

Computer Science Department
Faculty of Mathematics and Informatics
University of M'Sila
Second year of Artificial Intelligence (Master Level)
Logics and Process Algebras

Final Exam

January 20, 2024

Exam duration: One hour and half

Exercise number 1 (6 points):

1. What is the difference between the two operators: $\parallel$ and $\|$ (2 points)
2. Using the operator $[]$, give the equivalent of $[x > 0] \rightarrow \text{process1} [] [x = 5] \rightarrow \text{process2} [] [x < 9] \rightarrow \text{process3}$, if $x = 5$. (2 points)
3. If A and B are two behavior expressions, explain the behaviors of
 - a) $A \gg B$
 - b) $A [> B$ (2 points)

Exercise number 2 (6 points):

1. Give the LTS of $a; b; \text{stop} \parallel [a] a; c; \text{stop}$ and of $a; (b; \text{stop} \parallel c; \text{stop})$, then give a conclusion. (4 points)
2. Person1 and Person2 make breakfast (b) and dinner (d) separately, however they always eat lunch (l) together. Give a LOTOS specification for this process. (2 points)

Exercise number 3 (8 points):

The process "Process" has the following specification:

Process = $a; \text{stop} \parallel b; c; \text{stop}$

1. Give the graph of its Labelled Transition System (LTS) (4 points)
2. Give its Scola model (4 points)

Good luck
Pr. Mustapha Bourahla

Typical Correction

Exercise number 1 (6 points):

What is the difference between the two operators: $\parallel$ and $\parallel\parallel$

Solution:

The operator " $\parallel$ " is used for parallel execution, synchronous composition (1 point)

The operator " $\parallel\parallel$ " is used for interleaving execution (1 point)

Using the operator $[]$, give the equivalent of $[x > 0] \rightarrow \text{Process1} [] [x = 5] \rightarrow \text{Process2} [] [x < 9] \rightarrow \text{process3}$, if $x = 5$.

Solution:

$\text{Process1} [] \text{Process2} [] \text{Process3}$ (2 points)

If A and B are two behavior expressions, explain the behaviors of $A \gg B$ and $A [> B$

Solution:

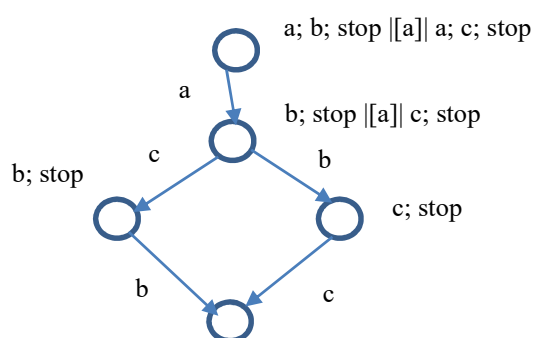
$A \gg B$: After an exit from A we do B (it allows to move on to the next process) (1 point)

$A [> B$: At any time during the execution of A, B can interrupt A by initiating its execution. A is no longer taken back (1 point).

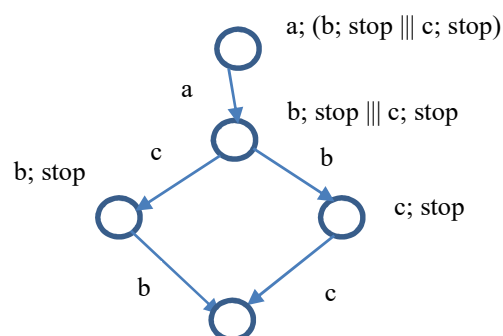
Exercise number 2 (6 points):

Give the LTS of $a; b; \text{stop} \parallel [a] a; c; \text{stop}$ and of $a; (b; \text{stop} \parallel\parallel c; \text{stop})$, then give a conclusion.

Solution:



$a; (c;b;\text{stop} [] b;c;\text{stop})$
(1.5 points)



$a; (c;b;\text{stop} [] b;c;\text{stop})$
(1.5 points)

The two expressions are equivalent (1 point)

Person1 and Person2 make breakfast (b) and dinner (d) separately, however they always eat lunch (l) together. Give a LOTOS specification for this process.

