

# CSCI910 – Software Requirements, Specifications and Formal Methods

## Tutorial 7

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### Objectives

- Get familiar with Petri Nets

### Information about the CPN IDE:

- Official Website of CPN IDE: <https://cpnide.org/>
- CPN Tools online Tutorials: <https://www.youtube.com/watch?v=38g1jMvNi6Q&list=PL24010632B8286DBC&index=4>

NOTE: CPN IDE is only for Windows, but you can use it in a virtual environment if you use Mac or Linux. Here is the link to the free version of VirtualBox (<https://www.virtualbox.org/>).

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### Exercise 1:

Given the following Petri net structure, draw the Petri net graph.

$$P = \{p1, p2, p3, p4\}$$

$$T = \{t1, t2, t3, t4\}$$

$$I(t1) = \{ \}$$

$$I(t2) = \{p2, p4\}$$

$$I(t3) = \{p1, p3\}$$

$$I(t4) = \{p3\}$$

$$O(t1) = \{p1, p1, p2\}$$

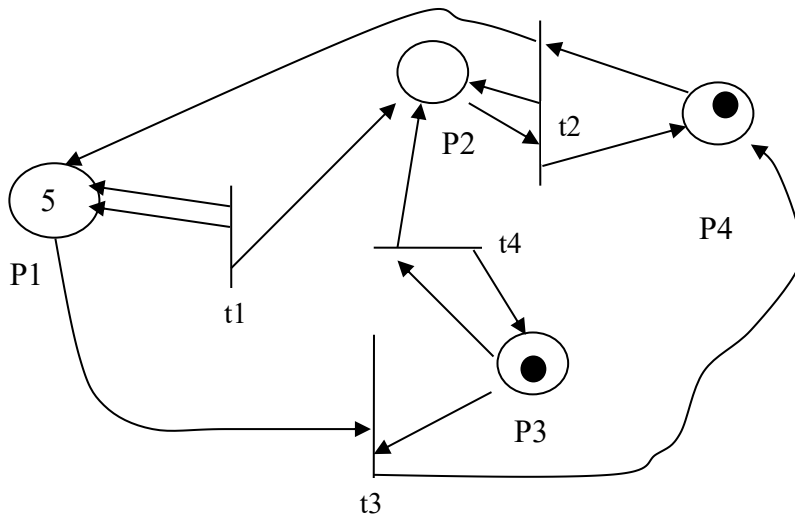
$$O(t2) = \{p2, p4, p1\}$$

$$O(t3) = \{p4\}$$

$$O(t4) = \{p2, p3\}$$

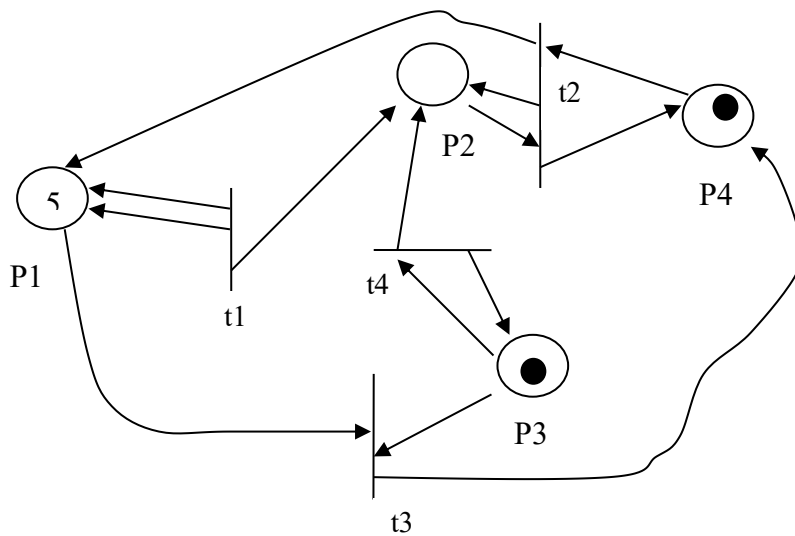
### Exercise 2:

Assume that the initial marking of Petri net as follows. Evaluate which transition/transitions can be enabled. **Answer: (T2, T3, T4)**



### Exercise 3:

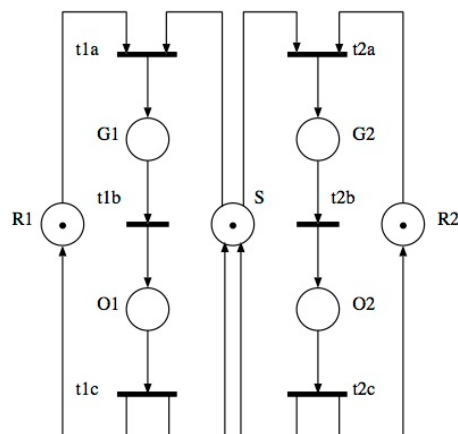
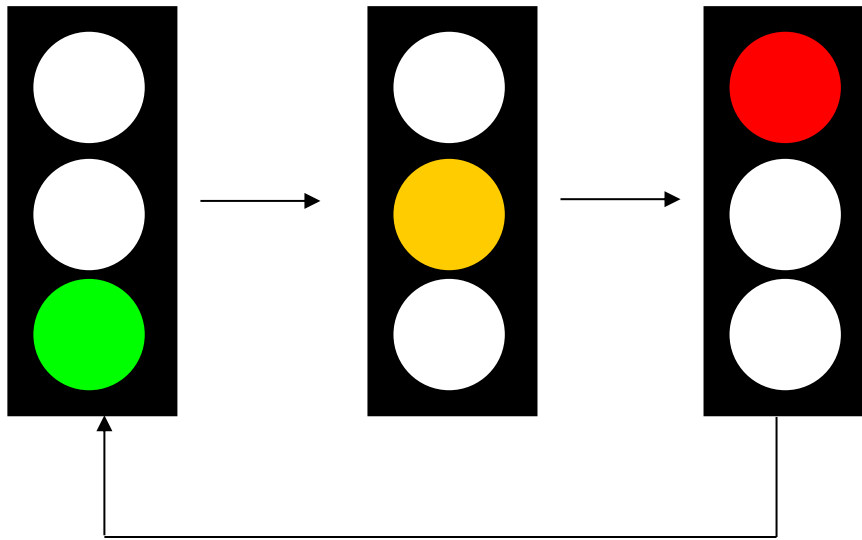
Suppose transition  $t3$  is fired first. What is the marking result after finishing transition  $t3$ .



**Answer:  $\mu=(5, 0, 1, 1) \rightarrow \mu=(4, 0, 0, 2)$**

#### Exercise 4:

Construct a CPN to model two traffic lights in an intersection. Two traffic lights can't be in the green same time and must turn green alternatively.



The Petri net uses one place per each color and traffic light:  $G1$ ,  $O1$ ,  $R1$ ,  $G2$ ,  $O2$ ,  $R2$ . It contains an additional place  $S$  to guarantee that only one green light is turned on.