. Let $L = \{w | w \in \{0,1\}^* \wedge (\exists k \in \mathbb{N}_0) |w|_1 = 2k\}$ and $K = \{w | w \in \{0,1\}^* \wedge (\exists k \in \mathbb{N}_0) |w|_1 = 3k\}$. Describe languages L/K and $K \setminus L$? Construct DFAs that accepts L/K and $K \setminus L$ respectively.

6. Consider finite automaton A described by the following state transition diagram:



Construct finite automata that accept following languages:

a) $L_1 = \{w|(\exists u, v \in X^*)w = uv \wedge uav \in L(A)\}$
b) $L_2 = \{w|(\exists u, v \in X^*)w = uv \wedge (uav \in L(A) \vee ubv \in L(A))\}$
b) $L_3 = \{w|(\exists u, v \in X^*)w = uav \wedge uv \in L(A)\}$