Solution:

Person1 ||| Person2 = b; l; d; stop ||| b; l; d; stop (2 points)

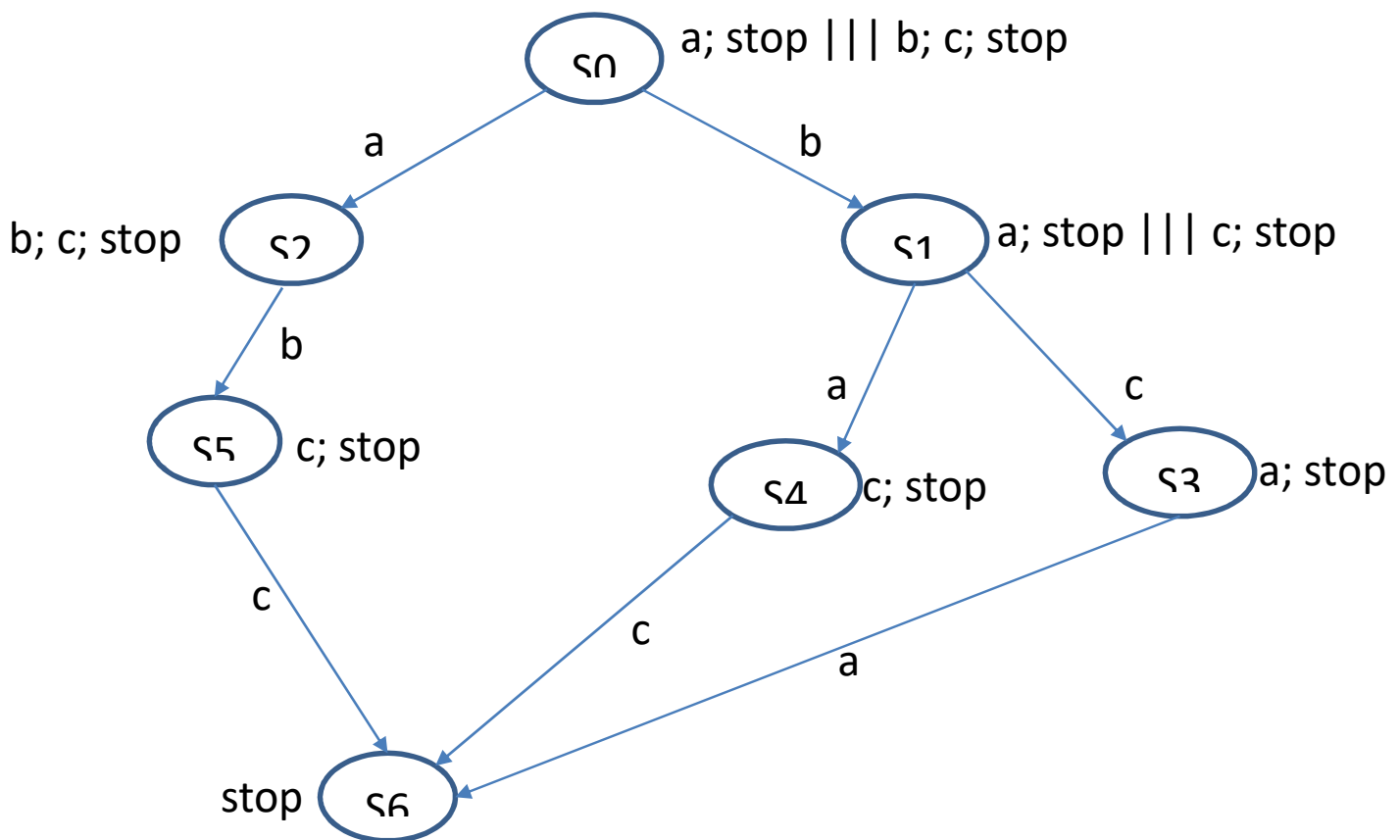
Exercise number 3 (8 points):

The process “Process” has the following specification:

Process = a; stop ||| b; c; stop

Give the graph of its Labelled Transition System (LTS)

Solution:



Process = a; b; c; stop [] b; (a; c; stop [] c; a; stop),

Note: A ||| stop = stop ||| A = A

4 points

Give its Scola model

Solution:

```
/* Process = a; b; c; stop [] b; (a; c; stop [] c; a; stop)
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*/
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domain Action {NONE, a, b, c, stop} end

block Process

 Action action NONE

end

scenario B as Process

 state S0

 task S1 set action b end

 task S2 set action a end

 task S3 set action c end

 task S4 set action a end

 task S5 set action b end

 task S61 set action a end

 task S62 set action c end

 task S63 set action c end

 task exit set action stop end

 choice CH1

 branch CH1B1

 branch CH1B2

 end

 next S0 CH1

 next CH1.CH1B1 S1

 next CH1.CH1B2 S2

 choice CH2

 branch CH2B1

 branch CH2B2

 end

 next S1 CH2

 next CH2.CH2B1 S3

 next CH2.CH2B2 S4

 next S3 S61

 next S4 S62

 next S2 S5

 next S5 S63

 next S61 exit

 next S62 exit

 next S63 exit

end

(4 points)