Lab due Jan 11, 2016 21:59 -02 Past due

Beta instruction sequences

0.0/5.0 points (graded)

- Summary of Instruction Formats (PDF)
- Beta Documentation (PDF)

For each of the Beta instruction sequences shown below, indicate the values of the specified registers after the sequence has been executed by an unpipelined Beta. Consider each sequence separately and assume that execution begins at location 0 and halts when the HALT() instruction is about to be executed. Also assume that all registers have been initialized to 0 before execution begins.

Remember that even though the Beta reads and writes 32-bit words from memory, all addresses are *byte addresses*, i.e., the addresses of successive words in memory differ by 4.

You can find detailed descriptions of each Beta instruction in the "Beta Documentation" handout -- see link above.

Hint: You can enter answers in hex by specifying a "`0x`" prefix, *e.g.*, 16 could be entered as "`0x10`". Usually one would enter addresses, values in memory, etc. using hex. You can also use a "`0b`" prefix to enter a binary value.

(A)

```
. = 0
AND(r31, r31, r0)
CMPEQ(r31, r31, r1)
ADD(r1, r1, r2)
OR(r2, r1, r3)
SHL(r2, r3, r4)
HALT()
```

Value left in R0? Answer: 0

Value left in R1? Answer: 1

Value left in R2? Answer: 2

Value left in R3? Answer: 3

Value left in R4? Answer: 0b10000

Address of 32-bit memory location containing OR instruction?

Answer: 0xC

(B)

```
    . = 0
    ADDC(r31, N, r0)
    LD(r0, 8, r1)
    SRAC(r1, 4, r2)
    ST(r2, 4, r0)
    HALT()

    . = 0x2000
N:  LONG(0x12345678)
    LONG(0xDEADBEEF)
    LONG(0xEDEDEDED)
    LONG(0x00000004)
```

Value left in R0? Answer: 0×2000

Value left in R1? Answer: 0xEDEDEDED

Value left in R2? Answer: 0xFEDEDEDE

Address of 32-bit memory location written by ST?

Answer: 0×2004

Value found in 32-bit memory location with address 0?

Answer: 0xC01F2000

(C)

```
    . = 0
    LD(r31, X, r0)
    CMPLE(r0, r31, r1)
    BNE(r1, L1, r31)
    ADDC(r31, 17, r2)
    BEQ(r31, L2, r31)
L1: SUB(r31, r0, r2)
L2: XORC(r2, 0xFFFF, r2)     // be careful here!
    HALT()

    . = 0x1CE8
X:  LONG(0x87654321)
```

Value left in R0? 0×87654321 Answer: 0×87654321

Value left in R1? 0×0001 Answer: 1

Value left in R2? Answer: 0×87654320

Value assembler assigns to L1? 0×0014 Answer: 0×14

Value found in 32-bit memory location with address 8? 0×77E10002

Answer: 0×77E10002

(D)

```
    . = 0
    ADDC(r31, 0, r0)
    LD(r31, N, r1)
    BEQ(r31, L3, r31)
L1: ANDC(r1, 1, r2)
    BEQ(r2, L2, r31)
    ADDC(r0, 1, r0)
L2: SHRC(r1, 1, r1)
L3: BNE(r1, L1, r31)
    HALT()

    . = 0x2468
N:  LONG(0x8F2E3D4C)
```

Value left in R0? Answer: 17

Value left in R1? Answer: 0

Number of times instruction labeled L2 is executed?

Answer: 32

Suppose that the instructions above were relocated so that the first instruction were at location 0×100 instead of location 0. Assuming we then started execution at location 0×100 and we wanted the instructions to perform the same computation, which instruction encodings should be changed when relocating the program?

- ◯ no instructions need to be changed ✔
- ◯ BNE and BEQ instructions would need to be changed
- ◯ LD instructions would need to be changed
- ◯ BNE, BEQ and LD instructions would need to be changed
- ◯ all instructions need to be changed

(E)

```
    . = 0
    BEQ(r31, L1, r0)
    ADDC(r0, 0, r0)
L1: LD(r0, 0, r1)
    HALT()
```

Value left in R0? Answer: 4

Value left in R1? Answer: 0xC0000000

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- BSim bug for part (E)? — 3
  The value BSim leaves in $r0$ after $BEQ\ (r31, L1, r0)$ in part (E) is different than the one that ...
- Am i doing something wrong if i get a literal as a fraction? — 3
  When i divide the offsets by 4 i get a fraction, is there some problem with my calculation or is t...
- R2 in section C — 3
  Is there a problem with the grader? No matter what I fill there for R2 (with and without "0x", wit...
- Clarification required on one question in Section B — 3
  What is meant by the question "Address of 32-bit memory location written by ST?" in section B...
- About question 4 of Lab1-c — 5
  For the question "Value assembler assigns to L1?", it should be compute the 32bit value of "SU...
- Where is N declared? — 3
  How does the assembler assign a value to N in the line, ADDC(r31, N, r0) I don't see it declared...