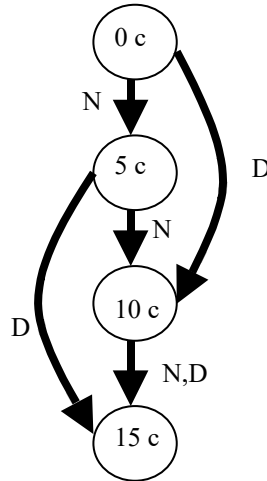


Homework #3

Due 5:00 pm March 26, 2019

- (3 point) Please formally define the vending machine's FSM in Fig. 1, i.e., Σ , Q ,



q_0 , δ , and F

Fig. 1

- (2 point) Please derive L and L_m of the FSM in Fig. 1 if the state 15c is a final state.
- (2 point) Represent graphically the following Petri net (P, T, I, O) where $P = \{p_i, 1 \leq i \leq 5\}$ and $T = \{t_i, 1 \leq i \leq 4\}$,

$$I = \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 \end{pmatrix} \quad O = \begin{pmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{pmatrix}$$

- (5 points) Please derive the reachability tree of the PN in Fig. 2, and determine its boundedness, safeness, liveness, and reversibility. J is the last digit of your banner ID. For $i=1, 2, \dots, 9$, $a_i=0$ if your i -th ID digit is smaller than or equal to 5, and otherwise 1. For example, if you ID = 121291755, $a_1-a_9=000010100$. Let $m_0(p_1)=a_6$, $m_0(p_2)=(1-a_6)$; $m_0(p_6)=a_7$, $m_0(p_3)=(J+2) \cdot (1-a_7)$; $m_0(p_4)=a_8$, $m_0(p_5)=1-a_8$.

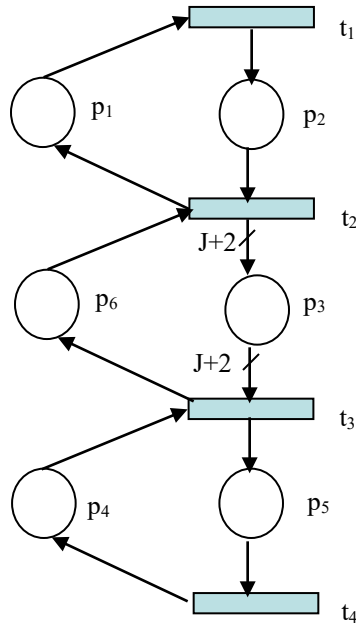


Fig. 2

5. (5 points) Please derive the reachability tree of the following PN in Fig. 3 and its boundedness, safeness, liveness, and reversibility. HINT: you may not be able to judge its properties based on the tree. Need more thinking and extra work.

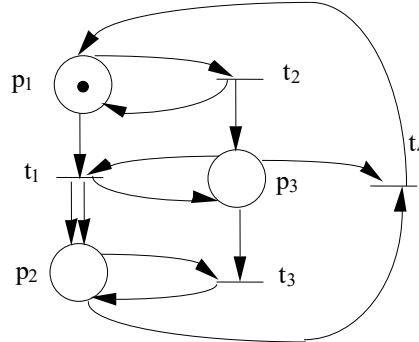


Fig. 3

6. (4 points). A small machine shop can make three different items, though it can work on only one item at a time. The shop can be in six different “states” corresponding to: an order is waiting, one of the three items is being made, an order is finished, and the shop is idle. There are six actions: order arriving, start work on item 1, start work on item 2, start work on item 3, finish processing, and order sent for delivery. Construct a Petri net model for this machine shop?
7. (4 points) Construct a PN model for calculating the logic conjunction of two variables x and y , each of which takes the values of “true” and “false”. Each is assigned a value independently of the other.