Process $P$ is an endless repetition of a “non-critical section” $PN$ and a “critical section” $PC$. Process $Q$ is similar.

$$P = PN \cdot PC \cdot P$$
$$Q = QN \cdot QC \cdot Q$$

They are executed in parallel ($P \parallel Q$). Specify formally that the two critical sections are never executed at the same time

(a) by inserting variables that are assigned but never used.

§ I introduce binary interactive variables $a$ and $b$ as follows:

$$P = PN \cdot a := \top \cdot PC \cdot a := \bot \cdot P$$
$$Q = QN \cdot b := \top \cdot QC \cdot b := \bot \cdot Q$$

Now mutual exclusion is specified as follows.

$$\neg \exists t'' : t, \ldots, \infty \cdot a t'' \land b t''$$

(b) by inserting outputs on channels that are never read.

§ I introduce binary channels $a$ and $b$ as follows:

$$P = PN \cdot a ! \top \cdot PC \cdot a ! \bot \cdot P$$
$$Q = QN \cdot b ! \top \cdot QC \cdot b ! \bot \cdot Q$$

Now mutual exclusion is specified as follows.

$$\neg \exists i : wa, \ldots, \infty \cdot \exists j : wb, \ldots, \infty \cdot (Ma_i \land T_{a_i} \leq T_{b_j} < T_{a_i+1} \lor Mb_j \land T_{b_j} \leq T_{a_i} < T_{b_j+1})$$

If we assume $PC$ and $QC$ take nonzero time we can specify mutual exclusion as follows:

$$\neg \exists i : wa, \ldots, \infty \cdot \exists j : wb, \ldots, \infty \cdot (Ma_i \land Mb_j \land (T_{a_i} \leq T_{b_j} < T_{a_i+1} \lor T_{b_j} \leq T_{a_i} < T_{b_j+1}))$$