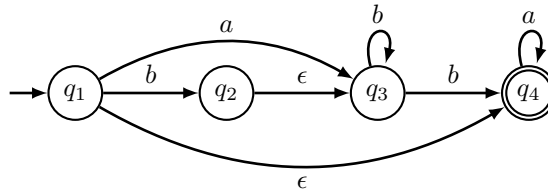


COM2109 Tutorial - Week 4

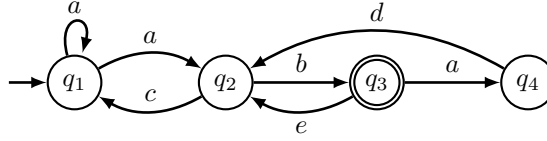
1. A simple tool for matching email addresses checks whether the address starts with letters a-z followed by @ followed by another string of letters, a dot (denoted with \bullet), and then either “uk” or “org”.
 - (a) Give a regular expression for this specification.
 - (b) Draw a DFA to recognise the corresponding language
2. Consider the NFA below with an alphabet $\Sigma = \{a, b\}$, the initial state is q_1 and the accept state is q_4 :



Which states will be entered by strings described by the following regular expressions:

- (a) a^* .
 - (b) bb^* .
 - (c) ab^* .
 - (d) b^4 .
 - (e) a^2b .
3. Simplify the following regular expressions:
 - (a) a^*a^* .
 - (b) $a(b^* + b)^*$.
 - (c) $(a^*a)^*$.

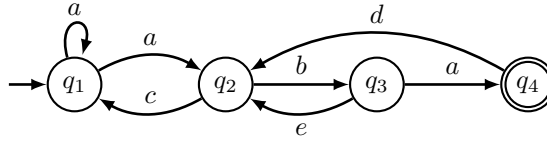
4. (a) Consider the following NFA:



Which of the regular expressions correspond to the language accepted by this NFA? Either respond with 'yes' if the regular expression describes the language accepted by this NFA or provide a counterexample in a form of a sequence that is either accepted by NFA but is not part of the sequences permitted by the regular expression or is a sequence permitted by a regular expression that is not accepted by the NFA.

- i. $a^*a(ca^*a + be)^*ba(d(ca^*a + be)^*ba)^*$.
- ii. $a^*a(ca^*a + (be)^*)^*ba(d(ca^*a + (be)^*)^*ba)^*$.
- iii. $a^*a(ca^*a + be)^*ba(d(ca^*a)^*ba)^*$.
- iv. $aa(ca^*a + (be)^*)^*ba(d(ca^*a + (be)^*)^*ba)^*$.
- v. $a^*a(ca^*a + be)^*ba(d(ca^*a + be^*)^*ba)^*$.

(b) Consider the following NFA:

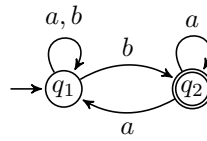


Which of the regular expressions correspond to the language accepted by this NFA? Either respond with 'yes' if the regular expression describes the language accepted by this NFA or provide a counterexample in a form of a sequence that is either accepted by NFA but is not part of the sequences permitted by the regular expression or is a sequence permitted by a regular expression that is not accepted by the NFA.

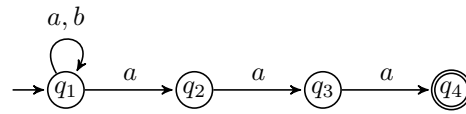
- i. $a^*a(ca^*a + be)^*ba(d(ca^*a + be)^*ba)^*$.
- ii. $a^*a(ca^*a + (be)^*)^*ba(d(ca^*a + (be)^*)^*ba)^*$.
- iii. $a^*a(ca^*a + be)^*ba(d(ca^*a)^*ba)^*$.
- iv. $aa(ca^*a + (be)^*)^*ba(d(ca^*a + (be)^*)^*ba)^*$.
- v. $a^*a(ca^*a + be)^*ba(d(ca^*a + be^*)^*ba)^*$.

5. Using the algorithm from the lectures, construct regular expressions for the following automata.

(a)



(b)



(c)

