Exam 2 Clarifications

Q3.1

1. Adjusted code:
   Initial values are: $t0 = 3 and $t1 = 6

```
loop:  addi $t0, $t0, -1     //Decrement $t0 ($t0 = $t0 - 1)
       addi  $t1, $t1, -1    //Decrement $t1 ($t1 = $t1 - 1)
       addi $v0, $v0, 1      //Increment $v0 by 1
       bne  $t0, $t1, end    //Branch to end if $t0 not equal to $t1
       bne  $t0, $zero, loop       //Branch to loop if $t0 not equal to 0
       addi $t1, $zero, 15   // $t1 = $zero+ 15 = 15
end:   add $t0, $t0, $t0
```

2. All possible data forwarding paths are implemented in every phase starting from the ID/RR phase.

Q3.2

1. Reworded questions:
   3.2.a.a. RAW hazard pairs, and how many bubbles does each pair introduce?
   3.2.a.b. WAR hazard pairs.
   3.2.a.c. WAW hazard pairs. Does this introduce bubbles? Why or why not?
   3.2.b. Only consider data hazards, not control hazards. The question will be reworded on the actual exam.

Q4.2

1. The shortest job is determined by considering only the immediate next CPU burst, ignoring all future CPU bursts.

Q5

1. Time starts at 0.

Q6

1. In the context of non-paged systems, if all free memory is contiguous, there is no external fragmentation.
2. Since it is not explicitly stated, memory compaction does not occur.