Concurrency Theory

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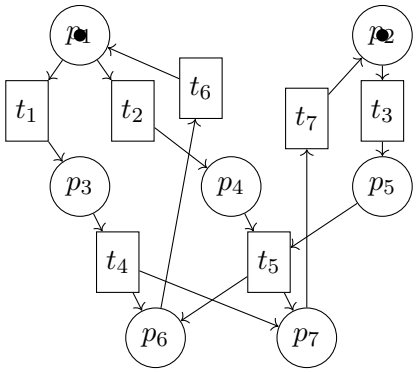
Sheet 11

Due: Monday, 2026-02-02

Exercise 11.1 (Petri Nets)

Consider the following Petri Net:



(a) Construct the Marking Graph for this Petri Net.

(b) List three distributed runs covering at least four transitions. If an infinite run exists, describe it.

Exercise 11.2 (CCS to Petri Net)

Consider the CCS system defined by $A \stackrel{\text{def}}{=} y.A$ and $B \stackrel{\text{def}}{=} x.(A \parallel \overline{y}.\mathbf{0})$.

(a) Draw the LTS for process B.

(b) Construct the corresponding Petri Net and its Marking Graph M.

(c) Prove or disprove: M is strongly bisimilar to the LTS of B.

Exercise 11.3 (Value Passing CCS and Session Types)

Consider a process acting as a recursive one-place buffer. Upon receiving a natural number n, it outputs the value 0 if $n \leq 0$, and $n - 1$ otherwise.

(a) Model this description as a Value Passing CCS equation system.

(b) Model the same description as a π-calculus term.

(c) Determine the session type of the channel used in this term.

(d) Provide a type derivation tree for the term.

If you have questions, please post a message in the dedicated chat.

Note: You may assume the π-calculus is extended with natural numbers and standard arithmetic operations, compared to the system defined in the lecture.