600.271 Automata & Computation Theory
Mid-Semester Examination
October 13, 2009
In-class, Closed Book, Time: 1 hr, 15 mins

All the subproblems carry equal weight. There are 5 subproblems in this examination.

I. Design the specified automaton for every one of the following languages.

1. An nfa for the regular expression $(a+b)^*(b+c)a^* \ + \ (c+(a+b)a^*b)^*$.

2. A dpda for the language $L_1 = \{xc^id^jc^ix^R |\ x \in \{a,b\}^*,\ i,j \geq 1,\ (|x|+i)(\text{mod } 2) \ = \ j(\text{mod } 2)\}$.

3. A dlba for the language $L_2 = \{a^i b^j c^{2ij} |\ i, j \geq 1\}$.

4. A CFG for the language $L_3 = \{xc^i x^R |\ x \in \{a, b\}^*,\ i \geq 0,\ |x| (\text{mod } 2) \ = \ i (\text{mod } 2)\}$.

II. Prove that the following language is not an fa language
$L_4 = \{a^i b^j |\ i \geq j \geq 100\}$.