FVOCA-MESCC Assessement, April 2023 (Example)

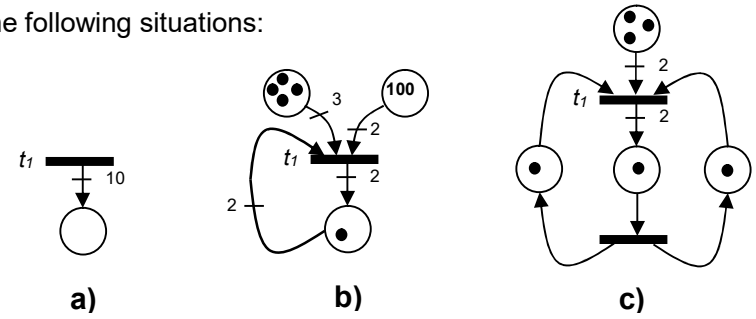
Duration: 60 mins (with access to notes and slides)

Grades: 3, 4, 3, 3, 3, 4 (SUM = 20)

Name: _____

Number: _____

1. Consider the following situations:



a) **b)** **c)**

State, with justification, the situations in which transition t_1 is enabled.

Answer:

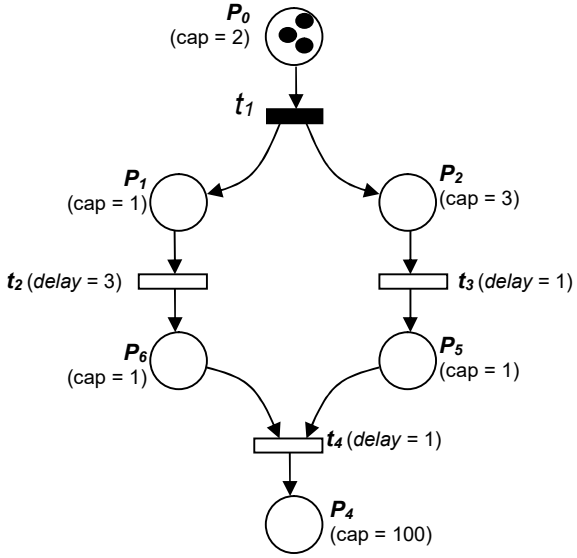
2. Consider the following Petri Net model:

W^- (pesos arcos $P \to t$)	W^+ (pesos arcos $t \to P$)	M_0 (marcação inicial)
$\begin{bmatrix} 2 & 0 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 3 \end{bmatrix}$	$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{bmatrix}$	$\begin{bmatrix} 4 \\ 1 \\ 0 \\ 0 \end{bmatrix}$

List the sequence of transitions that fire ($t_x \to t_y \to t_z \to \ldots$).

Answer:

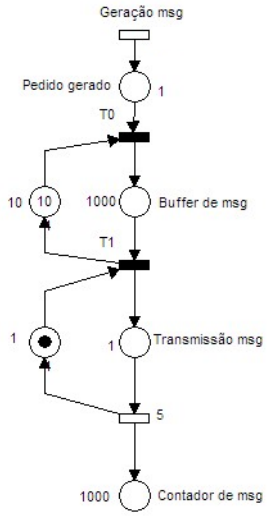
3. Assume the following HP-SIM Petri Net model of a system. In the model, both the capacity and name of the positions are indicated, as well as the deterministic delay of the transitions.



How many time units will elapse until P_4 having 3 tokens? Justify your answer.

