Chapter 3 - exercises

3.1 Show that `S1` and `S2` describe the same behavior:

```
P = (a->b->P).
Q = (c->b->Q).
||S1 = (P||Q).

S2 =(a->c->b->S2|c->a->b->S2).
```

3.2 `ELEMENT=(up->down->ELEMENT)` accepts an `up` action and then a `down` action. Using parallel composition to compose four elements of process `ELEMENT,` describe a model with interface actions `up` and `down,` that can accept up to four consecutive `up` actions at its interface (not counting internal hidden actions) before a `down` action at its interface. Draw a Structure Diagram for your solution. (Hint – see TWOBUFF which composes two single slot buffers and can accept up to two `in` actions before an `out` action, not counting internal actions).

3.3 Extend the model of the client-server system `CLIENT_SERVER` such that there can be more than one client using the server.

3.4 Modify the model of the client-server system described in question 3.3 such that the call may terminate with a timeout action rather than a response from the server. What happens to the server in this situation?

3.5 A roller coaster control system only permits its car to depart when it is full. Passengers arriving at the departure platform are registered with the roller coaster controller by a turnstile. The controller signals the car to depart when there are enough passengers on the platform to fill the car to its maximum capacity of M passengers. The car then goes around the roller coaster track and then waits for another M passengers. A maximum of M passengers may occupy the platform. Ignore the synchronization detail of passengers embarking from the platform and car departure. The roller coaster consists of three processes `TURNSTILE`, `CONTROL` and `CAR`. `TURNSTILE` and `CONTROL` interact by the shared action `passenger` indicating an arrival and `CONTROL` and `CAR` interact by the shared action `depart` signaling car departure. Draw the Structure Diagram for the system and provide FSP descriptions for each process and the overall composition.

3.6 Modify the example Java program `ThreadDemo` such that it consists of three rotating displays.