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CS 12 computer science 12

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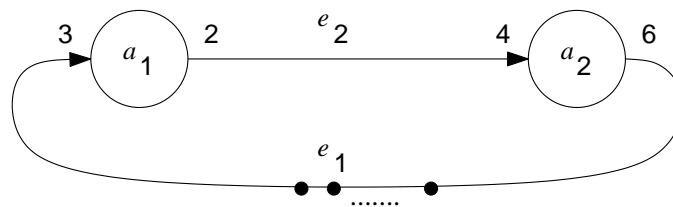nick.pietrass [☺] tu-dortmund.de

Exercise Sheet 3

(22 Points)

Please note: Solutions to theory assignments must be submitted (individually or in pairs) until 03.06.2019 at 12:00 AM (post box in OH16, ground floor, in front of room E16). Submitting solutions via mail is *not* possible. Discussion: 05-06.06.2019.

1 SDF - Theory (3 Points)

Suppose that the following SDF model is given:

Suppose that SDF actors execute in 1 unit of time. Generate a possible execution schedule, assuming a single execution unit (no parallel execution) and an initial set of 6 tokens for edge e_1:

Time	Tokens on edges		Next actor execution
	e_1	e_2	a_1 or a_2
0	6	0	
1			
2			
3			
4			

Now, assume an initial set of 9 tokens for edge e_1. Provide an example of parallel execution, i.e., an example for which both actors are active. Enter the names of the concurrently executing actors into the right column!

Time	Tokens on edges		Next actor execution(s)
	e_1	e_2	a_1, a_2 or (a_1 and a_2)
0	9	0	
1			
2			
3			
4			

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2   Petri Nets - Theory (3 Points)

Consider the following simple place/transition net with $M_0(p_1) = 9, M_0(p_2) = 0$:
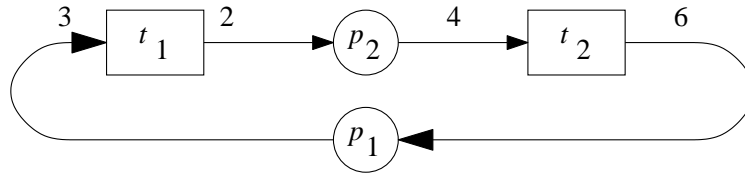
Which combinations of markings of p_1 and p_2 are feasible? Create a graph with $(M(p_1), M(p_2))$ as nodes and indicate possible transitions. Start with a node (9,0).

3   SDF vs. Petri Nets - Theory (2 Points)

Name at least two differences between SDF and Petri Nets.

