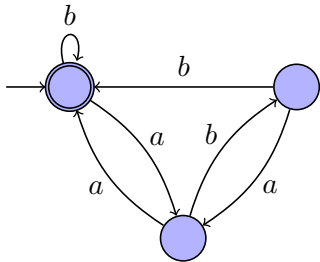**Automata, Games, and Verification**

Please send a mail to agv15@react.uni-saarland.de if you can't make it to the discussion session.

1. In a Safra tree, there can be a node whose macrostate is empty.

   ☐ True   ☐ False

2. Consider the following Büchi automaton $\mathcal{A}$. Is there an LTL formula φ such that $\mathcal{L}(\mathcal{A}) = \mathcal{L}(\varphi)$?
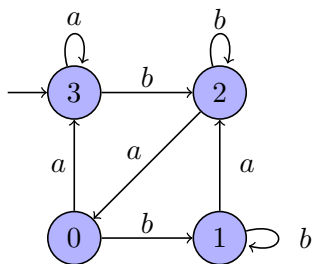

   ☐ Yes   ☐ No

3. Which of the following are true?

   ☐ $\alpha \models \Box(\bigcirc\varphi \to \Diamond\bigcirc\psi) \;\Leftrightarrow\; \alpha \models \bigcirc\Box(\varphi \to \psi)$

   ☐ $\alpha \models \Box\Diamond\varphi \wedge \Diamond\Box\psi \wedge (\psi \to \neg\varphi) \;\Leftrightarrow\; \alpha \models \psi\,\mathcal{U}\,\neg\varphi \wedge \Diamond\varphi$

   ☐ $\alpha \models \varphi\,\mathcal{U}(\psi \vee (\varphi'\,\mathcal{U}\,\psi)) \;\Leftrightarrow\; \alpha \models (\varphi \vee \varphi')\,\mathcal{U}\,\psi$

   ☐ $\alpha \models \Box(\varphi\,\mathcal{U}\,\psi) \;\Leftrightarrow\; \alpha \models \Box\Diamond\psi \wedge \Box\varphi$

   ☐ $\alpha \models \bigcirc\bigcirc\Diamond\varphi \wedge \bigcirc(\psi\,\mathcal{U}(\Diamond\Box\neg\varphi)) \;\Leftrightarrow\; \alpha \models \Diamond(\psi \wedge \varphi)$

4. In a Safra tree, the macrostate of each node is a strict subset of the macrostate of its parent (if it has one).

   ☐ True   ☐ False

5. Consider the following parity automaton $\mathcal{A}$. Is $\mathcal{L}(\mathcal{A})$ non-counting?

   ☐ Yes   ☐ No

6. Every non-counting language is Büchi-recognizable.

   ☐ True   ☐ False

7. Let L and L' be two non-counting languages, then also

   ☐ $L \cup L'$ is non-counting.   ☐ $L \cap L'$ is non-counting.   ☐ $L \times L'$ is non-counting.

8. Consider Construction 6.7 of the lecture notes. Is there an automaton $\mathcal{A}$ such that the empty tree is reachable from the initial state in the constructed automaton $\mathcal{A}'$?

   ☐ Yes   ☐ No