CS684: Embedded Systems
Spring 2020
Assignment 3.2 - LUSTRE version 6

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1 Problem Statement

1. Describe in English the output produced by the following Lustre V6 node:

```
node SMONITOR(P: bool) returns (OK: bool);
let
  OK = P -> (pre(OK) and P);
tel
```

   (a) Give the output of the above SMONITOR for the input flow:

   `P = true true true false true false true true`

   (b) Give a monitor node for the property: "Every time A occurs C will remain true until a B occurs"

   (c) Give a monitor node for the property: "If REQ has been true for the last 3 cycles (including the current cycle) then ACK must be currently true."

2. Model a Gas Burner Controller as a Heptagon node to meet the given requirements:

```
node CONTROLLER (flame: bool; sec: bool)
            returns (gas: bool; spark: bool)
```

2 Solution

Given below is my approach to the problem.

2.1 Question 1

2.1.1 Part 1

The first element of the OK flow is $P_0 = true$. The rest is the ANDed output of P and the previous value of the OK flow:

```
OK = true true true false false false false false
```

2.1.2 Part 2

```
node SMONITOR(P, Q: bool) returns (OK: bool);
let
  OK = (P and not(Q)) -> ( (pre(OK) or P) and not(Q) );
tel
```

2.1.3 Part 3

```
node SMONITOR(P: bool) returns (OK: bool);
let
  OK  = P and (false -> pre(P)) and (false -> pre(false -> pre(P)));
tel
```

2.2 Question 2

In order to randomize the effect of **spark** and display the functioning of the statement "*Not every spark results into flame*", **spark** is send every 75 seconds.

```
node CONTROLLER (flame: bool; sec: bool)
    returns (gas: bool; spark: bool);
  var secStart, timer: int; risk: bool;
let
  timer = 0 -> if sec then (pre(timer) + 1) else pre(timer);
  spark = if (not(true -> pre(risk)) and (timer % 75 = 0))
    then true else false;
  automaton
    state ON
      do
        gas      = true;
        risk     = false;
        secStart = 0;
      unless flame = false
        then StartUp
    state StartUp
      do
        gas      = if not(risk) then true else false;
        risk     = ((timer-secStart)>60);
        secStart = if not(true -> pre(flame)) then timer else pre(secStart);
      unless (spark and ((timer-secStart)<60 or (timer-secStart)>180))
        then ON

  end
tel
```