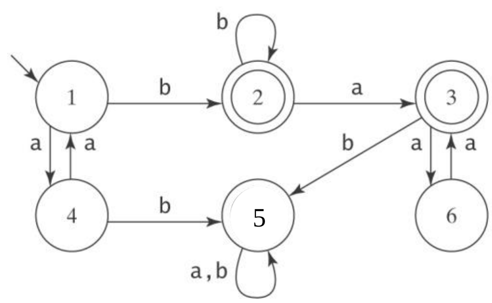
COMP2270/6270 – Theory of Computation
Third week

School of Electrical Engineering & Computing
The University of Newcastle

Exercise 1) (Chapter 5, Exercise 1 of Ref. [1])
Give a clear English description of the language accepted by the following FSM:



Exercise 2) (Chapter 5, Selected cases of Exercise 2 of Ref. [1])
Build a deterministic FSM for each of the following languages

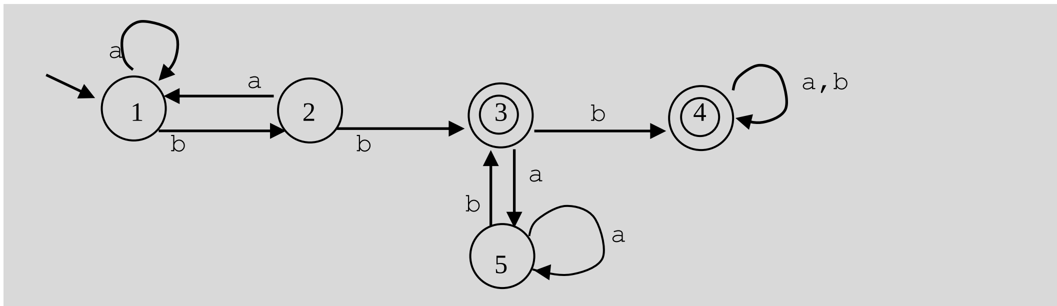
a) L = {$w \in$ {a, b}* : w does not end in ba}.
b) {w ∈ {0, 1}* : w corresponds to the binary encoding, without leading 0's, of natural numbers that are evenly divisible by 4}.
c) L= {w ∈ {0, 1}* : w does not have 001 as a substring}
d) {w ∈ {a, b}* : w has both aa and bb as a substrings}.
e) attempt to solve other exercises from the list of Chapter 5, Exercise 2 of Ref. [1]), (if you are studying with a colleague, attempt different exercises).

Exercise 3) (Chapter 5, Exercise 3 of Ref. [1])
Consider the children's game Rock, Paper, Scissors. We'll say that the first player to win two rounds wins the game. Call the two players A and B.

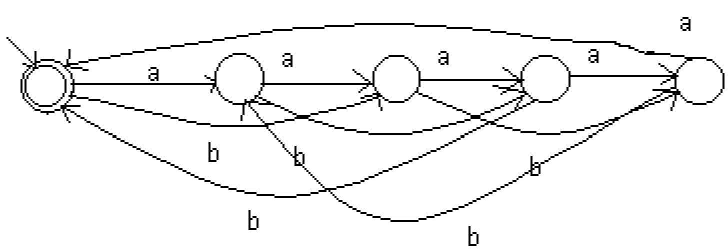
a) Define an alphabet Σ and describe a technique for encoding Rock, Paper, Scissors games as strings over Σ (Hint: each symbol in Σ should correspond to an ordered pair that describes the simultaneous actions of A and B.)

b) Let L_{RPS} be the language of Rock, Paper, Scissors games, encoded as strings as described in part (a), that correspond to wins for player A. Show a DFSM that accepts L_{RPS}.

Exercise 4) You have been given the diagram below and you have been told that it is the diagram of a FSM that recognizes a language L. Give a simple English description for a language that is accepted by this DFSM and an interpretation (also an English description) for each of the states in the DFSM.



Exercise 5) Give a simple English description for a language that is accepted by this DFSM



Exercise 6) For following languages *L* and *L'*

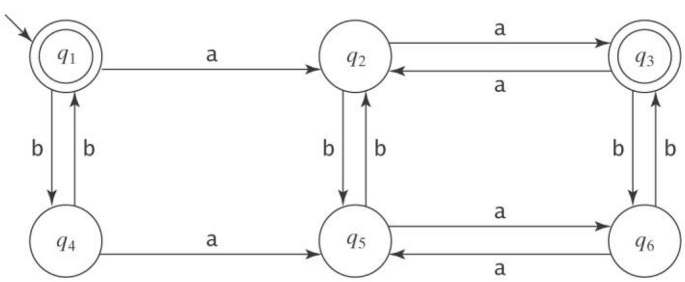
(i) Describe the equivalence classes of $\approx_L$.

(ii) If the number of equivalence classes of $\approx_L$ is finite, construct the minimal DFSM that accepts *L*.

$L = \{w \in \{0, 1\}^* :$ every 0 in w is immediately followed by the string 11$\}$.

$L' = \{ww^R : w \in \{a, b\}^*\}$.

Exercise 7) Let *M* be the following DFSM. Use *minDFSM* to minimize *M*.



REFERENCES

[1] Elaine Rich, Automata Computability and Complexity: Theory and Applications, Pearson, Prentice Hall, 2008.