University of Washington – College of Engineering

Spring 2023 Instructor: Justin Hsia 2023-05-18

EE/CSE371 QUIZ 4

Name: _____

Student ID Number: _____

Please do not turn the page until 11:40.

Instructions

- This quiz contains 3 pages, including this cover page. You may use the backs of the pages for scratch work.
- The quiz is closed book and closed notes.
- Please silence and put away all cell phones and other mobile or noise-making devices.
- Remove all headphones and watches.
- You have 40 (+5) minutes to complete this quiz.

Advice

- Read questions carefully before starting. Read *all* questions first and start where you feel the most confident to maximize the use of your time.
- There may be partial credit for incomplete answers; please show your work.
- Relax.

Algorithm to ASMD [16 pts]

The pseudocode to the right is for an algorithm to reverse the first `Num` elements of a **dual-port RAM** (*i.e.*, one that can read and write to two different addresses *in the same clock cycle*) with *unregistered* output.

- Include inputs `Num`, `Start`, and `Reset`.
- Include outputs `Ready` and `Done`. `Done` should remain asserted until `Start` is de-asserted.

```
N = Num
for k from 1 to N/2:
  A = RAM[k-1]
  B = RAM[N-k]
  RAM[k-1] = B
  RAM[N-k] = A
endfor
```

Create an ASMD chart for this algorithm. Please follow the names given in the algorithm, including using `RAM[i]` to indicate the data stored in the RAM at address `i`, and try to choose reasonable names for control signals.

Partial Datapath [10.5 pts]

For the same array reversal algorithm, the block diagrams for all of the main datapath components are given below. Draw out a partial datapath that includes these blocks and their connections.

- You do NOT need to show/generate the **status signals** or the **clock connections**.
- For **control signals**, you can simply attach their names on the ends of wires and buses in as many places as needed.
- For **arithmetic operations**, you may draw squares with the operations written inside (*e.g.*, [-1], [÷2], [>]).