ITK 328, Introduction to the Theory of Computation

Programming Assignment I
Convert a regular expression to an equivalent minimized DFA

Worth: 100 points

Due date: April 9, 2009, Thursday

1. Write a program that can take any regular expression as input and convert it to an equivalent minimized DFA as output that accepts the same language represented by the regular expression.

   - You can use any programming language and data structures in your program. A graphic interface and window programming are not necessary. However, necessary output directly from the program to show that your program does work is required.
   - You should be aware that the states of your intermediate DFA, ie., the one before minimized, will grow rapidly (more precisely, exponentially). So prepare your data structures to handle the situation.

2. Use your program to do the following tasks.

   (a) Convert the regular expression for signed numeric numbers specified above and the four regular expression used in Exercises 3.2.4 (page 87) into equivalent NFA's.
   (b) Convert the NFA's obtained from (2a) to equivalent DFA's
   (c) Minimize the NFA's obtained from (2b) to equivalent DFA's
   (d) Draw the transition diagrams for each minimized you got. Hand drawing is fine, as long as it is clear.

3. Submit the following:

   (a) A cover page with your name and student ID on it.
   (b) A brief report (no more than 5 pages) .
   (c) A printout of the source code.
   (d) Direct outputs of your program in every stage described in 2 (may use a script file or just copy-and-paste).

4. **Special Notes:**

   - Your score will be given based on the correctness and documentation of your program.
   - You should submit your program and its output and write up a brief report from which I should be able to understand your methods, data structures, and the difficulties you'd faced and your solutions. (I will spend, say, 15 minutes for each report; my extra effort in understanding your work can hurt your score).
   - If your program is correct, I will decrease your scores from 100 points where the amount of decrease is based on what you miss in the report, including programming style, elegancy of the data structures and program logics. If I can't understand what you have done, you will get a low score. If your program is not working, then I will decrease your scores from 70. However, if you claim that your program is correct and I find some obvious loopholes in your program, you will get a score no more than 50. So, if your program has problems known to you, tell me.
   - Plagiarism will get 0 point. Whether or not there is a plagiarism involved would be decided solely based on my judgement. Appeal will be directed to the department directly.