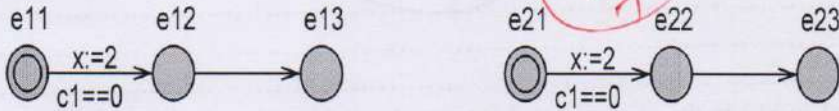


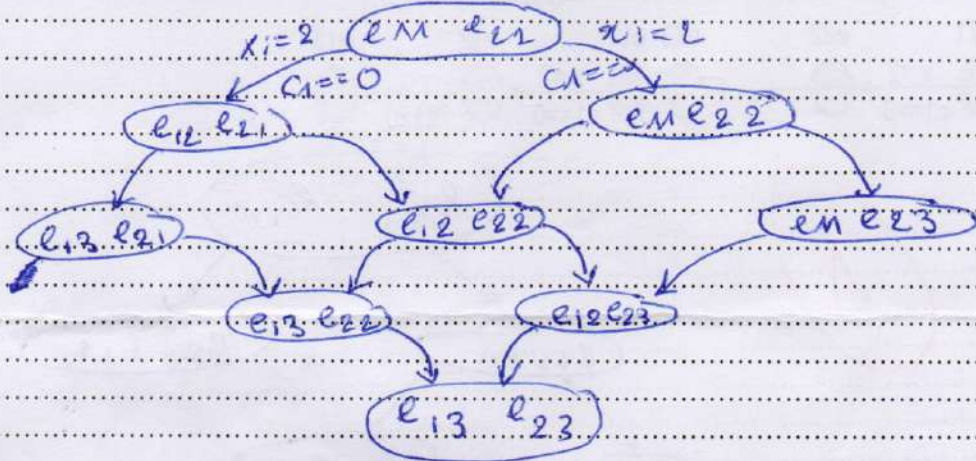
Questions:

- 1) Which logics can be used in Uppaal tool? *TCTL, PCTL*
- 2) Which logics can be used in SPIN tool? *LTL*
- 3) Give one advantage of using urgent locations in Uppaal tool *distinguish between priorities of states*
- 4) What is the basic difference between channels in Uppaal and channels in SPIN? *in spin, we can exchange information through B channel*
- 5) What is the basic difference between urgent place and committed places? *urgent: time doesn't pass
committed: more priority than urgent*

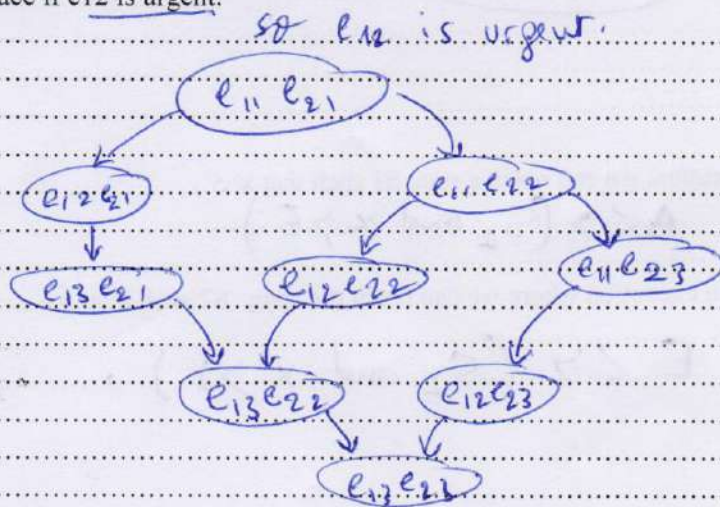
Exercise1: Let's consider the two automata in uppaal



