Automata Theory - Quiz I

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1 Instructions

- 1. The quiz is to be turned in by 12:15 pm.
- 2. The quiz is closed-book, although you are permitted one cheat sheet.
- 3. Each question is worth 3 points.
- 4. Attempt as many problems as you can. You will be given partial credit, as per the policy discussed in class.
- 5. The solutions have been posted on the class URL.

2 Problems

1. Induction: Show that

$$\sum_{i=1}^{n} i^2 = \frac{n \cdot (n+1) \cdot (2 \cdot n + 1)}{6}.$$

2. Language Properties: Let Σ denote an alphabet and let $L \subseteq \Sigma^*$ denote some language. The Kleene closure of L, viz., L^* , is also a language over Σ . Recall that L^* is defined as:

$$L^* = \bigcup_{i=0}^{\infty} L^i.$$

Argue that $(L^*)^* = L^*$, for any language L.

3. Regular Expression conversion: Write a regular expression for the language represented by the FSA in Figure (1).



Figure 1: FSA to Regular Expression

4. **Regular Grammars:** Construct a right-linear grammar for the language $L((aab^*)^*)$.

5. State Minimization: Minimize the number of states in the DFA shown in Figure (2).



Figure 2: DFA State minimization