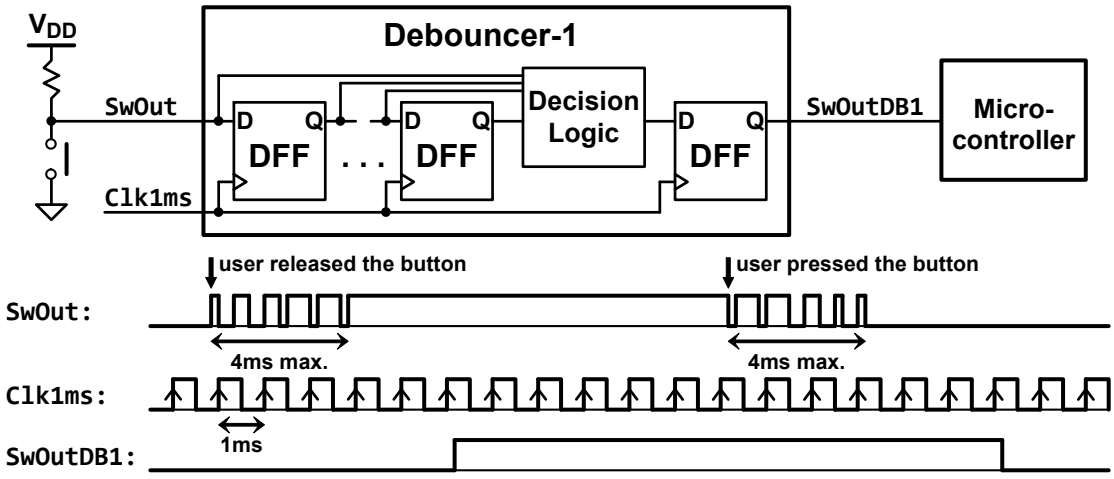
EE342 - Digital System Design

Laboratory Experiment - 3
Switch Debouncer

Preliminary Work

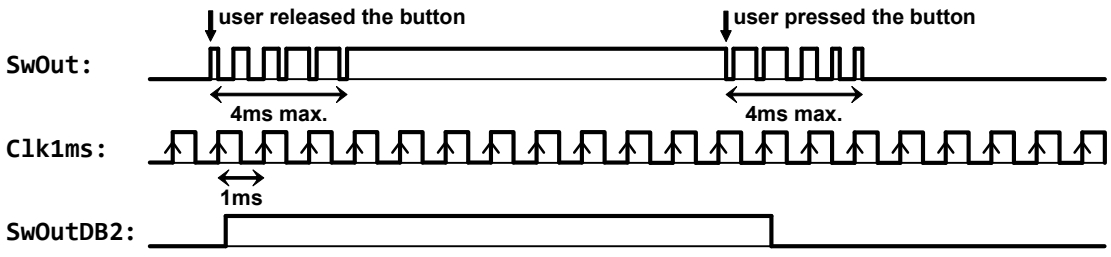
A typical mechanical push-button switch produces the signal shown below. The switch output, **SwOut**, "bounces" between high and low values many times whenever the switch position changes. The microcontroller on the other hand, requires a clean signal that gives a single transition every time a user presses or releases the switch. One possible solution is to sample the switch output using flip-flops, and wait until it produces the same 0 or 1 value for several consecutive samples.



1. Study Verilog coding examples of shift registers provided in the lecture notes.

2. Write a Verilog "***debouncer***" module that generates the filtered switch output, **SwOutDB1** shown above. The maximum duration of random transitions at **SwOut** is **4 ms**.

3. In case this switch and debouncer are used in a joystick, **4–8 ms** response time to a push-button switch is long enough to make the user a loser. Make a modified debouncer module to produce the following response. **SwOutDB2**, will change at the first input sample that has a different value, but debouncer will not allow it to change again for **4 ms** no matter what happens at **SwOut**.



Procedure

1. Create a project directory and set up a new project in Quartus II using the **File->New Project Wizard...** menu item following the instructions given in EE342_Lab_QuartusIntro.pdf.

2. Write a top-level Verilog module that instantiates both of the debouncer modules you wrote in the preliminary work.

3. Save the top-level module source code. Add the source code of the instantiated modules into project file list. Save your project.

4. Compile and debug the project.

5. Run the simulation tool of Quartus II to check and compare the two debouncer outputs. Set "**End Time**" of the waveform file and the input clock frequency according to the circuit requirements. Create a meaningful input signal (**`SwOut`**) that will allow verification of the circuit function.