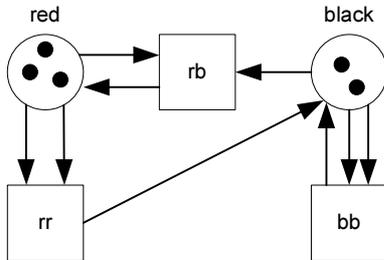# MTAT.03.083 – Systems Modeling

Exercises: Plain Petri nets (session 1)

Exercise 1 (Ball game)

Play the token game with the following Petri net. Then, model an equivalent state machine.

Hint: initially the state machine is in the state "3 reds, 2 blacks" and there are three transitions from this initial state: rr, rb and bb. Transition "rr" leads to state "1 red and 3 blacks".

Exercise 2 (Car Assembly) – taken from www.workflowcourse.com

Model as a Petri net the production process shown in the following Bill-Of-Materials.
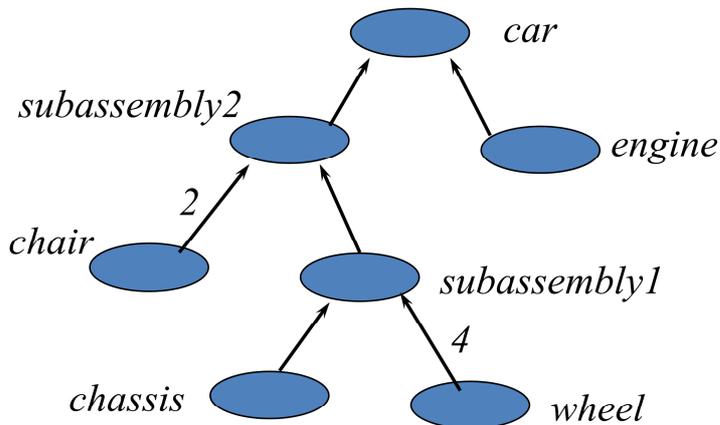
Exercise 3. Burning Alcohol– taken from www.workflowcourse.com

Model the chemical reaction $C_2H_5OH + 3 * O_2 => 2 * CO_2 + 3 * H_2O$ as a Petri net. Assume that there are two steps: first each molecule is disassembled into its atoms and then these atoms are assembled into other molecules.

Exercise 4 (vending machine)

We consider a vending machine that sells chocolate bars. The machine sells small bars for 15 cents and large bars for 20 cents. The machine accepts coins of 5 cents, 10 cents and 20 cents. The machine is not able to return coins. Accordingly, the machine never allows a user to insert more than 20 cents. Once the user has put 20 cents, the machine will not accept any more coins. Instead, it will

only allow the user to push the button and get a large bar. If the user has inserted 15 cents, he/she may opt to get a small bar, or put an additional 5 cents to get a large bar.

Capture this process as a Petri net.

Exercise 5. Circular rail network– taken from www.workflowcourse.com

A circular rail network consists of four tracks. Each track is in one of the following states:

- Busy, i.e., there is a train on the track.
- Claimed, i.e., a train has successfully requested access to the track.
- Free, i.e., neither busy nor claimed.

There are two trains driving on the circular track. Initially, one train is in track 1 while the other is in track 3. Trains can move from track 1 to 2, from track 2 to 3, from track 3 to 4 and from 4 back to 1.

The track where a train resides is "busy". To move to the next track a train first claims the next track. Only free tracks can be claimed. Busy tracks are released the moment the train moves to another track. One can abstract from the identity of trains only the state of the rail network is considered. Model the dynamic behavior of the rail network in terms of a Petri net.

Karachi Circular Rail (route plan)