Part 1 (Composition Synthesis)
Given the following target $T$ service and available services $A_1, A_2$, check whether a composition exists. If it does exist, produce the output relation of orchestrator generator. If not, single out the target state that cannot be simulated (ND-simulated), and propose a change to the available services so as to guarantee the composition.

(Notice: to check for composition existence, build asynchronous product of available services and check simulation/ND-simulation as appropriate.)

$$\begin{array}{c}
T \\
\begin{array}{c}
\bullet \\
a \\
\downarrow a \\
\bullet a2 \\
\downarrow b \\
\bullet \\
\end{array}
\end{array}$$

$$\begin{array}{c}
A_1 \\
\begin{array}{c}
\bullet s1 \\
\downarrow a b \\
\bullet s2 \\
\uparrow a \\
\end{array}
\end{array}$$

$$\begin{array}{c}
A_2 \\
\begin{array}{c}
\bullet q1 \\
\downarrow b \\
\bullet q2 \\
\uparrow a \\
\end{array}
\end{array}$$

Part 2 (Theoretical Question)
Prove that the following claim holds.

**Theorem:** If two states $s, t$ of two finite deterministic transition systems are bisimilar then $s$ is simulated $t$.

Prove also that the converse does not hold by showing a counterexample.