

## EECS 3201 :: Lab 4

### Shot Clock

#### Overview

In this lab you will:

- Create a shot clock appropriate for basketball; and
- Create a video to document your work.

Value: This lab is worth 5/20 of your total lab score.

#### Background

In most basketball leagues, a team with possession of the ball has a given number of seconds to take a shot on the basket, or else they lose possession of the ball. In the NBA, WNBA, and OUA, the shot clock is set to 24 seconds, while in the NCAA, the shot clock is set to 30 seconds.

#### Shot Clock

Your task is to create a shot clock with the following features, starting with a 24-second clock:

- The clock counts down from 24 to zero (\*), displaying the time remaining in seconds (as an integer) on the seven-segment displays;
- If the clock reaches zero, the display holds at zero until reset; and
- At any time, whether it has reached zero or not, the clock can be reset by pressing a button; once reset, it immediately starts counting down again from the maximum time.

If your countdown (\*) is in hexadecimal, this is worth 5 technical points (out of 8); if it is in decimal, this is worth 6 technical points.

Additional features:

- (\*\*) The clock can be paused by pressing a (second) button, and un-paused by pressing the same button. (1 technical point)
- (\*\*\*) The maximum time can be selected to either 24 or 30 seconds, via a switch. (1 technical point)

Verilog code for a clock divider (i.e., that takes the 50 MHz system clock as input, and gives a 1 Hz clock as output) is provided on eClass. You may use this code as-is, modify it, or disregard it, as you like.

You may use your code from previous labs to complete this lab. If you do, make a note of this in a comment in your code (e.g. // this file previously submitted as part of Lab 3).

**Deliverables**

As before, your video should include you stating your name and student number, followed by (without breaks/cuts) a short demonstration of your clock.

Your video must include at least one complete countdown.

If you implement (\*\*) and/or (\*\*\*), in the interest of time you can demonstrate them with just a few seconds of countdown.

**Scoring**

The lab is scored out of 10: 2 points for your video, and 8 technical points.

Video: 0/2 if missing, 1/2 if it does not conform to the specification, 2/2 if correct.

Technical points: Scoring is described above. Minor mistakes may lead to point deductions.