Fenerbahçe University
BLM 201 – Digital Design
LAB 2: Sequential Design

About Lab:

Sequential circuit applications with Verilog Language.

LAB Stages:

1- **Preliminary stages (0 Point)**

   In the Vivado design tool, open a blank project for the XC7A35Tcpg236-1 (Basys 3) device.

   Download the constraint file prepared for Basys3 and add it to your project.

   http://levent.tc/files/courses/digital_design/labs/basys3.xdc

   A module called ledManager will be implemented, which has a one-bit input named clk, rst and a 16-bit output named LED.

   When the rst signal goes this module as 1, the value of 16-bit LED signals will be 16'b1000000000000000. Only the rightmost LED will turn on and the others will turn off.

   When there is no rst (means 0), make a design where the LEDs move to the right every clock cycle.

   X 0 0 0 …
   0 X 0 0 …
   …
   0 0 0 0 … X
   X 0 0 0 ….

   Since the clock on the FPGA is 100 MHz, it will be too fast for the eye to see, and all the LEDs will appear to be on.

2- Waitting Module (50 Point)

In order for the design given in the preliminary stage to become visible, it needs to execute slowly. For this, a module called waittingModule will be designed. This module get clk, rst signals as input and OK as output.

After counting the 100 million rising edges of the clock input, waittingModule will generate OK signal as 1 for only 1 cycle and pull it to 0, and then wait for 100 million cycles again and make a repeating structure.

Modify the preliminary stage design with use waitModule design to able to see LEDs.

3- Upper Counter (50 Point)

A module named upperCounter will be designed. This module takes a clock signal named clk as input and outputs signals named seg 7-bit and an 4-bit as output. The operation of the module is to display the numbers between 0-3 (0 1 2 3 0 1 2 …) consecutively in the sevenSegment every second by using the waitModule made in the previous stage. For this, activate the sevenSegment LEDs given below and display the desired number. Note: Basys3 used an anode element. In other words, the value of 0 to be fed on it will be active, and the value of 1 will turn off the LEDs.