CIT 596 – Theory of Computation
Spring 2005, 212 Moore, TR 12-1.30PM

Homework Assignment 4

Due: Tuesday, February 15, 2005, by 12 PM (IN CLASS)

Name: __________________________________________
Student ID (8 digits): ______________________________
Email: ___________________________________________
Signature: ________________________________________

PLEASE, READ THE FOLLOWING INSTRUCTIONS:

• Fill out this form with your name, student ID, email, and signature and return it as the cover page of your homework.
• Turn in your homework at the beginning of your class on the due date described at the top of this page.
• Late assignments will be penalized 25% and will not be accepted after 1:30PM of the day following the due date.
• Late assignments must be turned in to Janean Williams in room 308, 3rd floor, Levine Building.
• All writings must be neat, well-organized, and include sufficient explanations in the delineation of the solutions.
• Full credit will be given only in the case where the correct answer has been properly justified with complete explanations.
• Good luck!

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<thead>
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<th>Question</th>
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<th>3</th>
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<td>Max</td>
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TOTAL: __________________________________________
Problem 1 [25 points]

Consider the $\epsilon$-NFA $M = (Q, \Sigma, \delta, q_0, F)$, where $Q = \{s_0, s_1, s_2, s_3\}$, $\Sigma = \{a, b, c\}$, $q_0 = s_0$, $F = \{s_3\}$, and $\delta : Q \times (\Sigma \cup \{\epsilon\}) \to \mathcal{P}(Q)$ is the transition function such that

<table>
<thead>
<tr>
<th>$\delta$</th>
<th>$a$</th>
<th>$b$</th>
<th>$c$</th>
<th>$\epsilon$</th>
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<tbody>
<tr>
<td>$s_0$</td>
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Then,

(a) Compute $\epsilon$-closure of $s_0$.
(b) Compute $\epsilon$-closure of $s_1$.
(c) Compute $\epsilon$-closure of $s_2$.
(d) Compute $\epsilon$-closure of $s_3$.
(e) Compute $\delta(s_0, aabc)$. 
Problem 2 [25 points]

Build a nondeterministic finite automaton (NFA) \textit{without} \(\epsilon\)-transitions that recognizes the same language recognized by the \(\epsilon\)-NFA in the previous problem.
Problem 3 [50 points]

Given a nondeterministic finite automaton (NFA) $N$ without $\epsilon$-transitions, prove that it is possible to construct a nondeterministic finite automaton $N_1$ with $\epsilon$-transitions such that $N_1$ has exactly one final state, and $L(N_1) = L(N)$.