CSA 2080
Core Computer Science 2:
Formal Languages and Automata

Assignment 3

This assignment is worth 15% of the final mark of the Formal Languages and Automata course. The documentation explaining your results are to be handed to the departmental secretary by Tuesday 2nd May 2006. Assignments handed in late will be marked down by 3 marks (out of 15) per day. No assignments will be accepted after Friday 6th May 2006.

The Department of Computer Science and AI takes a very serious view on plagiarism. Refer to the departmental website on plagiarism for more details:

http://www.cs.um.edu.mt/resources/plagiarism/

You are to solve all of the following problems.

1. Consider the finite state machine $M$:

(a) State whether it is deterministic or non-deterministic
(b) Give a formal description for $M$, using the appropriate mathematical constructs
(c) Prove that the string $abbb$ is accepted by $M$
(d) Prove that the string $cbb$ is rejected by $M$

2. Give non-deterministic finite state automata accepting the following languages

(a) $\{wab \mid w \in \{a, b\}^*\}$
(b) $\{w_1abw_2 \mid w_1, w_2 \in \{a, b\}^*\}$
(c) $\{w \mid w \neq w_1abw_2 \text{ where } w_1, w_2 \in \{a, b\}^*\}$
(d) $\{w \mid w \in \{a, b\}^* \} / \{w \mid w \in \{a, \}^*\}$

3. Give deterministic finite state automata that accept the languages described by the following regular expressions

(a) $ab + ac$
(b) $a(b + c)$
(c) $ac + bc$
(d) $a(c + b)c$
(e) $a(ab)^+a$
4. Give regular expressions for the languages accepted by the following deterministic finite state automata

(a)

(b)