Concurrent Programming - Exercícios 3

CCS

1. Which of the following expressions of CCS are correct?.
   (a) $(a.0 + \overline{a}.A)\backslash\{a, b\}$
   (b) $(a.0 + \overline{a}.A)\backslash\{a, \tau\}$
   (c) $\tau.\tau.B + 0$
   (d) $(a.b.B + \overline{a}.0)|B$
   (e) $(a.b.B + \overline{a}.0).B$

2. Let $A := b.a.B$, using the inference rules show that the following transitions exist:
   - $(A|\overline{b}.0)\backslash\{b\} \xrightarrow{\tau} (a.B|0)\backslash\{b\}$

3. Solve the CCS exercises in PseuCo.com

4. Consider the following definitions of a researcher that takes coffee and publishes articles.

$$\begin{aligned} CM &:= coin?.coffee!.CM \\ CS &:= pub!.coin!.coffee?.CS \\ Uni &:= (CM|CS)\backslash\{coin, coffee\} \end{aligned}$$

   Use the CSS inference rules to obtain the reachable fragment of $[\![Uni]\!]_\Gamma$. Test in pseuco.com. Compare with $Spec := pub!.Spec$.

5. Let $A := (a.A)\backslash\{b\}$ show that $[\![A]\!]_\Gamma$ infinite (even the reachable fragment).

6. The following definitions try to solve the mutual exclusion with a semaphore.
   (a)

$$\begin{aligned} Mutex_1 &:= (User|Sem)\backslash\{p, v\} \\ User &:= \overline{p}.enter.exit.\overline{v}.User \\ Sem &:= p.v.Sem \end{aligned}$$

   Use the CCS inference rules to obtain the reachable fragment of $[\![Mutex_1]\!]_\Gamma$. Test in pseuco.com.
   (b) Let

$$Mutex_2 := ((User|Sem)|User)\backslash\{p, v\}$$

   Use the CCS inference rules to obtain the reachable fragment of $[\![Mutex_2]\!]_\Gamma$. Test in pseuco.com. There will be changes if one uses $User := \overline{p}.enter.\overline{v}.exit.User$?
   (c) Let

$$\begin{aligned} FMutex &:= ((User|Sem)|FUser)\backslash\{p, v\} \\ FUser &:= \overline{p}.enter.(exit.\overline{v}.FUser + exit.\overline{v}.0) \end{aligned}$$

   Use the CCS inference rules to obtain the reachable fragment of $[\![FMutex]\!]_\Gamma$. Test in pseuco.com. Do you think that $Mutex_2$ and $FMutex$ has the same behaviour?