

EE/CSE 371 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 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 [15 pts]

The pseudocode to the right is for an algorithm that computes the **dot product** for two arrays of length $Len \geq 1$ that are both stored in the same **single-port ROM** (*i.e.*, one that can read from one address at any given time) with *unregistered* output.

```
A = Addr1
B = Addr2
P = 0
for L from Len-1 to 0:
    P += ROM[A+L] * ROM[B+L]
endfor
```

- Include inputs **Len**, **Addr1**, **Addr2**, **Start**, and **Reset**.
- Include outputs **Ready** and **Done**. Done should remain asserted until Start is de-asserted.
- The datapath on the next page (tip: look at it first!) includes a counter **L** (up or down) and registers **A**, **B**, **P**, and **T**.
- Assume all arithmetic operations can be completed within a single clock cycle.

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

Partial Datapath [11 pts]

For the same dot product algorithm, all of the main datapath components are given below. Recall that L can be an up or down counter. Draw out a partial datapath that includes these blocks and their connections.

- DO NOT show the **clock connections**, but DO generate the **status signals**.
- For **control signals**, you can attach their names to the ends of wires and buses in as many places as needed.
- For **arithmetic operations**, draw squares with the operations inside (e.g., [-1], [$\div 2$], [$>$]).

