

# Mandatory Assignment 3

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This assignment must be handed in no later than April 13 at noon.

## Question 1 — Structural Congruence and Substitution

**Question 1.1** Use the rules of structural congruence to prove that  $P_1$  and  $P_2$  are structural congruent

$$\begin{aligned} P_1 &= (\nu a)(a\langle b \rangle) \mid a\langle c \rangle \\ P_2 &= (\nu a')(a\langle d \rangle) \mid a'\langle b \rangle \end{aligned}$$

**Question 1.2** Perform the following (capture free) substitution

$$(a\langle b \rangle).b \mid (\nu c) b\langle c \rangle \{c/b\}$$

## Question 2 — Equivalences

This question should first be answered after Lecture 9, since it depends on the material presented there (*trace-* and *bisimulation equivalence*)

**Question 2.1** What is the possible traces of the CCS process

$$(\hat{c}b)(a.b.0 \mid c.\bar{b}.a.0) \tag{1}$$

**Question 2.2** Construct a process not containing parallel composition and bisimulation equivalent to (1).

- Check your solution using `eq (eq agent1 agent2)` in MWB.