DE (SCV)

Petri nets

Question 1 :
Correction :

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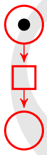
— 

— This is not possible (live $\implies$ quasi-live).
— This is not possible : if there is a deadlock, then the system would be bounded by the bigger marking of the model places (which can not be increased).

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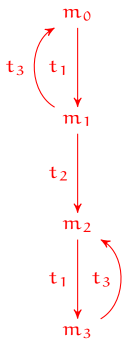
Question 2 :
Correction :

1. $m_0 = s_1 + s_4$
   $m_1 = s_2 + s_3 + s_4$
   $m_2 = s_1 + s_3 + s_5$
   $m_3 = s_2 + 2s_3 + s_5$



2. YES
3. It is not quasi-live (t_4 is never fired) and it is deadlock-free.
4. No. It suffices to inverse the arc linking s_4 to t_4 (t_4—> s_4).

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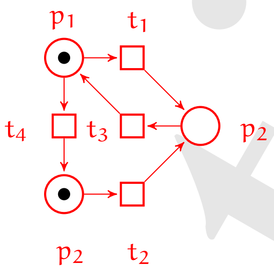
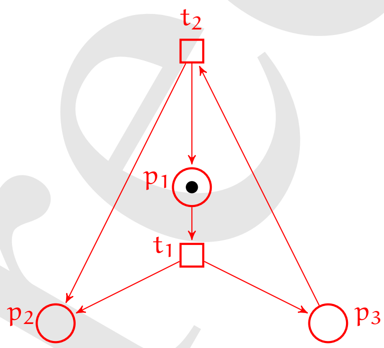
Question 3 :

Correction :

1. The petri net having this reachability graph is the following :



2. It is not possible since there is no arc labeled with t_1 from state $(2, 0, 0)$. Indeed, this marking is greater than the marking $(1, 0, 0)$ from which t_1 is enabled.
3. The petri net having this coverability graph is the following :



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LTL and Büchi automata

Question 1 : Warm-up exercise on LTL

Correction :

1. $G\phi = \neg(F\neg\phi)$
2. $F\phi = true U \phi$

Question 2 :

Correction :

1. (a) $G green$
   (b) $G(red \implies F green)$
   (c) $G(green \implies (green U yellow))$
   (d) $G(yellow \implies X red)$
2. (a) Not satisfied (a counter example could be the sequence $(s_0.s_1.s_2)^\omega$.
   (b) Not satisfied (a counter example could be the sequence $s_0.s_1.(s_2)^\omega$.
   (c) Not satisfied (a counter example could be the sequence $(s_0)^\omega$.
   (d) Satisfied.

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Question 3 :

Correction :

1. The sequence $(\neg p.p)^\omega$ satisfies the second formula but does not satisfy the first one.
2. The sequence where p is never satisfied satisfies the second formula but does not satisfy the first one.
3. The sequence $(p.q)^\omega$ (where p and q are never simultaneously satisfied) satisfy second formula but does not satisfy the first one.

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