Solutions to Quiz 2

-

Question 1

There were different versions of this question with different bit widths, parameter names and default parameter values.

Write the declaration (the **module** statement) for a module named **smooth** that has: (1) a parameter named **n** (or **k**) with a default value of 8 (or 4), (2) a 16 (or 12)-bit logic input named **in**, (3) a 16 (or 12)-bit logic output named **out**, and (4) a logic input named **clock**. Do not write the body of the module or **endmodule**.

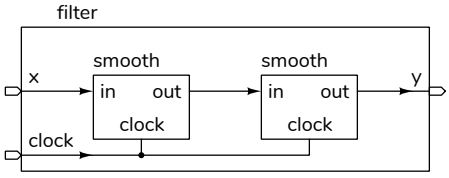
Answer

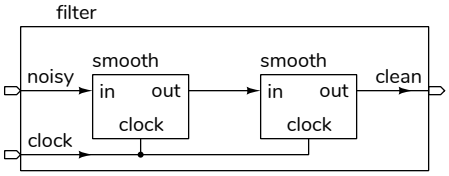
```
module smooth
  #(parameter n=8)
   ( input  logic [15:0] in,
     output logic [15:0] out,
     input  logic clock ) ;

// alternate:

module smooth
  #(parameter k=4)
   ( input  logic [11:0] in,
     output logic [11:0] out,
     input  logic clock ) ;
```

Question 2

There were different versions of this question with different bit widths, parameter names and port names.

Write a module named **filter** that has a 16 (or 12)-bit input named **noisy** (or **x**), a 16 (or 12)-bit output named **clean** (or **y**) and a **clock** input. Instantiate two copies of the **smooth** module, connecting them as shown ~~at right~~ below. The value of the parameter **n** (or **k**) should be 4 for the **smooth** module left on and 8 for the one on the right. Declare any signals required to connect the modules. You may use any port-to-signal mapping style.





Answer

```
module filter
  ( input  logic [15:0] noisy,
    output logic [15:0] clean,
    input logic clock ) ;

   logic [15:0] s ;

   smooth #(.n(4)) s0 (.in(noisy),.out(s),.clock ) ;
   smooth #(.n(8)) s1 (.in(s),.out(clean),.clock ) ;

   // also correct:
   // smooth #(4) s0 (noisy,s,clock) ;
   // smooth      s1 (s,clean,clock) ;

endmodule
```

Question 3

Would a signal named $\overline{\texttt{open}}$ (or **closed**) have a high or a low logic level when a door is open (or closed)?

Answer

- $\overline{\texttt{open}}$ is active-low; if the door is open then the truth value is true and the logic level should be low.
- **closed** is active-high; if the door is closed then the truth value is true and the logic level should be high.