

## Verification

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### Problem 1: LTL vs. CTL [2 Points]

Prove that there does not exist an equivalent LTL-formula for the CTL-formula

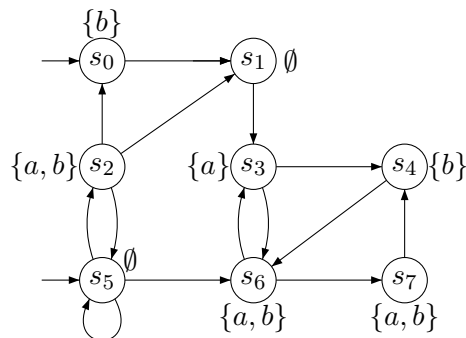
$$\Phi = \text{AF}(a \wedge \text{EX} a).$$

### Problem 2: CTL\* Model Checking [10 Points]

Consider the CTL\*-formula (over  $AP = \{a, b\}$ )

$$\Phi = \text{AFGEX}(a \text{ UEG } b)$$

and the transition system  $TS$  given below:



Apply the CTL\* Model Checking Algorithm to compute  $Sat(\Phi)$  and decide whether  $TS \models \Phi$ .  
*Hint:* You may infer the satisfaction sets for LTL formulas directly.

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The following exercises belong to the afternoon session.

### Problem 3: Bisimulation [5 Points]

Which of the following transition systems are bisimulation equivalent? Justify your answers by providing bisimulations or  $CTL_{\setminus U}$  formulae that distinguish the considered transition systems. (Note that a  $CTL_{\setminus U}$  formula contains no U-operator or its derived operators.)