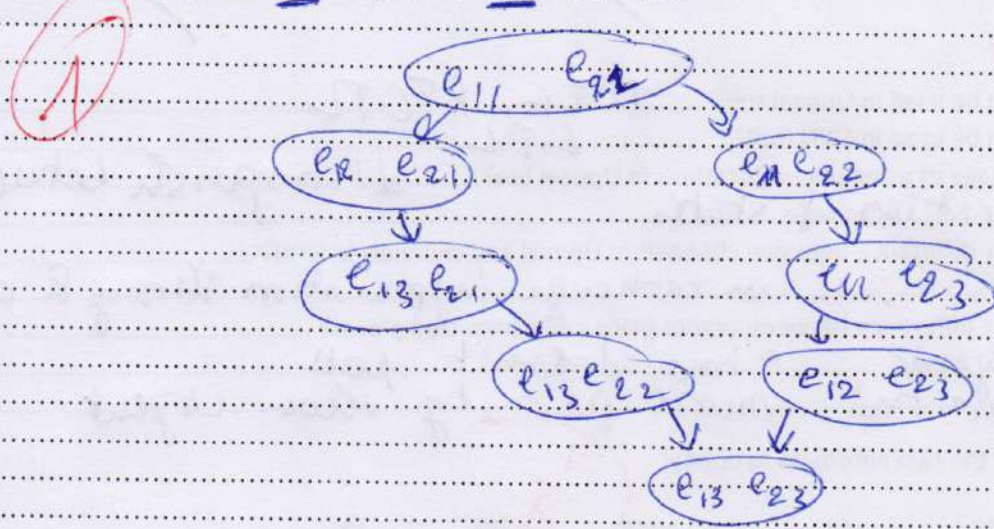
- 1) Provide the state space of the system composed of these two processes.



- 2) Provide again the same space if e12 is urgent.



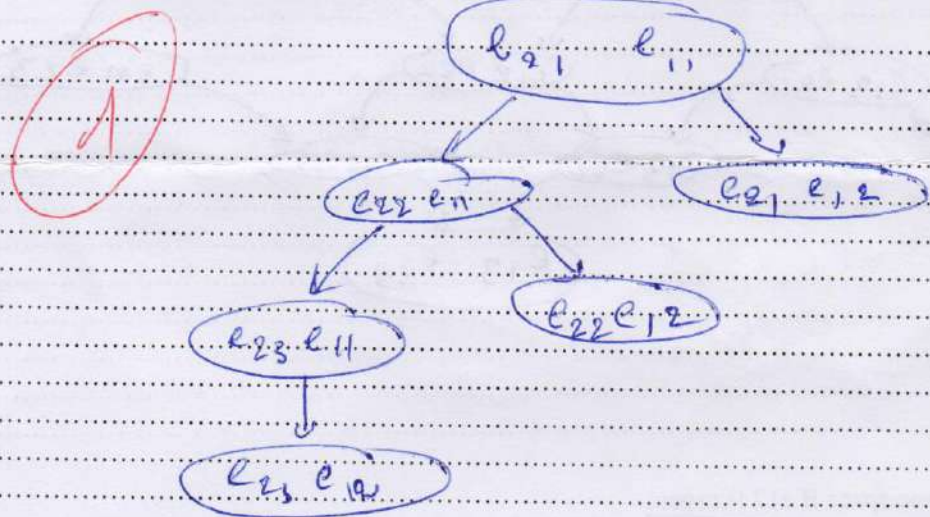
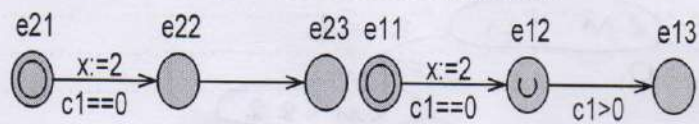
3) Provide again this space if e12 is urgent and e22 is committed.



4) Give the interval of values of $c1$ in $e13$ in the cases of : $e12$ is normal, urgent and committed.

normal: $c1 \in [2, \infty[$, urgent: $c1 \in [5, 03]$, committed: $c1 \in [0, 01]$

5) Provide the state space of the following system:



6) Write in TCTL :

- In all execution, we can reach a state $S1$ such that $x > 5$

$A < > (S_1 \text{ and } x > 5)$

- There is an execution where we can reach the state $S2$ such that $que > 5$

$E < > (S_2 \text{ and } x > 5)$

Exercise2: Let's consider the following promela code

```
mtype = {msg, ack};
chan to_sndr = [2] of { mtype, bit };
chan to_rcvr = [2] of { mtype, bit };
```

```
active proctype Sender(){
  bool seq_out, seq_in;
  do
    :: to_rcvr!msg(seq_out) -> to_sndr?ack(seq_in);
    if
      :: seq_in == seq_out -> seq_out = 1 - seq_out;
      :: else
    fi
  od
}
```

```
active proctype Receiver(){
  bool seq_in;
  do
    :: to_rcvr?msg(seq_in) -> to_sndr!ack(seq_in);
    :: timeout -> to_sndr!ack(seq_in);
  od
}
```

Question :

- 1) How many processes in this code? 3 Which ones? Sender, Receiver, Root. Are they active or not? Yes
- 2) Propose an automaton for each one: 1