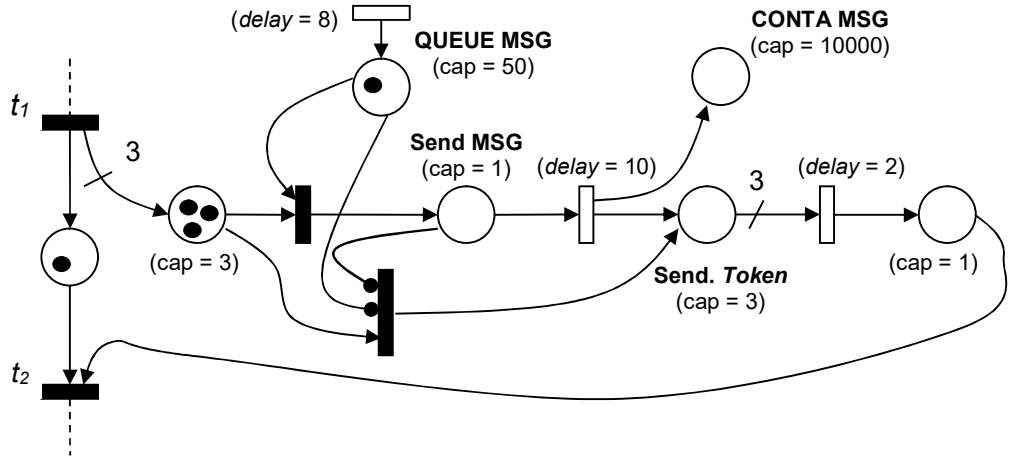
Answer:

4. The following Petri Net represents a system in which messages are generated with a certain distribution pattern and placed in a transmission buffer. A message transmission takes 5 time units. For each place, its capacity (HP-SIM) is indicated. In the modelled system, the transmission buffer allows a maximum of 10 pending messages. Complete the Petri Net representing the system that while the transmission buffer if full, any generated message is discarded. Add also, to the Petri Net model, a counter of discarded messages.



5. Consider a Petri model of a time critical communication where nodes have the right to transmit pending messages when they receive a special message (called token). There are *n* network nodes. The token is passed among them as follows: node 1 → node 2 → node 3 → … node *n* → node 1 → … In each network node there is a queue (QUEUE MSG) with capacity for 50 pending messages. When a node receives the token, it can transmit up to 3 messages before passing the token to the next node. A message transmission takes 10 time units. The token transmission takes 2 time units.

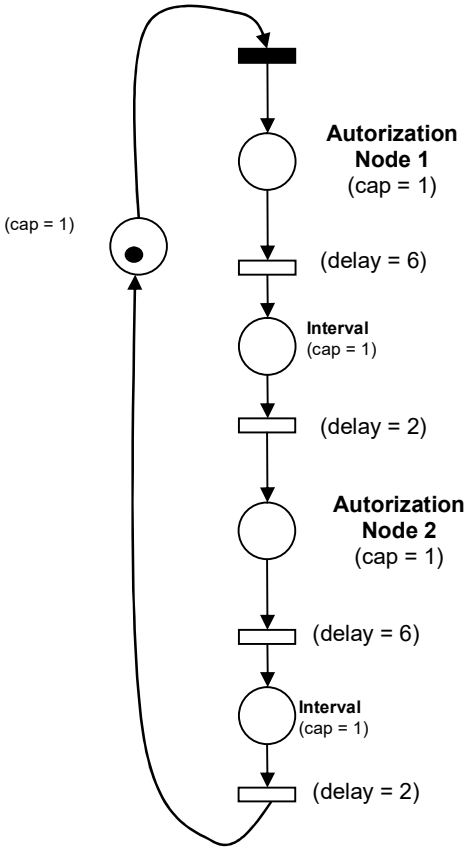
   The following Petri Net illustrates Node 1. The Petri Net marking illustrates the time instant just after the token arrival (after transition t_1 fired), and QUEUE MSG has a token.



   Immediately after the next firing of transition t_2, what is going to be the marking of position COUNT MSG? Justify your answer.

   Answer:

6. Consider a *Time Division Multiple Access* (TDMA) computer network. Each network node can transmit pending messages during an allowed time.



In each of the network nodes (Petri Net model not part not included above), messages are generated and placed in a queue (with capacity 30). Each message transmitted (while the node is allowed) takes 2 time units.

Complete the Petri Net model (you can use the modelling capabilities of HP-SIM).