

Computer Architecture Ph.D Qualifying Exam

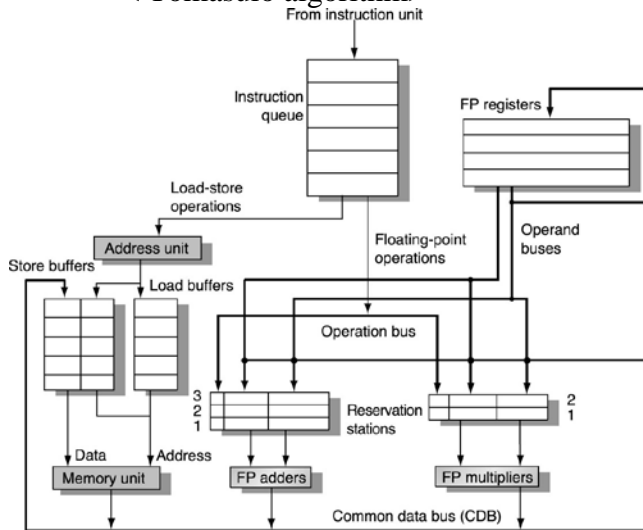
Summer 2017

Write your answers in legible and separate letters or I will not grade them.

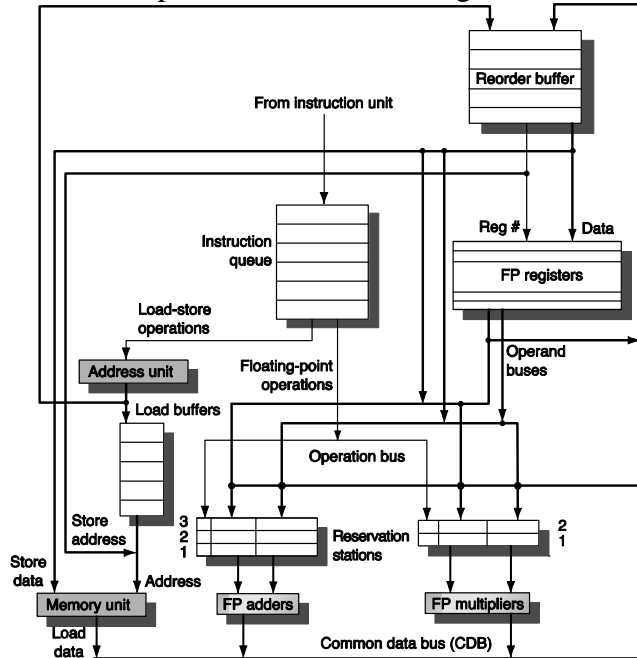
Use only given space for your answers.

1. The following figures depict the original Tomasulo and speculative Tomasulo algorithms. Compare and contrast them in terms of their register renaming and write results. (30points)

< Tomasulo algorithm >



<Speculative Tomasulo algorithm >



6. For the following MIPS assembly code, identify all data dependences by type. List the two instructions involved. Draw the data dependence graph for this code (15pts).

```
add  $1, $5, $3
sw   $1, 0($2)
lw   $1, 4($2)
add  $5, $5, $1
sw   $1, 0($2)
```