COM 2003
Marked Problems Sheet 1

This problems sheet is to test your understanding of concepts relating to finite automata, regular languages and regular expressions. The sheet will be marked to give you feedback on your understanding, but does not count towards your final mark for the semester. Rather it is an opportunity to practice the kind of problems you will face in the January exam.

Deadline: October 31st 2014

Hand-in: via Regent Court Reception, at James' office hour, or a lecture.

1. For each of the following regular expressions, draw a **DFA** recognising the corresponding language:
    (a) $(0 \cup 1)^*110^*$
    (b) $(11 \cup 10)^*$
    (c) $(1 \cup 110)^*0$

2. (reproduced from Sipser) In certain programming languages,comments appear between delimiters such as /# and #/. Let C be the language of all valid delimited comment strings, so a member of C must begin with /# and end with #/, and have no intervening #/. For simplicity, comments are written from a reduced alphabet, so the alphabet of C is $\Sigma = \{a,b,/,\#\}$.
    (a) Give a **DFA** that recognises C
    (b) Give a regular expression that generates C

3. (reproduced from Sipser) Convert the following two NFAs to DFAs:
(a)   (b)
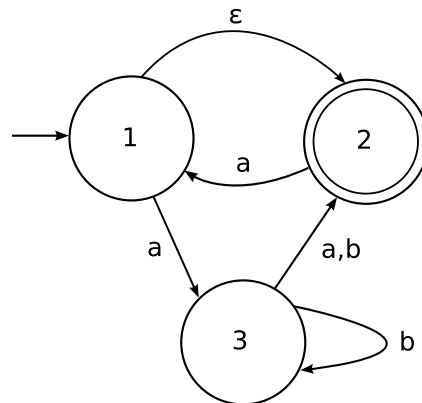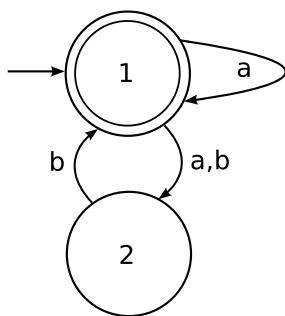
4. Give regular expressions generating the languages recognised by DFAs 3(a) and 3(b) above.

5. Consider the regular expressions: $R1 = a^* \cup b^*$ and $R2 = ab^* \cup ba^* \cup b^*a \cup (a^*b)^*$
    (a) Find a string corresponding to R1 but not to R2
    (b) Find a string corresponding to R2 but not to R1
    (c) Find a string corresponding to both R1 and R2
    (d) Find a string that does not correspond to either R1 or R2