CS315 2023F Project02 Exam Problems   Solutions

Question 1 - RISC-V Snippet 1

Assume `a0 = 1`, `a1 = 2`, and `a2 = 3`. What is the value of `a2` after executing this snippet:

```
add a0, a0, a0      a0 ← a0 + a0      a0 ← 1+1      a0 = 2
add a1, a1, a2      a1 ← a1 + a2      a1 ← 2+3      a1 = 5
mul a2, a1, a0      a2 ← a1 * a0      a2 ← 5×2      a2 = 10
```

Question 2 - RISC-V Snippet 2

Assume `a0 = 0`, `a1 = 3`. What is the value of a0 after executing this snippet?

```
        addi a0, a0, 1      a0 ← a0+1   a0 ← 0×1   a0 = 1
        j boo
foo:
        addi a0, a0, a1     a0 ← a0+a1  a0 ← 3+3   a0 = 6
        j goo
boo:
        addi a0, a0, 2      a0 ← a0+2   a0 ← 1+2   a0 = 3
        beq a0, a1, foo     a0 = 3 a1 = 3
goo:
        addi a0, a0, 1      a0 ← a0+1   a0 ← 6+1   a0 = 7
```

Question 3 - RISC-V Snippet 3

Assume `a0 = 0`, `a1 = 2`, and `a2 = 0`. What is the value of a0 after executing this snippet? How many instructions are executing in the snippet below? Note that labels such as `loop:` and `loopend:` do not count as instructions. Also assum beq counts as one instruction whether or not the branch is taken.

```
        li a3, 0             ① a3 = 0
loop:
        beq a1, a2, loopend  ② a1 = 2, a2 = 0   ⑥ a1 = 1, a2 = 0   ⑩ a1 = 0, a2 = 0
        add a3, a3, a1       ③ a3 = 0+2 = 2      ⑦ a3 = 2+1 = 3
        addi a1, a1, -1      ④ a1 = a1-1 = 1     ⑧ a1 = 1-0 = 0     11 total
        j loop               ⑤                   ⑨                   instructions
loopend:
        mv a0, a3                                                    ⑪ a0 = 3
```