ETH
Eidgenössische Technische Hochschule Zürich
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DYNAMO

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based on Prof. Dr. Lothar Thiele's material

Discrete Event Systems

Solution to Exercise Sheet 14

1 Time Petri Net

step	τ	t_{fired}	M^τ	L^τ
0	0	-	$[0,1]$	$(t_3,\, 2)$
1	2	t_3	$[2,1]$	$(t_1,\, 3)$, $(t_3,\, 4)$
2	3	t_1	$[0,2]$	$(t_3,\, 4)$, $(t_2,\, 5)$
3	4	t_3	$[2,2]$	$(t_1,\, 5)$, $(t_3,\, 6)$, $(t_2,\, 6)$
4	5	t_1	$[0,3]$	$(t_3,\, 6)$, $(t_2,\, 6)$
5	6	t_2	$[2,1]$	$(t_3,\, 8)$, $(t_1,\, 7)$

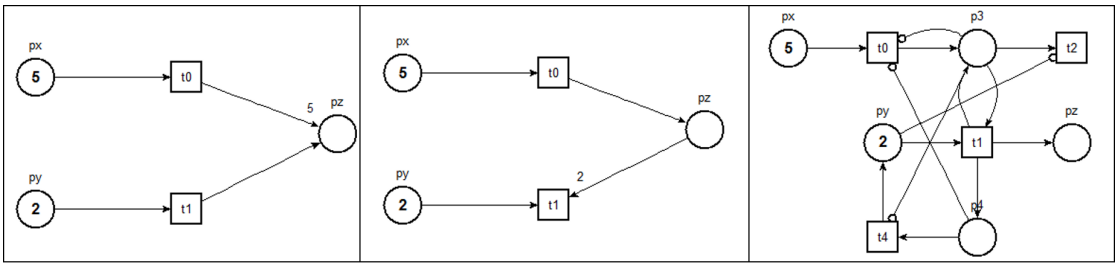
2 Liveness Properties

a)

- t_1: L_3-live. We can fire t_1 infinitely starting from the initial marking, e.g., with sequence $\{t_1, t_1, \dots\}$. t_1 is not L_4-live, because t_1 is dead for any marking we obtain after firing t_2.
- t_2: L_1-live. It can be fired once and exactly once starting from the initial state, e.g., with sequence $\{t_2\}$. After firing it, there is no way to place a token at p_1, therefore it is not L_2-live.
- t_3: L_2-live. For any positive integer N, we can first fire t_1 for N times, then fire t_2 once, then fire t_3 N times. It is not L_3-live, since infinitely firing t_1 means t_2 is never fired, therefore infinitely firing t_1 means t_3 is never fired, and t_3 cannot be infinitely fired.
- t_4: L_1-live. It can be fired once and exactly once starting from the initial state, e.g., with sequence $\{t_1, t_2, t_4\}$. It is not L_2-live, since after it has been fired once, it can never be enabled again.

3 Calculating with Petri nets

NOTE: the solution is not unique.



a) b) c)