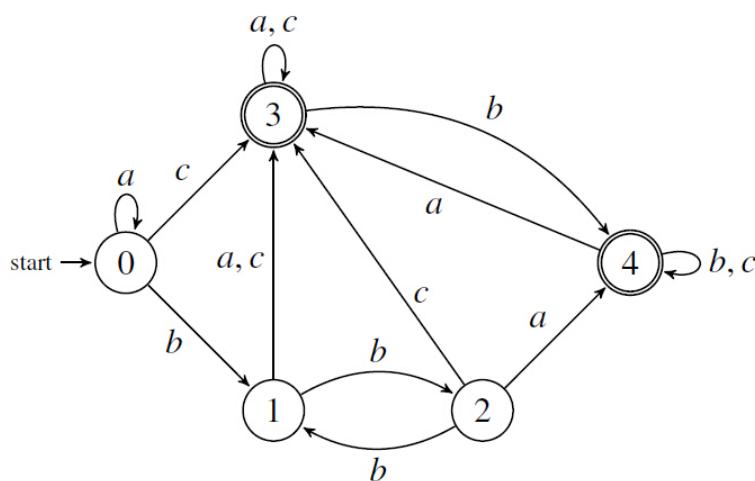


LAC Coursework
Deadline: Tuesday 22nd of May, 2018

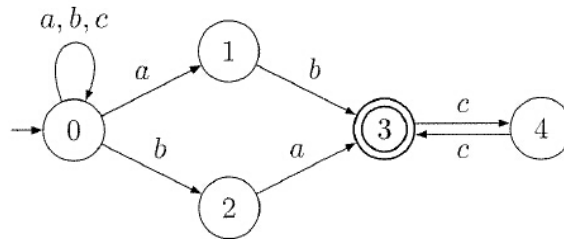
This coursework assignment is worth 25% of your final module grade.

You must submit your work to Moodle as **a single PDF file**. You can use any software (Word, Latex, etc.) to write your answers.

1. Minimise the following Deterministic Finite Automaton (DFA) using the table-filling algorithm. Then draw the transition diagram for the resulting minimal DFA. **(6 marks)**



2. Given the following Nondeterministic Finite Automaton (NFA) N over the alphabet $\Sigma = \{a, b, c\}$, construct a Deterministic Finite Automaton (DFA) $D(N)$ that accepts the same language as N by applying the subset construction. To save work, consider only the reachable part of $D(N)$. Clearly show your calculations in a state-transition table. Then draw the transition diagram for the resulting DFA $D(N)$. Do not forget to indicate the initial state and the final states both in the transition table and the final transition diagram. **(7 marks)**



3. Consider the following Context-Free Grammar (CFG):

$$\begin{aligned}
 S &\rightarrow SpA \mid A \\
 A &\rightarrow BmA \mid B \\
 B &\rightarrow a \mid b \mid c \mid lSr
 \end{aligned}$$

S , A , and B are nonterminals, a, b, c, l, m, p and r are terminals, and S is the start variable. Draw the derivation tree according to this grammar for the word *amlapbpcrma*. **(6 marks)**

4. Consider the language L , defined as “All odd-length strings over $\{a, b\}^*$ with middle symbol a .” **(6 marks)**
- Find production rules for a context free grammar, G , that generates the language $L(G)$.
 - Construct a Pushdown Automaton, A , accepting the same language, $L(G)$. Formally define A stating all transitions and acceptance.
 - Trace the sequence of Instantaneous Descriptions (IDs) for A on accepting input string *ababb*.