- These problem sets are not graded. However students are strongly encouraged to solve these problems and submit solutions for feedback.
- Submissions shall be accepted till Thursday, 16th January 2020 for feedback. Feel free to contact the TA in case of any doubts.

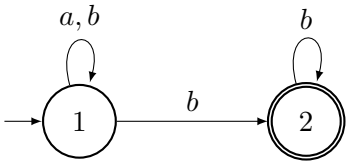

Figure 1: NBA A

Let L be the language accepted by the NBA A given in Figure 1. Let $h(u) \in \{0,1,2\}^{Q^2}$ be the flow matrix corresponding to the word u for the automata A.

1. For the following words, find $h(u)$: (a) ε (b) $bbaa$ (c) bb (d) $babb$

   Let $\mathbb{M} = \{h(u) \mid u \text{ word given in question 1}\}$
2. Give a DFA for $h^{-1}(M)$ for each $M \in \mathbb{M}$.
3. Which matrices $M \in \mathbb{M}$ are idempotent?
4. Which members of $\mathbb{M} \times \mathbb{M}$ are linked pairs?
5. Assuming $h^{-1}(M) = \emptyset$ for all $M \notin \mathbb{M}$, give an expression for L in terms of $h^{-1}(M)$.
6. Assuming $h^{-1}(M) = \emptyset$ for all $M \notin \mathbb{M}$, give an expression for L^c in terms of $h^{-1}(M)$.