1. Form the global state graph $P||B||Q$, when

a)

$P : \rightarrow P_1 \xrightarrow{a} P_2 \xrightarrow{b} P_3 \xrightarrow{c} P_4,$

$Q : \rightarrow Q_1 \xrightarrow{a} Q_2 \xrightarrow{\tau} Q_3 \xrightarrow{b} Q_4 \xrightarrow{\tau} Q_5 \xrightarrow{c} Q_6,$

$B = \{a, b, c\};$

b) $P$ and $Q$ as in a), but $B = \{b\};$

2. Consider the following client/server system with 2 clients. Form the global state graph of the whole system. All communication is synchronous (tightly coupled).

Client $C_i$:  

Server $S$:  

Buffer $B_i$:  

3. Give an example of a situation where the parallel operator is not associative.

4. Consider the following version of the AB protocol (with a channel and a separate timer):
Let us change the protocol in such a way that $R$ first sends $a_0$ and only then makes the transition $\text{give}$. The same with $a_1$. Draw $R$ and the whole global state graph.

Further assume that the communication is synchronous and there is no channel. Is the modified protocol working properly?

5. Show that

$$P[[B]](Q[[B]]|R) \equiv (P[[B]]Q[[B]]|R)$$

for all action sets $B$. Here $\equiv$ means that the graphs are the same with the exception of the names of the states.