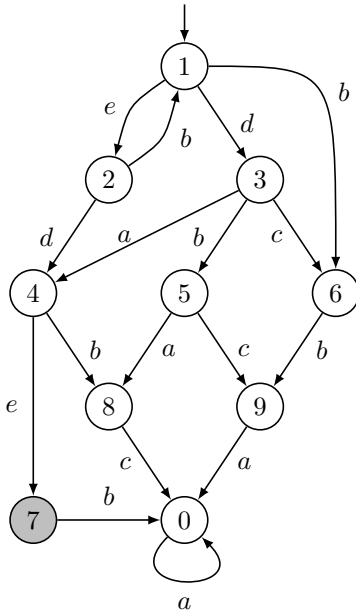

5. Give a Büchi automaton (with alphabet $\{\emptyset, \{p\}, \{q\}, \{p, q\}\}$) that accepts $\mathbf{F G}(\mathbf{X}p \rightarrow q)$. (3p)

6. Partial-order reduction

Consider a Kripke structure $\mathcal{K} = (\{0, \dots, 9\}, \rightarrow, 1, AP, \nu)$, where $AP = \{p\}$, $\nu(p) = \{7\}$, and whose transitions, labelled with actions from the set $A = \{a, b, c, d, e\}$, are shown below.



(a) Find all pairs of actions that depend on each other. (2p)

(b) Check whether the reductions given in i. through iv. conform with conditions C0–C3. If a reduction violates one of the conditions, please explain why.

i. $red(0) = \emptyset$

ii. $red(1) = \{b, d\}$

iii. $red(2) = \{d\}$

iv. $red(3) = \{a, c\}$

In each case assume that $red(s) = en(s)$ for all $s \in S$ where $red(s)$ is not given explicitly. (4p)

7. Model-checking

(a) Describe the model-checking procedure for checking an LTL formula against a P/T net. (3p)

(b) Describe the main ideas for an algorithm to check the emptiness of a Büchi automaton. (3p)