

Verification of Cyber-physical Systems : Exercise Sheet 6

Deadline : Monday 20th November 2017, 11 :55 pm

Exercise 1

The following pseudocode represents a process consisting of two tasks A_x and A_y . The task A_x is nothing but an assignment while the task A_y is a conditional statement : the value of y increases by 1 if x is an even number.

```
byte x=0; y=0;
```

```
active proctype A_x(){  
  do  
    :: x = x+1;  
  od  
}
```

```
active proctype A_y(){  
  do  
    :: even(x) -> y = y+1;  
  od  
}
```

Consider the infinite execution of the model in which only the task A_x is executed. Answer each of the questions below with a brief justification.

1. Is this execution strongly fair with respect to the task A_x ?
2. Is this execution strongly fair with respect to the task A_y ?
3. Is this execution weakly fair with respect to the task A_x ?
4. Is this execution weakly fair with respect to the task A_y ?

Exercise 2

Consider the following pseudocode consisting of two processes.

```
byte x=0, y=2;
```

```
active proctype Process1(){  
  do  
    :: x = x+1;  
  od  
}
```

```
active proctype Process2(){  
  do  
    :: y = x+y;  
  od  
}
```

Answer each of the questions below with a brief justification. When adding fairness assumptions, clearly specify whether you are using *strong fairness* or *weak fairness* and for which task.

1. Is it guaranteed that the value of x eventually exceeds 5? If not, is there a suitable fairness assumption for the two tasks under which this guarantee holds?
2. Is it guaranteed that the value of y eventually exceeds 5? If not, is there a suitable fairness assumption for the two tasks under which this guarantee holds?
3. Is it guaranteed that at some step in the execution the values of x and y become equal? If not, is there a suitable fairness assumption for the two tasks under which this guarantee holds?