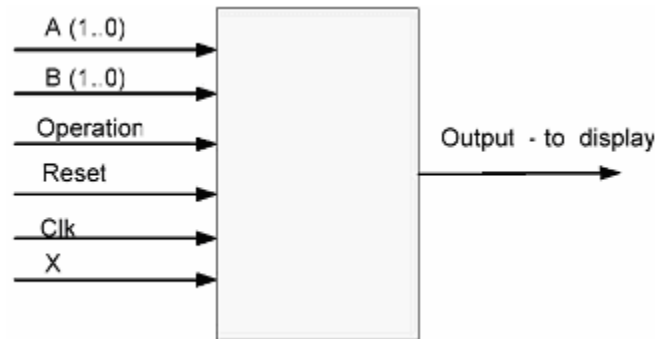


Lab 9 - Two-Function Calculator

Specifications

You have to implement a two-function calculator with special operations. Consider the system shown by the block diagram below.



The calculator accepts two parallel-input numbers, **A** and **B**, (2-bits each) and multiplies them if **Operation**= 1 or adds them if **Operation**= 0. Let **R** be the result of this operation. Then, the system has to count up cyclically from 0 to 99 in steps of **R** synchronously with the system clock **Clk**, displaying the result on the two-digit display. This clock will be implemented with a button. The counter stops if the serial sequence **X**= 11101 is entered, and resumes if a second sequence **X**=11101 is detected. The **Reset** input is used as usual: when it is 1, the counter and the sequence detector is reset.

To implement any mathematical operation, you can use the IEEE numeric_std package (see Section 3.5.4, pp. 60-65 of the book by P. Chu).

Lab Task

- 1) Present your block diagram of the calculator including all the internal signals that connect the blocks with other blocks and with the outside (inputs and outputs).
- 2) Provide the ASM chart for any state machine you use in your design.
- 3) Simulate the different subsystems and the overall system. Turn in the waveform for each of them.
- 4) Implement the system in the FPGA board.
- 5) Turn in your source code.