4   D/E-Simulations - Theory (4 Points)

Consider the following simple cross-connected NOR-gates.
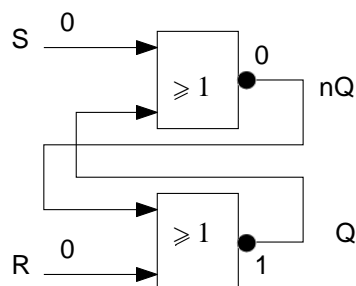
Assume that the top NOR-gate delays all changes by 2 ns, the NOR-gate at the bottom delays all changes by 3 ns. Assume that for $t < 0$, signal values are as indicated in the timing diagram below. At $t = 0$, R is assumed to change to '1'. Depict the waveforms at the outputs nQ and Q of the two gates, as computed by discrete event simulation!
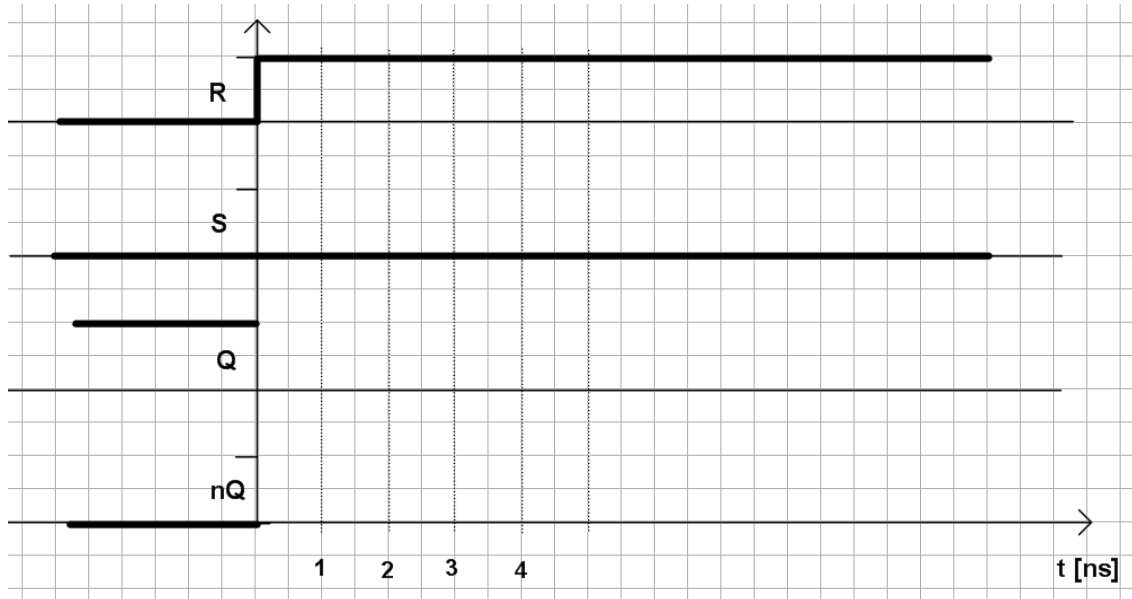
5 Preparation - Practice (3 Points)

Please note: The solution to this assignment must be submitted!

Previous to the exercise session, read chapter 9 of the OSEK manual and chapter 3.2.6 of the OIL specifications. Answer the following questions:

- a.) Which objects does an alarm need for the system creation?

- b.) What is the difference between ALARMTIME and CYCLETIME?

- c.) Let a counter be connected to a the system clock which ticks 1000 times per second. Which value does the counter indicate?

6 Alarm Management in OSEK - Practice (7 Points)

In the CI-Lab, choose the virtual machine `es` and log on. Under `media/nfs/es`, the folder `PeriodicRealtimeScheduling` is located. Here, the file `scheduling.oil` is located in which the following three tasks with a runtime of 2 seconds each are defined:

- Task τ_1: The LED flashes in green.

- Task τ_2: The LED flashes in orange.

- Task τ_3: The LED flashes in red.

For the task priorities, it holds: $\tau_1 > \tau_2 > \tau_3$..

Analyze the .oil file and find out why the schedule given below is not executed. Modify the file so that it is executed correctly. Please note that the LED flashes in red while EV3OSEK boots. However, the program starts when it flashes in green.
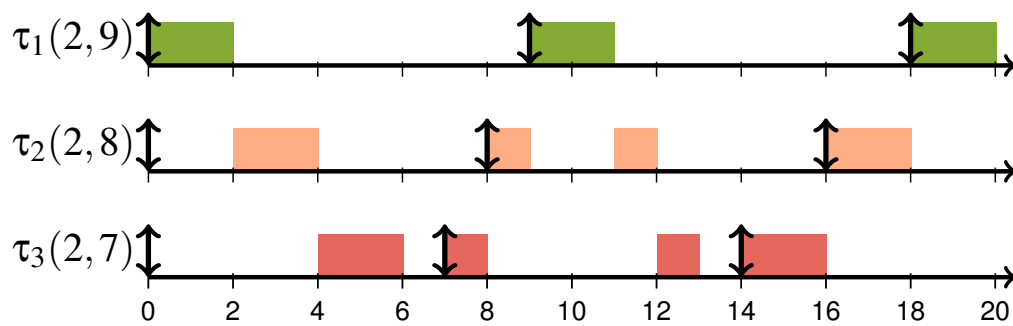
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Abbildung 1: Expected Schedule.